

San Fernando Valley State College

AN EXPLORATION OF OPTICAL CONSTRUCTIONS

Some Indication of Principles Involved, Problems
Encountered and Range of Application Inherent
to Three Dimensional Optical
Painting/Sculptures

An abstract submitted in partial satisfaction of the
requirements for the degree of Master of Arts in
Art

by

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TABLE OF CONTENTS

	Page
LIST OF FIGURES	iv
A. STATEMENT OF INVESTIGATION	1
B. AN EXPOSITION OF METHODS, PROCEDURES AND MATERIALS EMPLOYED THROUGHOUT THE PERFORMANCE	1
C. STATEMENT OF FINDINGS	11
D. CONCLUSIONS DRAWN BY THE ARTIST	15
BIBLIOGRAPHY	20

LIST OF FIGURES

	Page
FIGURE 1A	2
FIGURE 1B	3
FIGURE 2A	5
FIGURE 2B	6
FIGURE 3A	9
FIGURE 3B	10

A. STATEMENT OF INVESTIGATION

1. To explore in an organized scholarly manner and exploit by means of an appropriate art form, some of the psychophysical findings in visual research.
2. To take advantage of new materials, paints, or techniques which help to present these optical experiences more effectively in the creation of new images or forms.

B. AN EXPOSITION OF METHODS, PROCEDURES AND MATERIALS EMPLOYED THROUGHOUT THE PERFORMANCE

All designs, decorative elements, and proportions of pieces of the construction (see Figures 1A and 1B), as well as the construction itself are built on even divisions of one inch and one foot (i.e., $1/8''$, $1/4''$, $1/2''$, $1''$, $2''$, $4''$, $6''$). This has the effect of lulling the eye into accepting these innumerable divisions as some established norm. However, at the very heart in contrasting color lies a glittering checkerboard cube in an odd division ($3/8''$), which is perceived intuitively (but not consciously usually) as a dimension change not in the previously established series. This is analogous to illusions based on distortion of perspective. The arms of the central core have $1/4''$ stripes which, due to varying viewing distances and angles, were to

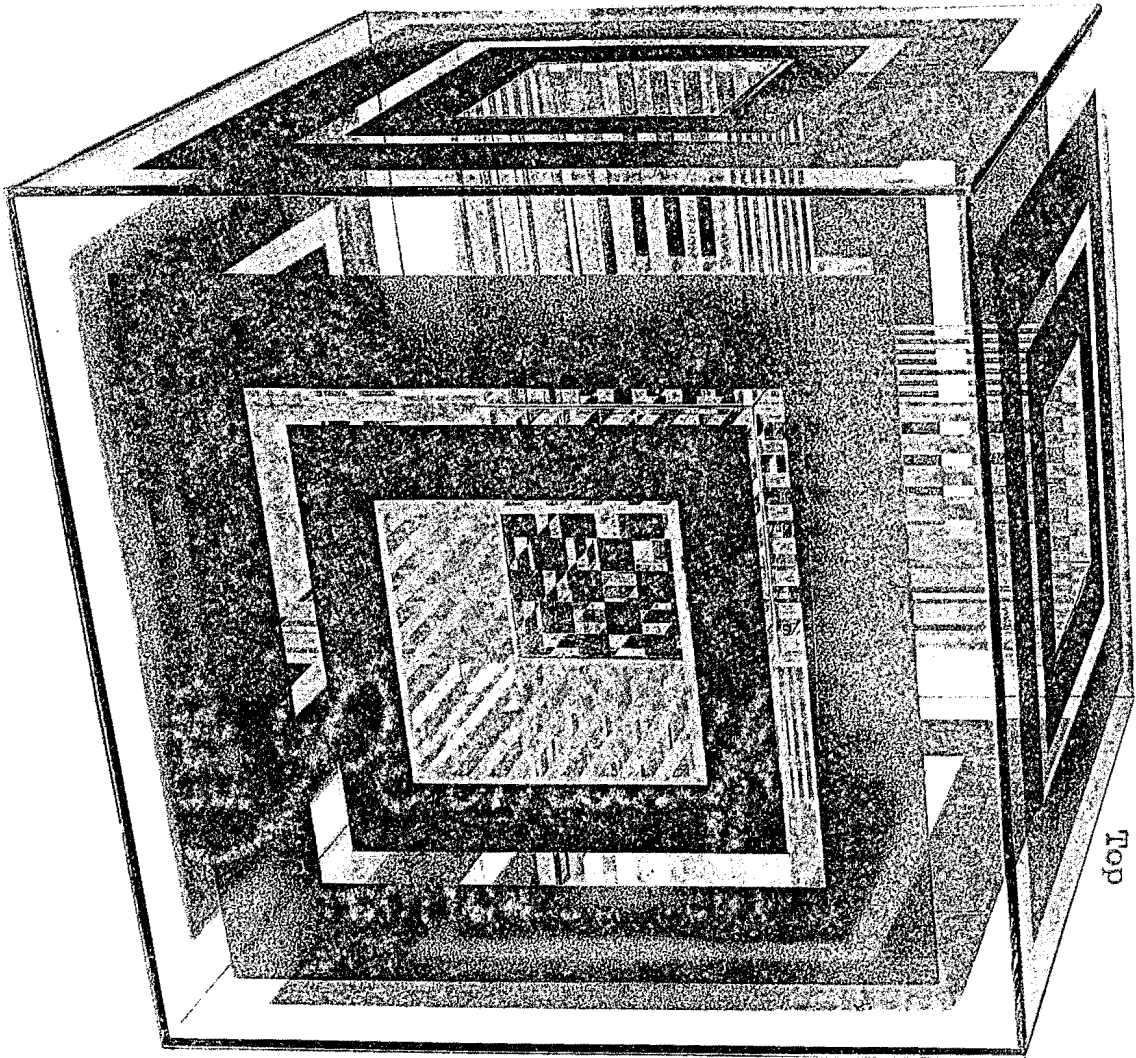


FIGURE 1A

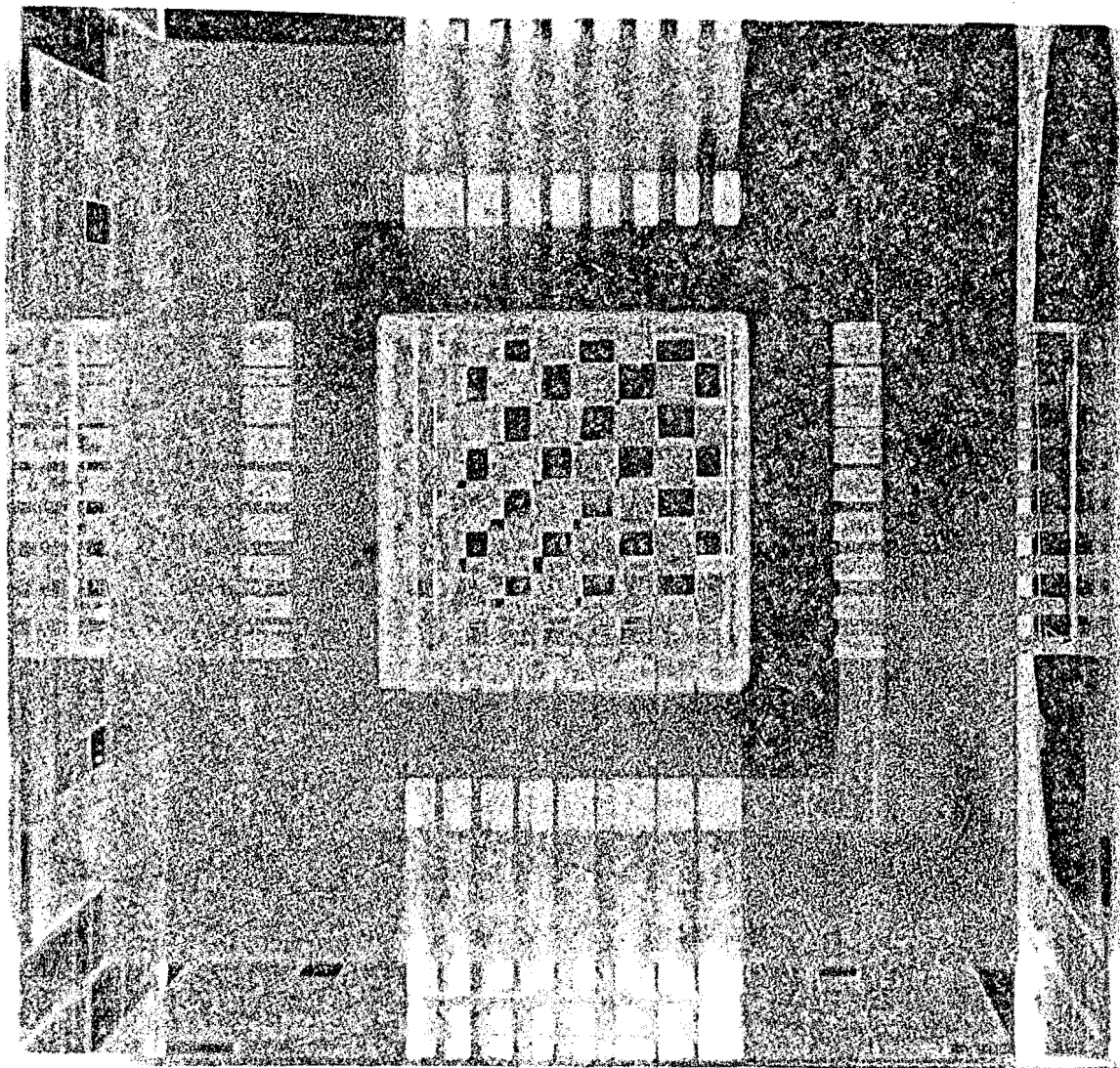


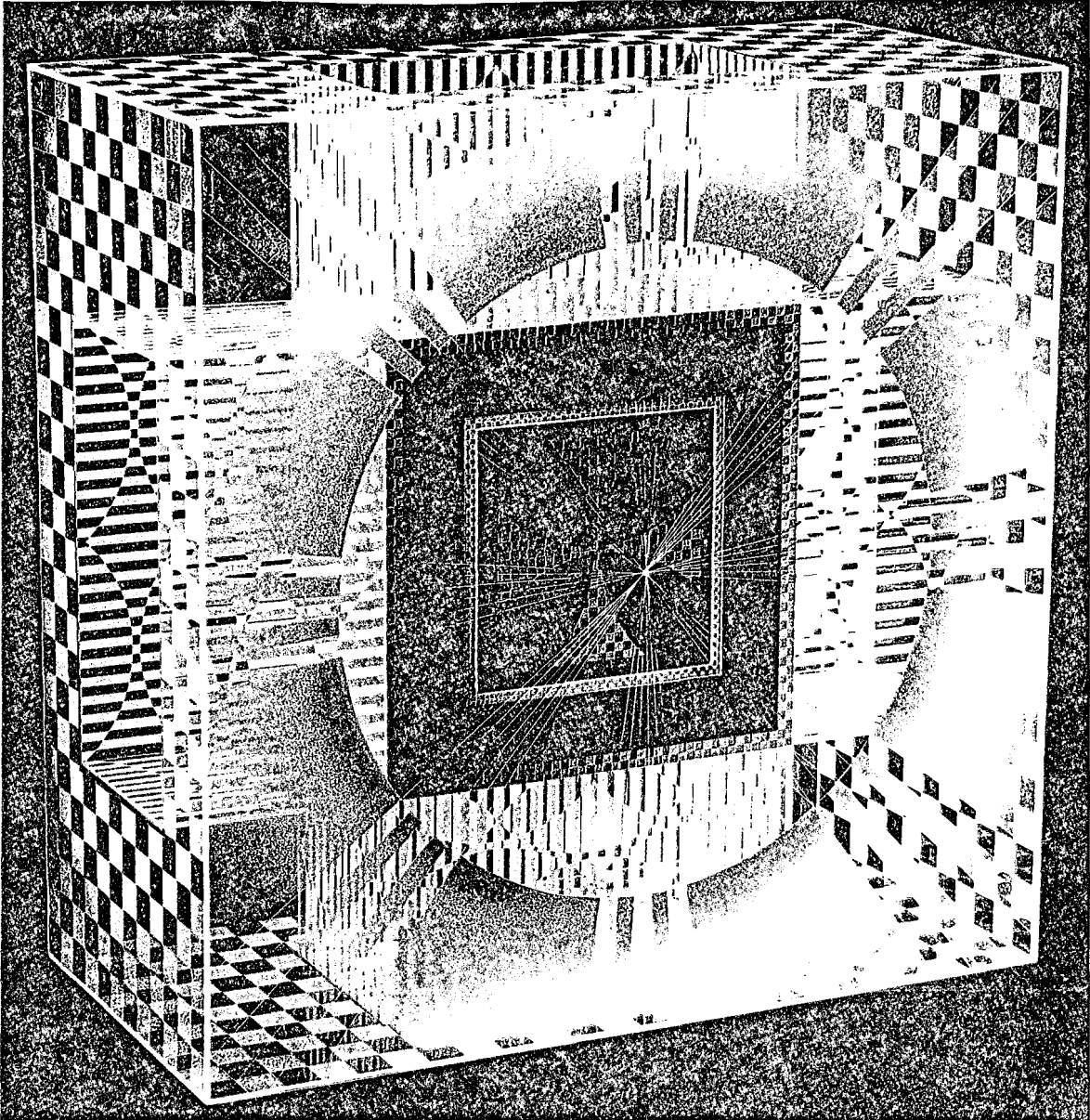
FIGURE 1B

set up varying moiré patterns. The stripes on the arms of the central construction were produced by roughening the surface of the acrylic by hand with emery cloth in an attempt to exploit the natural color of the material as opposed to its transparency. A metallic burgundy spray paint for surface enrichment of the outer construction sides were used. It was sprayed on the outer surfaces by fogging on heaviest from the center outward. This was to emphasize the centrality and transparency set up by the enclosed volume of the arms of the core.

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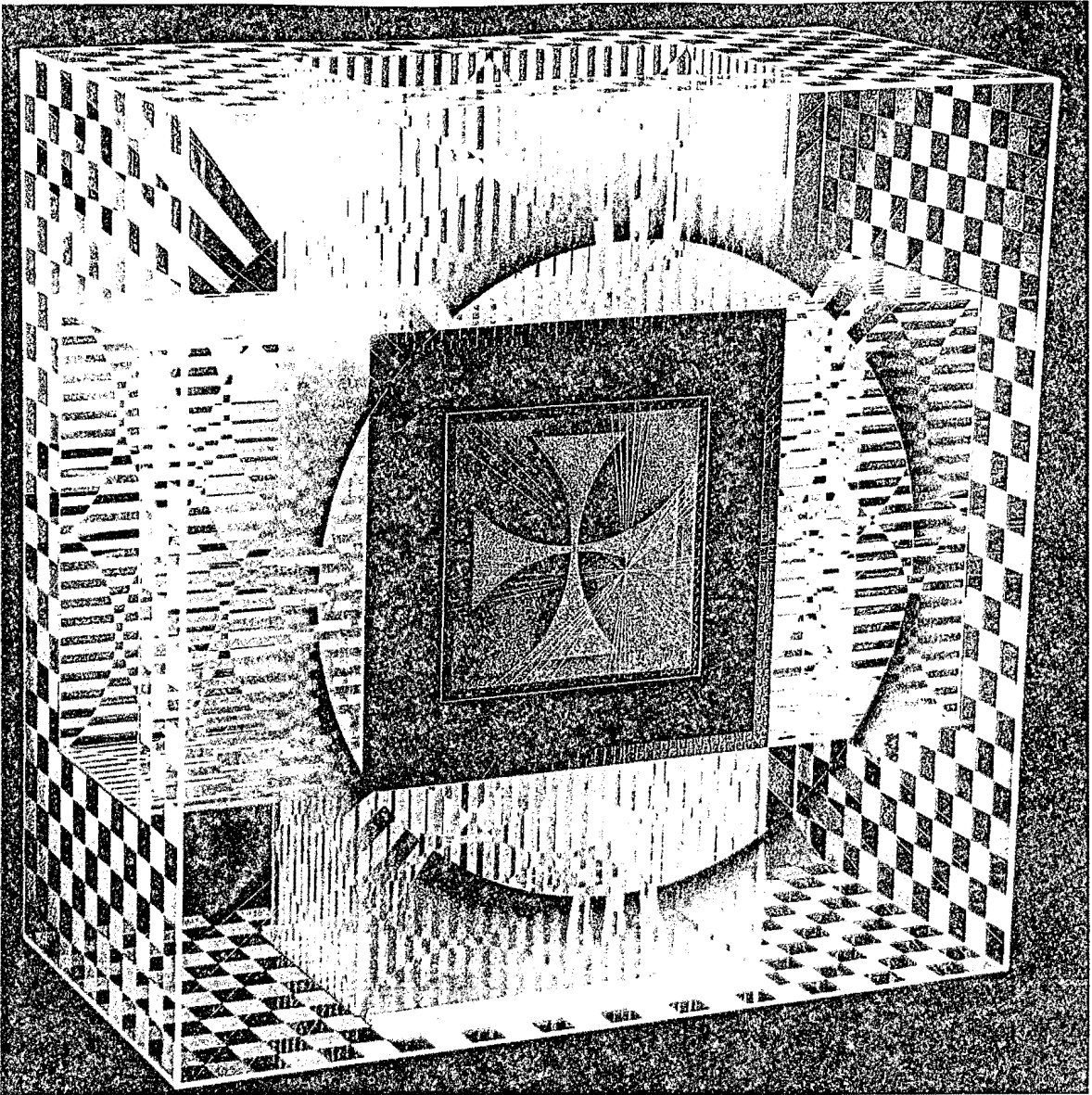
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In Figures 2A and 2B new candy-apple colors were used on the core which depend for their effect on a special underpainting of gold or silver. This opaque undercoat is then sprayed with alternating coat after coat of clear, then color and lightly rubbed out as is done at custom auto body paint shops. The light penetrates through and is reflected somewhat on the order of a conventional highly glazed painting surface. The difference lies in the size of the reflecting molecules and to an extent, thickness of paint. In both types of color, the color particles act as lenses reflecting the light back through the transparent medias. However, the newer color particles are on the order of several hundred sizes smaller. They are almost individual molecular lenses giving a peculiar sparkle and luster unknown a few years ago. The use of brilliant color next to



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FIGURE 2A



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FIGURE 2B

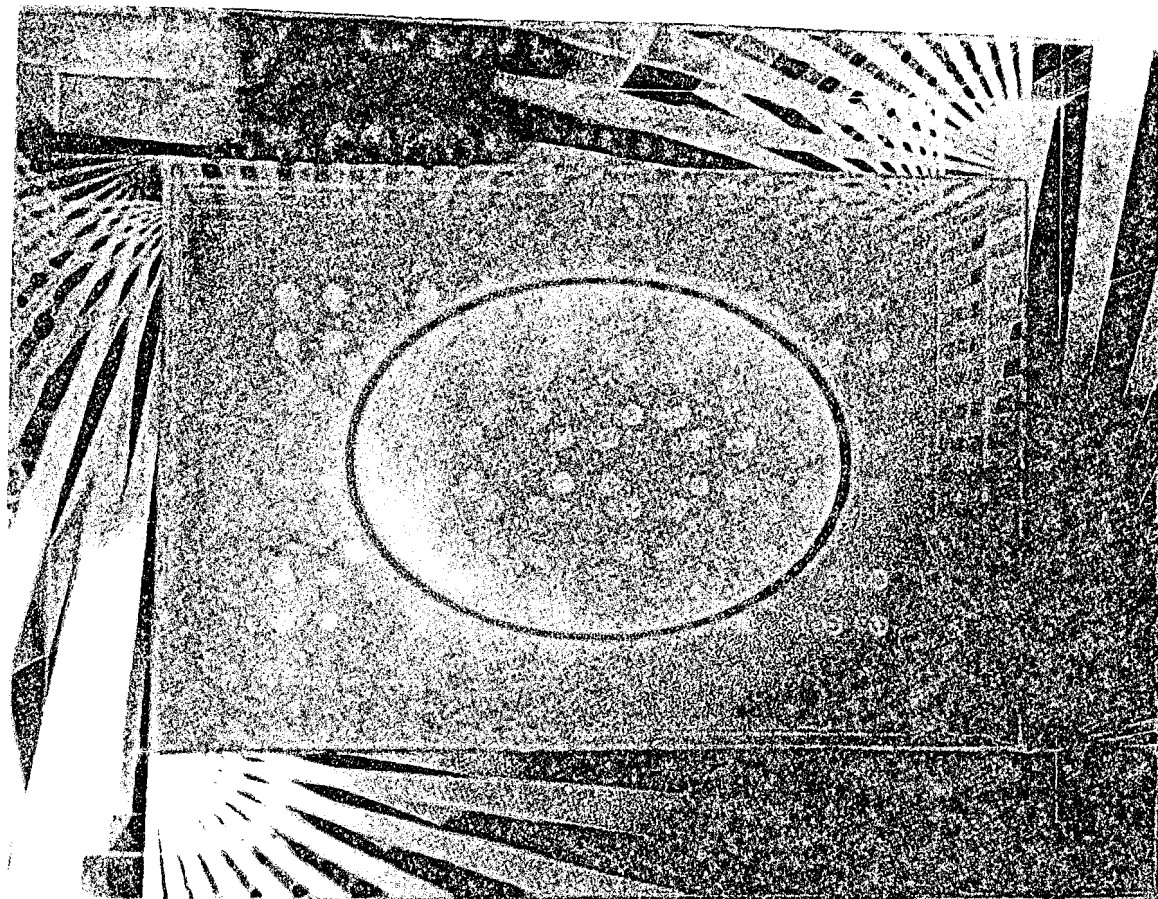
brilliant color was to cause after-image effects. The checkerboard patterns separating several of the strong color areas in the central core was made to give color interaction and chromatic vibration and to induce flicker effect. Widespread use of chart tapes was integrated into the central design for ease of handling and brilliancy of color. Front and back outer surfaces were painted with a penumbra-like halo to establish two seeming surfaces which would give a reversing effect of a deep hole, then a plate-like section floating in front of the core construction painting. Lines were etched on the front and back surfaces to give a preponderance of visual evidence of where the surface was. Moiré stripes were sprayed on the arms of the core, but cut across with semi-circular reversing patterns so that further complex solid patterns could appear at certain viewing angles. These would be extensions of the possibilities of moiré patterns. An attempt was also made to cause further flicker effect with these patterns. The view into the core from the sides (not shown) was of a checkerboard that forms an ellipse as it reverses pattern. This was to pulsate backward and forward so as to deceive the eye as to the actual position of the surface. Da-glo type florescent lemon yellow spray paint was used on core sides to try to present sufficient contrast to define them and the sides of the core against all that was occurring on the front and back surfaces. Acrylic plexiglas has the quality of transporting out to its edges undiminished, any color

placed on its surface. This light-transmitting quality exploited in the core gives an excellent contrast where joined to outer surfaces.

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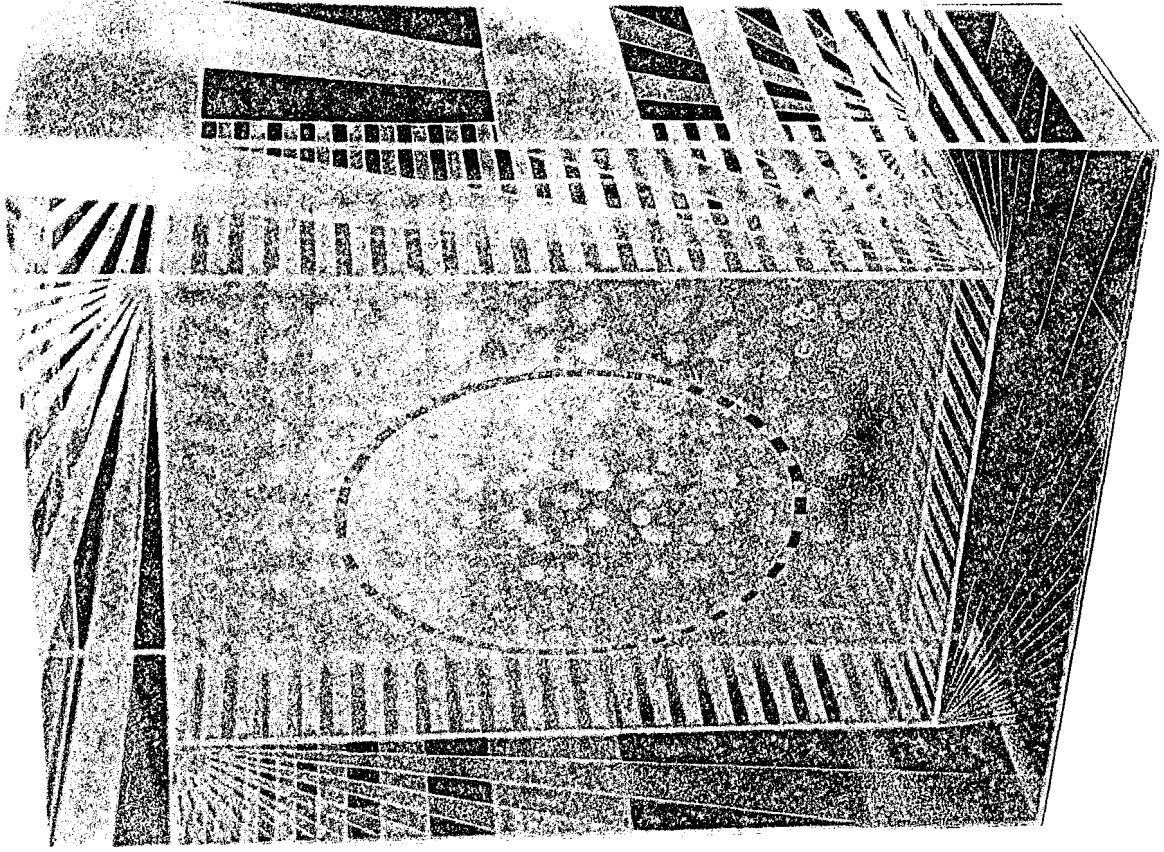
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Moirés on outer surfaces were painted in five degree increments which when combined with its opposite side cause circular beats to appear (see Figures 3A and 3B). A natural (clear) pearlescent spray paint duplicated (with little effort) the effect of hand roughening of acrylic with emery paper on the outer surfaces. These patterns also were to give an illusion of whirling circular movement of the outer construction. The sheets of acrylic making up the central core are of florescent red with interesting properties. Any scratch or roughening anywhere on the surface of this material lights up brilliantly, even glowing in semidarkness. Therefore a series of drill holes return a large dividend of illumination against the rather bland color of the polished sheet. The pattern of small circles made of drill holes in the central core were designed to create several simultaneous happenings. First, by the relation of one identical pattern with the one behind it, to set up a series of moirés. Second, to create a reversing squares then rings pattern when stared at by an observer. Third, in combination with the oval shape fogged onto the outer surface, to see if the gestalt principles of proximity and similarity occur.



Top

FIGURE 3A



Top

FIGURE 3B

C. STATEMENT OF FINDINGS

Problems that can be grouped under technical construction problems occurred only in this type of box (see Figures 1A and 1B). Tolerances in painting and in the joining of the pieces making up the central core to each other and to the outer construction, along with angles formed at these joints, were found to be much more critical than with other boxes. In boxes of this general structure where a center construction has as many sides as the outer construction (e.g., each inner edge should be joined to each corresponding outer surface), one side, it is found, cannot be joined with its corresponding inner core. This is only partially overcome by various unsatisfactory construction subterfuges, such as, a slow-acting epoxy at this joint or hiding the non-joint at the center. No complete solution is possible because of the nature of geometry and using only the dissolving weld type cements that are most effective with acrylic plexiglas. Some difficulties in reproducing the same appearance of varying density of paint from heaviest to lightest on the outer surfaces due to inferior technique and equipment has now been corrected. In reference to using the natural roughened stripes which set up moirés on the arms, the results were produced by arduous and time-consuming hand labor. These effects were duplicated on later pieces by a fully as effective, but far shorter, method using a clear pearlescent spray lacquer. Moiré patterns appear

quite readily in the arms of the box from every aspect of viewing. This also sets up shifting spatial relationships with varying contained volumes. The small central cube with the checkerboard design element being in a subtly altered proportion has a relatively large impact on the visual apparatus. The eye is led from one even division to the next, into the center, where, having accustomed itself to these even divisions on the way in, begins to signal something pleasantly unusual is happening. The analogous situation of perspective distortion makes use of the fact that people are accustomed to basing their judgments of contours, sizes, distances, or distinctions between objects and backgrounds on past experience and can be fooled by odd combinations. In this case the past experience is the even divisions and the fooling is the central orange checkerboard which is out of the series.

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In Figures 2A and 2B some unique aspects are apparent. First, are construction problems which are the result of the large size of this box. No constructions as large as this had been attempted before nor any since. Practical limits in the ratio of size to structural strength in this thickness of acrylic ($1/8''$) in both joints and span seem to have been reached. Edge finishing (some seventy-two feet here) is a monumental and almost impossible task by hand, especially when an edge is longer than about eighteen

inches. Special machinery and techniques are needed, the solution is still not finalized as yet. The problem in joining these long edges is another aspect of the size question which fortunately in this piece did not become worrisome. However, on slightly smaller constructions; joining was extremely trouble-filled. The moirés in the arms are particularly effective from several aspects combining into larger and more complex beats. The flicker effect is not very pronounced in the arms, probably as the individual elements making up this effect were on too large a scale. The reversing elliptical images on the sides at the core just give way under the onslaught of all the other stimuli, however they now have a rather effective calming influence in an over-all highly charged situation as one moves to this aspect. Acrylics' almost perfect light transmittance (92%) does give a deep hole-floating plate effect, but with the etched lines it is not as pronounced because the surface tends to stabilize. The central core painting comes up to expectations; marked after-image, color interaction, chromatic vibration, and flicker effect can be observed occurring at various points.

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Because of the florescent properties of the central core (see Figures 3A and 3B), any of the solvent cement that drops on this material causes roughening and in turn a glowing mark where not wanted. The painting of the oval halo

was by a technique of fogging on a mist of metallic spray paint. Evidently the surfaces were not clean enough. This caused ripples in the even texture of the varying gradient of these halos. When making five degree divisions the angles formed (while extremely small at the vertex over the distances extended) allow much error at the further terminals. The attempt to fit the sides to the front by matching the design was only moderately successful and in turn caused severe joining problems in final assembly. Moirés of outer surfaces are quite striking at certain angles with an illusion of whirling movement also very apparent. The central core was quite successful. The patterns created on each sheet by drill holes caused several different moiré beats to appear depending on visual angles. The individual ring and square pattern, reverses nicely when fixated by an observer. Finally, these reversing patterns are stablized by the oval painted on the outer surface. The gestalt principle of similarity causes the pattern to be more readily seen as rings inside the oval. The proximity principle forms squares outside the oval in combination with the rectangular shape of the core. All things being equal, the organization of elements of a pattern will be determined by proximity relations among elements. When the collection is composed of two kinds of elements, then sub-groups will tend to form in a proximity relation. However, similarity overrides proximity when the

grouping can be seen as similarly grouped figures. The relation of oval to ring pattern to circular drill holes is strong enough to overcome the dominant square pattern. The edges, because they transmit so much fluorescence, could be exploited more fully in another type of painting construction. In this piece some excellent fringe benefits occur where alternating transparent-translucent sections provide viewing of the fluorescence alternately brilliant then subdued. The painting of the oval and its halo on the outer surface, while not a large element in the total scheme, seem to be of paramount importance to establish almost all the subsystems.

D. CONCLUSIONS DRAWN BY THE ARTIST

The use of the box form and the cubical internal structures within it are logically dictated. They are simple shapes which, coupled with the transparency of plexiglas, make an exciting visual experience of geometric forms. When, in addition, the other operant factors are introduced, they can reveal unsuspected new relationships and aesthetic involvements.

The over-all effect of these boxes for the viewer is extraordinarily large, considering the minimal information actually available. Well over half the surfaces are completely transparent. Although highly organized, the little color that is meaningful then, is heavily reinforced by

complex almost transparent spatial relationships. These transparencies of themselves must be the most productive of significant information for the viewer, especially when acting in concert with optical phenomena.

Craftsmanship is the really difficult side to the work and proving most intractable to solution. Efforts to correct this condition will continue throughout my career. In most newer advanced painting your author has observed, craftsmanship is an absolute imperative. Even though seldom obtrusive, if lacking, the object cannot succeed visually. This becomes doubly important in your candidate's work; where a fingerprint, a miscut mask, or improperly joined edge, may soon overtake the pleasure of the initial visual events. This is hardly craftsmanship for craftsmanship's sake, but the heart of the kind of images the artist is attempting to convey. Imperfections of this nature destroy the purity of expression, detract from visual impressions, and get in the way of aesthetic enjoyment of subtle relationships occurring on the perceptual threshold. This is one area where there is no substitute for extensive superior experience in the use of these new materials, techniques, and tools.

The technical skill in using candy colors for maximum effect does not come easily; and at least several test surfaces should be prepared and experimented with before attempting the real thing. Even then, uneven quality and other disappointments can spoil their employment. Your

author recommends spending several months around a custom auto body shop and the use of the very best paints and spray equipment available, to insure the results desired.

Problems posed by joining 90° butt joints are not too difficult on smaller pieces. If the edges are finished straight and smooth, the commercial solvents will work excellently. Exploratory efforts to join other than right angles, or long pieces usually require jigs and a professional tool layout. In this connection, several weeks assimilating the craft of a model prefabricator would be most helpful.

If and when your author goes on to unequal angles or curvilinear shapes, internal lights, motors or liquids, or attempts movement or vibration in the pieces, it will only be after thorough investigation of how the professionals do it. Any other way means money and time are wasted. Under this heading should be included the contemplated use of artisans to do some of the joining of edges; the use of a vacuum chamber to mirrorize surfaces; or to introduce an inert gas at slightly more than atmospheric pressure to keep out dust and moisture. This is in the future, but again indicates the investigative process that is on-going at all times.

One must never lose sight of aesthetic sensibility in the breadth of exploration. Yet with all the miracle technology and materials, the use of gimmicky or slipshod work, the employment of a new material that will not do any better

than the old, has become a great temptation. In all, though, it must be realized that there cannot be a simple aesthetic any more, our sensibilities stand on the verge of an aesthetic of an advanced nature. Advances in technology and science, such as, candy-apple spray paints made of synthetic bases; or metal vacuumizing gold, silver, aluminum, and exotic metals to plastics, are conjoining with rarified psychological and sociological findings and being conceptualized onto a wider and deeper aesthetic by articulate artists and critics at this moment.

For your author, regarding the aesthetics of these painting/constructions, it was necessary to cut through fuzzy amorphous outlines; to clear images and burn through to harsh simple shapes. While introducing the use of direct and powerfully uncomfortable color; it became important to use what might be termed "designedness" to unify and to keep, what seemed of great importance, control. Your candidate finds that this bothered some, and continues to bother some--the sure evidence of rational thinking alongside a dissonant element. It represents no difficulty, it is merely a subtle consistent signature. To your candidate, to incorporate even more design merely allowed any irrationality or non-logicality to assume a more prominent part, a delightful mystique of its own. To operate with even the most completely articulated optical phenomena, or fully understandable physical laws, seems to more fully delineate and enunciate the essential mystery possible when faced with

an irrational visual experience.

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