

AN ANALYSIS OF RETAINED TWO DIMENSIONAL ELEMENTS
IN A THREE DIMENSIONAL SCULPTURAL FORMAT

PROBLEM IN LIEU OF THESIS

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CHAPTER I

INTRODUCTION

My background is centered on the more than twenty years that I spent working two dimensionally as a stained glass artist. Considerable time and effort went into developing my skills and knowledge. The concentration in that area led to a virtual lack of effort and, therefore, lack of development of skills and knowledge of three dimensional design expertise. Consequently, when I began working in sculptural formats, there was very little prior knowledge and skill from which to draw. There was no point of reference from which to depart other than the two dimensions with which I had been working. An obvious simplification would be to state that the third dimension involves only an extension of depth to height and width of two dimensions for the creation of a successful sculptural image. Although easy to state, the completion of the process was not that simple. As a consequence, my early sculptural efforts were really no more than two dimensional configurations which were affixed to a support system that elevated the effort in a halting way off the surface and gave it a semblance of three dimensionality.

External, but nevertheless germane to my sculptural work, are my interests in archaeology and science fiction. These references have manifested themselves in a series of works that mark the transition from the two dimensionality of my stained glass work to the beginnings of successful, three dimensional, sculpture. The series is entitled Artifacts from an Age Yet to Come, and many of these works have historical references that are architectonic in nature. All of them, hopefully, have something of a mystique about them that raises more questions than are answered in their viewing.

Even though these works are successful as sculpture, there remains an often distinctive remnant or echo of the previous two dimensional design idiom with which I had worked. It is from within this context that my problem in lieu of thesis was derived.

Statement of the Problem

The object of this problem in lieu of thesis has been the exploration and identification of the retained two dimensional design idiom in the sculptural format of my work. (By this, I am referring to the lateral, planar quality which often continues as part of my designs.) Continuing with the Artifacts from an Age Yet to Come concept, I posed the following questions for evaluation:

1. To what extent did the work rely on a two dimensional reference?
2. What was the specific two dimensional reference included in the work under consideration?
3. To the extent that there was a two dimensional design element in the work under consideration, did that element detract from or enhance the three dimensional nature of the work?
4. Notwithstanding the possible two dimensional design references in work that was intended as three dimensional, does the work elicit the kinds of questioning curiosity posed by the Artifacts from an Age Yet to Come concept in which it was framed?

Methodology

Answering the questions posed in this problem and documenting the work that was proposed has resulted in the creation of five works; three of which were analyzed in the context of the questions that were posed for the problem. The media for these pieces was glass, stone, and/or steel. The steel was formed by welding and forging. The stone was formed by sawing, carving, and sandblasting. The glass was formed by cutting, fusing, slumping on a drop-out mold, and by a lamination process using an adhesive which is activated by ultraviolet radiation from the sun's rays. Techniques of glass work beyond the level of simple cutting are presented

in the discussion on the works as they are analyzed, and a glossary of the specialized terminology has been included in the appendix.

Additionally, the works have been documented by drawings done while the works were in progress and by photographs taken on their completion.

CHAPTER II

DISCUSSION AND ANALYSIS OF THE WORKS

The five works created for this problem are, in order of their creation, Reliquary for a Petroglyph, Vessel for an Unknown Ritual, Deco Retro, An Apprehension of Hazards More Real Than Perceived, and Inspiritu. The works chosen for analysis are An Apprehension of Hazards More Real Than Perceived, Inspiritu, and Reliquary for a Petroglyph. The sequence has no significance other than to present the discussions in a ranking order; presenting the most two dimensional to the least two dimensional of the works in a logical sequence.

An Apprehension of Hazards More Real Than Perceived

In the overall series of works that have been created over the last three years, there are several that I consider to be anomalous to the series. The anomaly is generated by the choice of materials in that the work is composed only of stone; is composed of stone and steel with no glass, or is composed of steel and glass with the exclusion of stone. An anomaly can also occur when the work clearly falls outside the conceptual grouping embraced by the title of the series. The overall group nearly always is composed of stone and

glass with steel occasionally being the unifying material for the piece.

An Apprehension of Hazards More Real Than Perceived is anomalous on two accounts; the first being the absence of stone in the composition, and the fact that it does not fit easily into the created mythology represented by the series' title: Artifacts from an Age Yet to Come. This work is the most two dimensional of all the works that I have produced to date. It exists more nearly at the planar level than any of the others. Outside of the base upon which it rests, the piece projects from the front vertical plane by no more than 1 3/4 inches from the defining plane delineated by the sheet of 3/4 inch plate glass which measures 31 1/2 inches high by 37 inches wide. When seen from the ends, the piece virtually disappears, and it relies almost entirely on the two dimensional presence defined jointly by the large sheet of clear glass and the high contrast black and yellow graphics. These graphics are painted on the 2 inch by 4 inch welded steel assembly which caps the glass across the top and unevenly down the sides to lengths of 11 inches and 20 inches.

The graphics are a representation of the alternating black and yellow diagonal stripes that are internationally recognized as a hazard warning. It is widely recognized as scientific fact that black and yellow in combination with one another provide the highest possible visual contrast.

The visual contrast generated by this color combination, the ambiguity posed by the transparency of the glass, and the simultaneous reflections that one sees even while viewing objects through the sheet of glass provide much of the dynamic impact inherent in the work.

The dynamics are further enhanced by the fact that the mounting of the glass to the column which supports it at essentially eye level is asymmetrical. It is placed one inch off the vertical center of the glass. The tension is further heightened by the fact that the slot into which the glass is mounted to the column is slightly lower on one side than the other. The visual effect is to create a very slight, but very real, unsupported diagonal. Because of the tensions which this element of design creates in addition to the ambiguities already noted, the piece appears to be physically unstable. (In fact, however, this is probably one of the most stable pieces that I have done.)

A final element of the design of the work is the chipping off of the exposed lower corners of the glass. Although rounded off with abrasives, these corners give the appearance of being very sharp. They visually pose a threat; a hazard, if you will, of the very nature suggested by the graphics at the top of the piece.

These several aspects; the graphics at the top of the piece, the ambiguity posed by the simultaneous transparency and reflectiveness of the glass, the asymmetrical mounting

of the glass and the concurrent unsupported diagonal, along with the visual threat posed by the broken glass at the lower corners of the plate of glass, are effectively seen only from the sides of the piece. They are either unrecognizable or strongly diminished when viewed from the ends and create, then, a piece that is, for all practical purposes, a two dimensional sculpture.

Although this piece does not easily fit into the mythology suggested by the Artifacts series, it nevertheless creates its own mythology; and this, in spite of its very pronounced two dimensionality. The hazard symbol seems to float in mid-air; an illusion heightened by the ambiguity of the glass which is, at once, both transparent and opaque. The questions generated by the piece range from ecological, to societal, and to psychological issues. Which of these, if not all of them, is being raised by the work? People approach the work and shy away from it initially, but often return to it to ponder its significance. The piece stands alone without its title. And yet, once appraised of the title, there tends to be a confirmation of the validity of the work and an internalized acceptance of the fact that, yes, indeed, there are hazards out there that are more real than we ever perceive.

In light of the preceding discussion of this work, it is obvious that it relies almost entirely on its two dimensional reference for its impact. That reference is the

virtually flat plane delineated by the sheet of plate glass which is effectively defined by the painted steel cap at the top and by the chipped corners at the bottom. The very strong two dimensional aspect of this work effectively negates the work as three dimensional sculpture. The almost nonexistent third dimension has very little presence, and the graphics are all but lost to the viewer from this viewpoint.

Even with the almost blatant two dimensionality of this work, I feel that it very successfully meets the expectations of raising the kinds of questioning curiosity posed by the Artifacts series. The anomalies of its materials and its posture outside the series are not a detriment to its success. The responses which I have observed either anonymously or in the company of the viewers have confirmed the effective ability of the piece to pique one's curiosity. It is the strength of the two dimensionality of this piece that imposes itself upon the viewer and gives it its visual impact.

Inspiritu

Inspiritu very easily falls into the grouping that is embraced by the concept of the Artifacts series. The choice of materials, glass and stone, plays a large part in drawing the mental image beyond the physical to an almost metaphysical concept of what one is actually viewing. It is

not so much the use of stone and glass, but the use of a specific kind of stone and the way the glass is used to complement that choice of stone which work together at that metaphysical level.

In many ways, the piece is very simple, but not necessarily in its verbal description. The stone is a fossiliferous limestone from a quarry near Austin, Texas. It is a sedimentary limestone in which the leached-out cavities of countless sea shells remain to echo the fact that living things once occupied these spaces. There are two pieces of stone. There is a base which measures 12 inches by 16 1/4 inches by 2 1/2 inches. Affixed to the base is a column which is centered on the base. The column is 4 1/2 inches thick throughout its height when measured along the side. From the front, the column measures 8 1/2 inches at its base and tapers to a width of 5 1/2 inches some 60 inches above the base. At this junction, it tapers from each side at an approximate 45 degree angle to a point which adds an additional 4 inches to the height of the column. This brings the combined height of the stone to 64 inches. Centered along both sides of the column, beginning 14 inches above the base, is a slot that is 3/4 inch wide and 1 inch deep that proceeds to the top of the column; exiting through the angled tops of the sides.

Into these slots has been inserted what appears to be a monolithic piece of glass which both completes the work and

gives it its vibrancy. The glass, rather than being one solid piece, is, in fact, a composition of more than 1,100 individually measured, cut, and laminated pieces of glass. All are 1/8 inch thick, are nominally 5/8 inch wide, and have lengths which range from 1 1/2 inch to more than 8 inches. At the bottom of the slots on either side is a footing in the glass composition which extends 1 1/2 inch from the stone and quickly narrows to a mere 3/8 inch projection. The glass composition gradually increases in a straight line which angles away from the stone to a point near the top where the glass begins to curve rather than angle outward. This curve terminates at a point level with the angling of the stone column near its apex. The width of the glass at this level is 17 inches and this is juxtaposed against the 5 1/2 inch width of the stone at the same level. The glass tapers, layer by layer, from this level, to a point that is 8 inches above the widest part of the glass composition. Within this expanse of glass has been left a circular negative space whose radius is 3 3/4 inches. The radius point of the circle is placed above the apex of the stone so that the radius meets the stone at the point where the stone begins its angle from the sides to its final height at the apex.

The lamination process is derived from industrial applications of the adhesive which hold the glass together. The adhesive is a liquid that sets up when exposed to the

ultraviolet radiation from sunlight. In the absence of that ultraviolet radiation, the adhesive has an unlimited working time before it sets up. It will set up overnight with the use of a black light bulb, but the setting is almost instantaneous in full, unobstructed sunlight. Clouds absorb an enormous amount of the ultraviolet radiation and this should be taken into account when one uses this process. The extended working time for this adhesive in the absence of natural ultraviolet radiation is an asset for the artistic use of the adhesive. It gives sufficient time for the careful assembly of the glass once it has been prepared. If one chooses, it is possible to assemble several segments for later assembly into a larger, final assembly. This is especially helpful if the subsections are particularly difficult or unwieldy.

The glass must be very clean for the adhesive to work properly in bonding the pieces together. All oil from one's hands, dust, powdered glass from the cutting process, and blood resulting from fingers cut in the process must be removed from the glass or the bond will not be properly made. The result will be a weakened joint that is likely to fail. An ammonia based glass cleaner is recommended for cleanup prior to assembly. A commercial glass cleaner which has an ether content can be used successfully in the cleanup of the glass once the adhesive has set up following exposure to ultraviolet radiation. Properly applied and cured, the

adhesive is optically clear. The bond between the pieces is stronger than the glass itself. The glass will break before the bond will.

The result can be a very strong, durable piece that, even if broken, can be repaired. The repaired area will often leave facets which can lend additional visual interest to the work. In fact, the intentional fracturing and re-bonding of the work in progress can be successfully used in the planning and execution of the work. This can provide additional visual interest to the work, but its use in the composition should be carefully considered, since the effects can be carried to an excess.

Once the physical and technical aspects of Inspiritu are considered, the visual aspects remain. Because of the placement of the glass structure in the vertical plane of this piece, there is a consequent two dimensionality which is conferred in it. However, since the shaft of stone plays such a significant role in the overall composition of this piece, the impact of the two dimensionality is reduced. The visual interest in the piece continues as one progresses around it. Even from the side, where the planar delineation is at its greatest, there is still an interest because of the greater mass of the stone column, the visual interest caused by the shell cavities, and because of the structure of the glass which captures and refracts the light. When compared to a piece like An Apprehension of Hazards More

Real Than Perceived, the impact of its two dimensionality is greatly minimized. The limited extension of the glass from the mass of the stone combines with the translucency of the glass to reduce the visual impact of the two dimensionality of the plane which derives from the glass assembly.

As a part of the Artifacts series, Inspiritu inspires the kinds of feelings that are anticipated in the series. There is a monumentality to this piece that exceeds, perhaps, the expectations of its physical presence. Life once existed here in the very place where these cavities in the stone now are. Light has, since before recorded history, been recognized as a force that is an integral part of life and that life, ultimately, cannot exist without it. Light is pulled into and made a part of the piece by the way that the glass has been assembled and incorporated into it. The texture of the cut edges of the glass and the faceting generated by the laminating process work together to generate a translucency in the glass rather than a transparency. The images that are transmitted by the translucency of the glass are vague and nonspecific. All of these aspects combine to create a sense of mystery and awe in the responses of viewers. The light that is transmitted through the glass energizes the work and gives it the semblance of a life of its own.

Although metaphorical references to the Washington Monument are encountered, the more usual response is one of

some kind of religious or spiritual empathy. There is an occasional reference to something specific such as a Celtic cross, but the most frequent response has been a generically spiritual feeling that is generated by the piece rather than one of a specific, identifiable historical reference.

The two dimensionality of this piece is minimized by the fact that the glass element remains both physically and visually so closely tied to the thrust of the central shaft of stone. The fact that both the stone and the glass move visually upward and culminate in a point further ties the two elements together into a unified whole that minimizes the play of the two dimensional aspect on the consciousness of the viewer. The glass, which delineates the two dimensional plane of the work, becomes, not the focal point of the work, but a sublimated part of the overall experience that is encountered in the piece. The spiritual response that is often generated places the work fully within the framework of the anticipated experience. The two dimensionality of this piece is limited and probably is not a part of the average viewer's cognitive participation. The sublimation of the two dimensionality allows the work to function with the success that it has achieved.

Reliquary for a Petroglyph

The reliquary is a construction composed of a base of stone, a steel support structure mounted in the base, and a

graffiti inscribed disc of stone that is enclosed between two semispherical glass domes that are mounted along with the stone disc into the steel support structure. The glass domes draw attention to the markings on the stone, and, by encasing them for presentation, endears them with a certain preciousness that creates an enigma for the viewer; to wit, "What are their meanings and why are they so precious?"

The base of the piece is of limestone that is 4 inches thick. It stands 10 3/4 inches tall at its highest and is 12 inches wide. Viewed from the side of the base that places the tallest part of the base to the left, the leading edge of the base cants backward from the vertical and rises to the 10 3/4 inch height. The top of the base then inclines downward to meet the trailing edge at the right side of the base at a level some 7 inches above the bottom of the base. The trailing edge cants backward at a slightly less acute angle than the leading edge. When viewed from this vantage, the base has a sharply defined, pointed seam which begins at the bottom of the base and, centered, continues from there to a point just behind the mounting hole on the top. There is a hole drilled into the stone from the top, the angle of which cants the steel support structure backward at nearly the same angle off the vertical as the leading edge of the base.

The steel support structure is composed of two 3/8 inch rods which have been heated and bent around a circular

armature in the figure of an arc which encloses approximately two-thirds of a circle. The ends of the rods are pieces of the same diameter rod which have been drawn out to a point using a furnace and a hammer and anvil. these points were then welded to the ends of the arced rods. The points have been worked into an organically entwined arrangement which further encloses the arc described by the curved steel rods and which then point up at an angle roughly equalling the incline of the top of the base. The support structure has a diameter of 20 inches, and, when mounted on the base, gives the piece an overall height of 30 inches.

Enclosed within this support structure are the disc of stone and the two semispherical glass domes which highlight and showcase the graffiti marks on the stone. These domes were formed in an electric kiln with the aid of a steel drop-out ring which allows the glass to drop through the circle that had been cut into the steel. This drop occurred once the glass had been raised to a temperature of 1,450 degrees Fahrenheit. The extent of the drop in the glass is a factor of the temperature of the glass and the time that it is allowed to remain at the given temperature. The dropout ring is mounted horizontally in the kiln on a combination of fire bricks and/or stilts just as would a kiln shelf. A special, ceramic fiber paper is used as a separator between the steel dropout ring and the glass.

Without the separator, the glass would adhere to the dropout ring. The coefficients of expansion and contraction for the steel and glass are so different that they are not compatible with one another. The result of not using a separator is an almost certain shattering of the glass and ruination of the glass. In the case of the two hemispheres used in this piece, both were fired at the same time so that the drop in the two pieces of glass could be as nearly the same as possible. The slight difference that did result from this firing was most likely caused by an uneven heating in the two ends of the kiln.

Once the desired amount of drop had been attained, the temperature of the glass and the interior of the kiln were stabilized at a temperature of approximately 900 degrees Fahrenheit. This was done by opening and closing the lid of the kiln until the temperature was reached and maintainable for a period of time which would result in the proper annealing of the glass. Without the annealing process, another cycle of stress is imposed on the glass and, just as if no separator had been used between the glass and steel, the glass will shatter.

Along with the seam which rises through the middle of the back of the base, these three elements echo and reinforce the central plane of this piece and define the two dimensional plane from which both sides of this piece proceed to unfold in a symmetrical balance. However,

because the semispherical glass domes dominate the piece in such an overwhelming way, the two dimensionality of the piece is effectively lost to the viewer. There is a constant visual impact as one moves around the piece. The domes act as if they were a magnifying glass focused on a word or passage in a book. The asymmetrical structure of the piece when viewed from either side tends to disengage the viewer from the central plane. The unsupported diagonal created by the canting backward of both the leading and trailing edges of the base and the corresponding cant of the upper support structure lend an additional level of interest and tension to the piece which draws attention away from and diminishes the impact of the two dimensional delineation of the piece. Consequently, the subject of the piece, the graffiti marks on the stone, becomes the focal point of the work and the two dimensionality of the piece is diminished to a mere technical aspect rather than being a factor in the viewing experience.

The two dimensionality of this work is of little significance, although it is present in a minor way. The mass of the glass and stone focal point is enhanced rather than diminished by the two dimensionality that is defined by the sharply-pointed ridge on the lesser side and top of the base and by the ring which is defined by the pieces of glass and the stone disc. The two dimensionality is obviated by the semispheres of glass which showcase the graffiti on the

stone. The arcing pieces of steel rod with their organically entwined tips serve to bring the focus more to the subject of the piece than they call attention to the two dimensions which they help to define in more of an analytical than critical sense. The rounded mass of the glass brings the focus to the graffiti on the stone and, therefore, calls attention to the questions raised by their presence. In this way, the piece accomplishes its position within the context of being able to generate the kinds of "questioning curiosity" anticipated in the Artifacts series.

CHAPTER III

CONCLUSIONS

In all of the works that were completed in this problem in lieu of thesis, there was an identifiable, two dimensional element. This can be identified as the plane from which the whole of each piece emanated. On some works, the plane was more easily identified than on others. An Apprehension of Hazards More Real Than Perceived functions, for all practical purposes, at the two dimensional plane. The limited extent to which it extends from the two dimensions that are defined by the large sheet of plate glass amplifies the two dimensionality of the piece. Another aspect of the two dimensionality of the works is the fact that, in all of them, the thickness or depth of the pieces was maintained in a symmetrical balance on either side of the plane of reference. Each side was a mirror image of the other. This mirror imaging of the two sides calls attention to the fact that there is a plane of reference. It is this planarity that defines the two dimensionality of the works.

In Reliquary for a Petroglyph, the compactness of the piece and the bulk of the glass semispheres tend to minimize the impact, visually, of the planarity. The two dimensional plane from which the piece begins to intrude on the third

dimension is recognizable on close inspection. However, the planarity plays very little part in the visual experience of the piece. Its two dimensionality becomes, ultimately, more of an academic discussion than a cognitive visual experience. The mass of the glass domes begins to approach the overall width of the piece and reduces the impact of the two dimensional reference from which the design begins. The ratio of height, width, and depth work together in this piece to negate, visually, the impact of the two dimensional plane.

It is this ratio of depth in relationship to the height and width which determines the impact of the two dimensionality of the work on the visual experience of the piece. When these ratios are considered in Inspiritu, it becomes apparent that not only the physical dimensions are a part of this ratio, but the perceived dimensions and their attendant psychological impact, become a part of the formula as well. The case in point deals with the effect that the translucency of the glass has on the perceived dimension of the glass in relation to the mass of the stone which supports the glass structure.

At its widest point, the glass portion of this sculpture is 17 inches. At the same elevation above the base, the stone has a width of 5 1/2 inches. The ratio of stone to glass is, effectively, 1:3. However, because of the translucency of the glass, there is a reduction in the

apparent overall width of the entire piece. Notwithstanding the fact of the width of the glass, its translucency allows the transmission of light and the comprehension of activity or movement in the space behind the glass. In contrast with the opacity of the stone through which no light or perception of movement can be ascertained, the glass provides a visual transition from the opacity of the stone to the perceptions allowed by the translucency of the glass to the full recognition of whatever might have been either fully obscured by the stone and then partially revealed by the composition of the glass.

This visual ambiguity reduces the effect of the actual width to one which is indefinably, but none the less, perceived to be less than it actually is. This psychological function narrows the width in relation to the mass of the stone and, thereby, tends to unify the visual impact more nearly around the central mass of the piece and, therefore, reduces the impact of the two dimensionality that is, in fact, the beginning plane. I am able to visualize the impact that clear plate glass would have had on this piece had it been used instead of the laminated glass. This visualization is based on similar compositions in which the clear glass was used in conjunction with the stone. The effective narrowing of the glass width in the overall composition would have been an almost total elimination of the impact of the glass. Only the ambiguity caused by the

outer edge of the glass would impact in extending the width of the piece beyond the mass of the core material; whether made of stone, steel, or whatever else had been selected.

Beyond these specific conclusions, I find that there are others of a broader nature which are relevant. The first is that the two dimensionality of a piece is a function of the way a material is used. A large piece of plate glass used whole and with very little modification is going to produce a work that, by its very nature, will have a strong two dimensional aspect. The more the glass is modified; especially if heat treatments or laminating for the purpose of increasing the visual mass of the glass are used, the less will be the perception of the two dimensionality.

Glass can have an ambiguity that, if properly understood, can be used to reduce or enhance its two dimensional effects. Depending on the way, then, that the materials are used, the two dimensionality can be emphasized to increase the impact of a work. Glass can be used in a balanced composition which then unifies the choice of materials into a more cohesive whole.

Further, even though a piece begins from a two dimensional plane and extends symmetrically or otherwise from that plane, the balance that is maintained around the central core of the piece will determine the effect that the two dimensionality will have on its visual impact. This is

true, it would seem, whether the balance is derived from an actual, physical balance or from a psychologically perceived balance such as that obtained from the translucency of a work such as Inspiritu.

Finally, and perhaps most important of all my conclusions, is the one which pertains to the aspect of two dimensionality itself. Once a detriment to my work, I now feel that I have derived an important tool from something that once was perceived as harmful. A design element which once held me back has now been transformed into part of a larger body of knowledge which can prove to be most beneficial. Now, then, when I look back on the introduction to this paper, I find that, rather than having "very little prior knowledge and skill from which to draw," there was, in fact, after more than twenty years of two dimensional design experience, a point of reference from which to depart; that being, the two dimensions with which I had been working.

APPENDIX

Glossary

Annealing. A required step in the cooling stage of working with glass in any of the heat forming processes such as the use of a dropout ring, fusing, draping, slumping, casting, or blowing. It is a factor of time and temperature derived from a combination of the chemistry of the glass being used and the mass or relative thickness of the piece being annealed. Annealing results in the removal of internal stress induced into the glass during the cooling process. Once the glass has undergone processing at its highest temperature, it is quickly brought down to the annealing temperature which is generally in the range of 900 degrees Fahrenheit. This can vary either above or below this temperature; depending on the chemistry of the glass. If the temperature is not specified by the manufacturer, it will have to be determined by trial and error. The length of time at which the temperature is maintained during the process is a factor of the thickness of the glass and can range from a few minutes to several weeks or months. For the 3/8 inch glass used in the works considered in this paper, the temperature used was 875 degrees Fahrenheit, and it was maintained at this temperature for approximately five hours. It is far better to maintain the annealing temperature longer than necessary than to try hurrying the process by cutting short the time at which the glass is held at the temperature. Once a sufficient time for annealing

has taken place, it is usually practical for studio work done in a kiln to be finally cooled to room temperature by turning off the kiln and allowing it to cool at its own rate to room temperature. This would, of course, be done with the lid closed.

Coefficient of expansion and contraction. A mathematical notation which is derived from the chemical formula of the glass itself. It denotes, in scientific terms, the rate at which it will expand and contract in the heating and cooling modes. It is used to determine the cooling temperatures and to compare glasses for compatibility if they are being fused (melted together), or if they are being formed over or into another material (such as steel, clay, plaster, etc.).

Dropout ring. A metal or ceramic disc or plate which has a hole in it through which glass, once it has reached a viscous temperature, will drop out or down through the hole. The hole can have any configuration as the glass will, because of its elasticity at a viscous temperature, conform to the shape. The ring must have sufficient thickness that it does not bend or break under the combined temperature of the kiln or the weight of the glass being formed. The extent to which the glass drops through the ring is a factor of the thickness of the glass, the temperature to which the glass is raised, and the time at which the glass is maintained at the temperature. The higher the temperature,

the quicker and further will be the drop of the glass. It is usually better to proceed at the lowest temperature from which the glass will begin to move and take a longer time to accomplish the drop so that you have more control over the movement of the glass. Once the glass drops to the extent that you desire, the kiln temperature is reduced to the annealing range and that process completes the procedure.

Laminate. A fabrication process which assembles many layers of a material into a larger whole. The general concept requires the use of some kind of adhesive to maintain the integrity of the finished project. With glass, the lamination process can be achieved by the use of adhesives or by heating the glass to a temperature at which the various layers begin to melt together or fuse. Each process has its advantages and drawbacks as well as its own special appeal for the effect that is being sought. Glass which has been laminated by fusing must be taken through the annealing process noted above.

Separator. A barrier material which is used to prevent glass from adhering to a kiln shelf, dropout ring, or any other form into or onto which glass is being formed, cast, or otherwise manipulated in a heat forming process. It can be a traditional kiln wash used in ceramics, or one of the highly technical, ceramic fiber materials derived from the space age materials used for the insulating tiles on the space shuttle. The separator compensates for the

differences in the coefficients of expansion and contraction by acting as a buffer between materials such as steel and glass which expand and contract at different rates. As a result, the glass can be formed over a material which can maintain its shape in the process without fear of the glass being destroyed because of the incompatibility of the glass and the form over or into which it is being shaped.



Fig. 1 An Apprehension of Hazards More Real Than Perceived,
Front View



Fig. 2 An Apprehension of Hazards More Real Than Perceived,
Side View

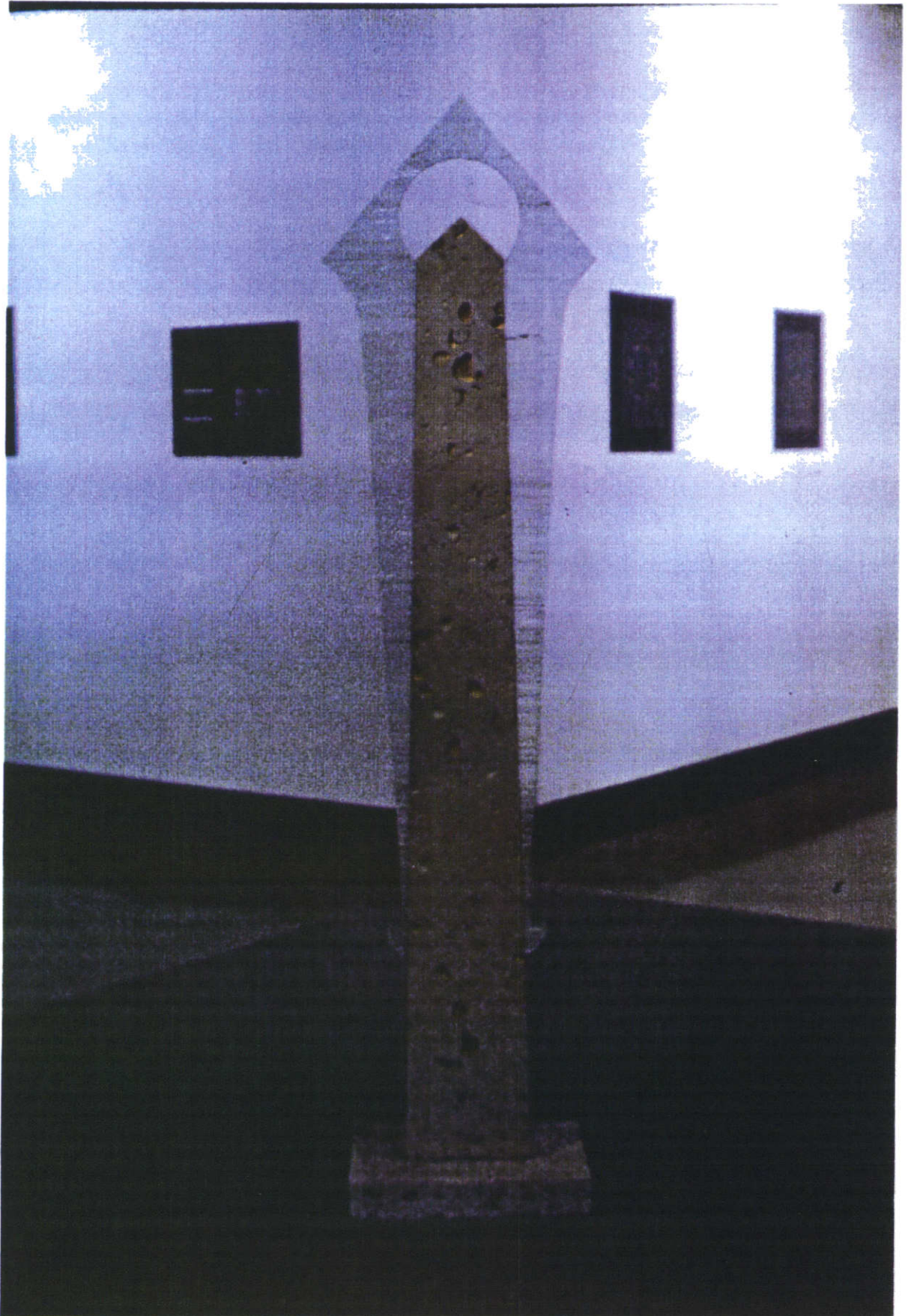


Fig. 3 Inspiritu, Front View

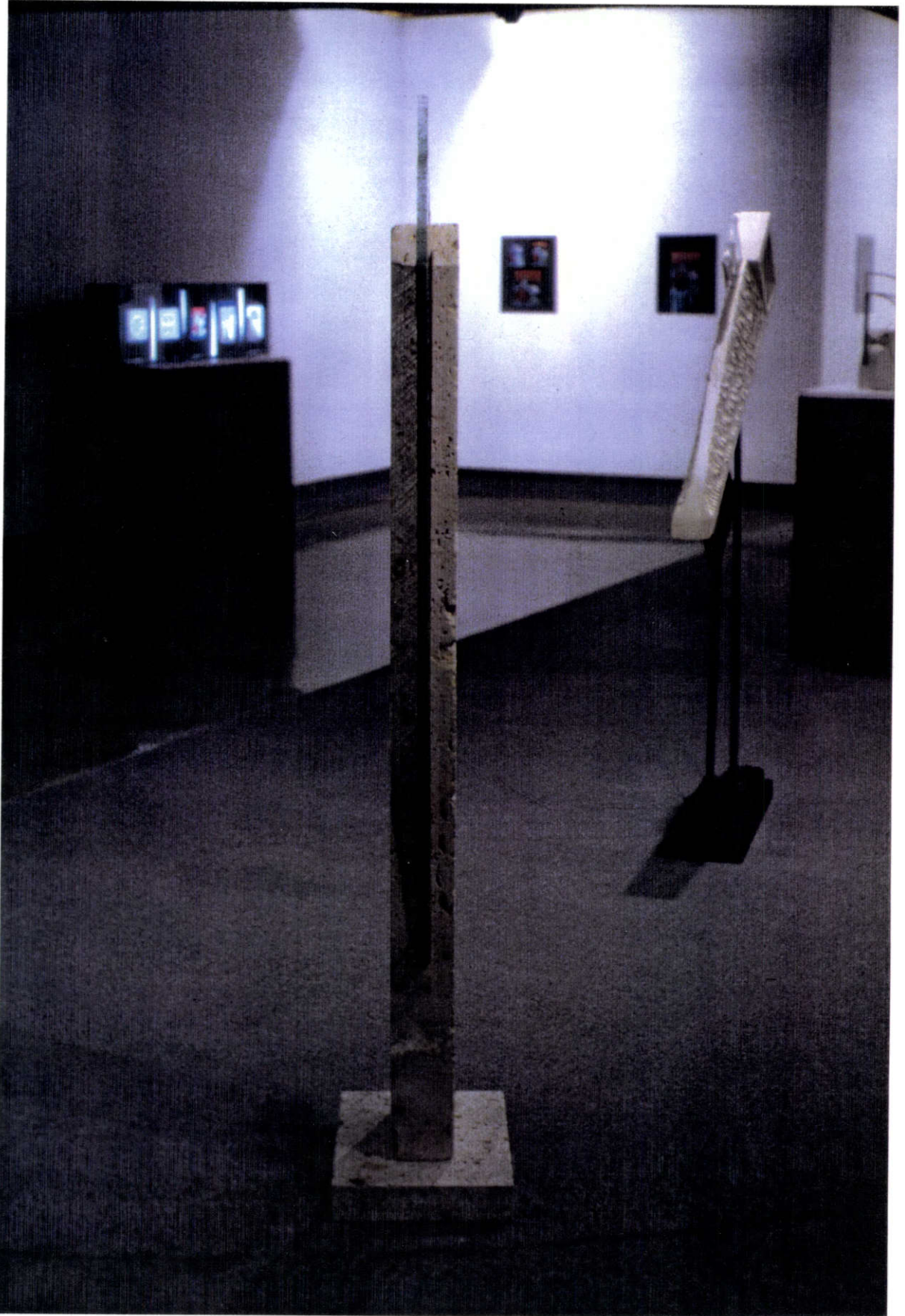


Fig. 4 Inspiritu, Side View

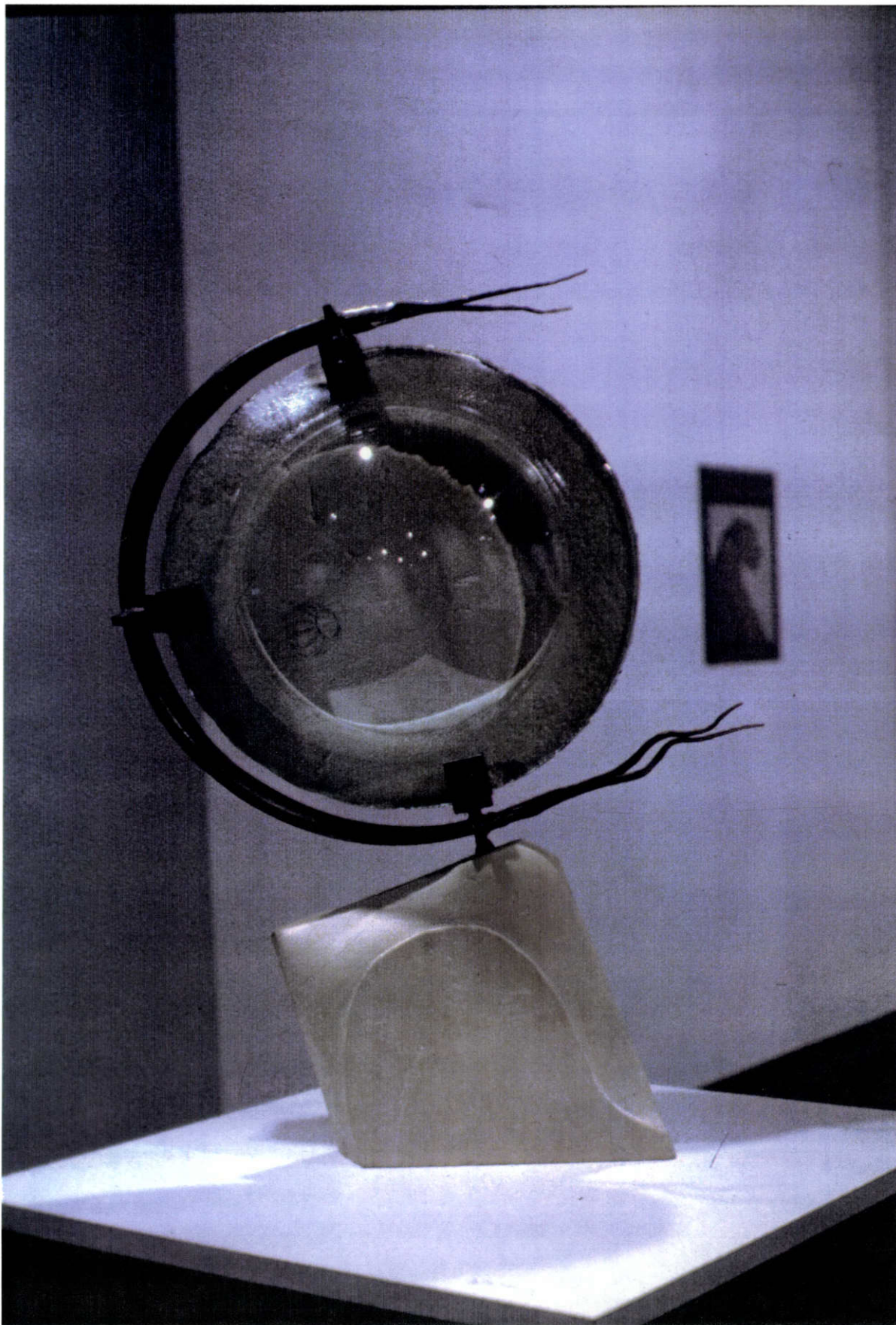


Fig. 5 Reliquary for a Petroglyph, Front View

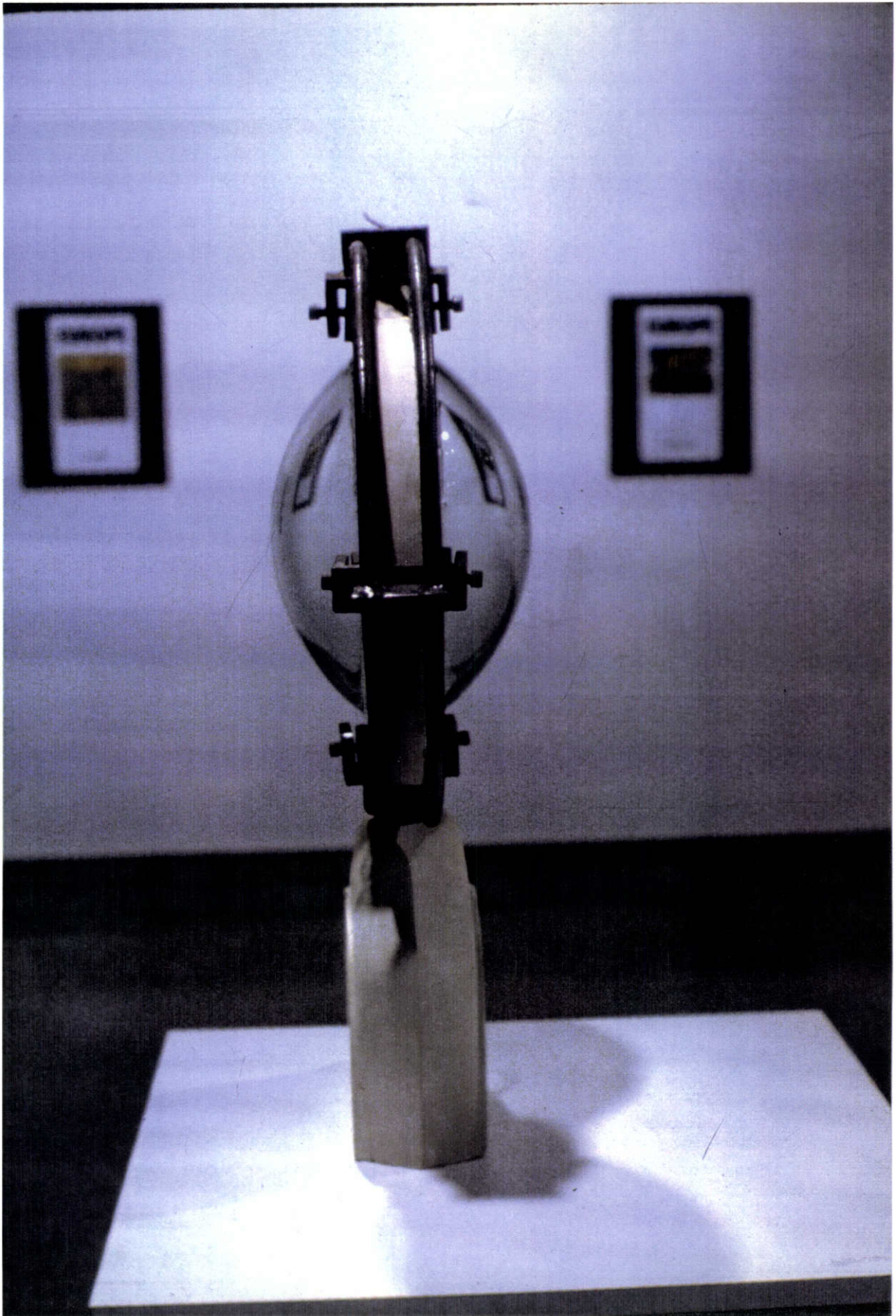


Fig. 6 Reliquary for a Petroglyph, Side View