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Modern Art through Geometric Eyes

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MODERN ART THROUGH GEOMETRIC EYES

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MODERN ART THROUGH GEOMETRIC EYES

Introduction

When tourists—even homefolks—go through a modern art museum, many opinions are accumulated. Some people may have chills when they see a certain painting, while others get a sick feeling of dizziness when they see the same one. In fact, if there were an opinion box at the exit of an art show, I imagine you could almost accurately count the different opinions by counting the total number of people who viewed the show. Yet, there is one opinion that most "ole foggies" (and I use the term loosely) would agree upon, and that is this: "Why that's nothing but a bunch of hog wash! My three-year-old granddaughter can fingerpaint as well as that." Yes, some modern art appears to have no basis, and it looks as though a brush was tied to a cow's tail. Yet, there are some great paintings in modern art which clearly show a basis—whether it be imaginary or precisely to the point. The basis I refer to is geometry. A lot of high school students complain about this one subject, I feel, however, the complaining is steered from the proof standpoint and not from the figure. Geometric figures are easily reconized, and here we won't be involved with the statements of proving them so.

What I have sought to do in this paper is to show how some artists used simple geometric figures as the foundations of their popular paintings, some worth many hundreds of dollars. Also, with the help

of certain paintings and other examples, I have choosen two simple

terms used in the earliest days of geometry that also apply to the a

art world. I have compared some paintings to geometric fugures such

as all forms of circles, triangles--equalateral and isosceles, quadra-

laterals, and inscribed squares, triangles, and hexigons. All put

together we'll see how modern art can be seen through geometric eyes.

Today's Art

Modernist art must be estimated as a natural uprising, and in its

broadest aspects, an an educational measure. As an educational measure,

the Modernist movement can hardly be overestimated. It has given the

death-blow to naturalism; it had destroyed the old superstition that

art is the mechanical imitation of nature.

The Modernists exposed the shallowness of Impressionism, and at

the same time, the academic fallacy that the emotional elements of

art--its "beauty," its perfection of form, its majesty, and all the

rest--reside intact in nature, and that the artist has only to seek

out these natural forms and duplicate them in **paint in** order to create

a work of art.

Nature is made up of all kinds of geometric figures. In every-

day life we are confronted with squares, rectangles, triangles in

simple items as pots, glasses, boxes, houses, and furniture. It's no

wonder that an artist has only to find natural forms and duplicate

them and as a result a fine work of art is formed.

Painter Rene Parola compared "op" art to the past and present this

way: "Optical art or "op" art as it has become known during the twentieth

century is universal in concept. It reaches into the past for principles

and combines them with psychological and perceptual discoveries of the twentieth century. For example, the Renaissance theory of perspective to create the illusion of depth is blended with a modern school of psychology which believes every aspect of a person's life in an identical part of an overall pattern--life squares in a checker-board."[1]

To begin with art has always been a reflection of the society in which it was made--its beliefs, its traditions, its values. Rapid change characterizes our times. Science and its accompanying technology change the world almost daily. Therefore, is it unusual to witness many changes in art? At no other time in history have visual images changes so rapidly.

In a modern home a person may not find great works of Michelangelo or de Vinci, nor the traditional Colonial or French Provential furniture. Today's homes are being furnished with water beds and bean chairs. To add to the decore, modernist art is being placed in rooms of this nature. Art is changing quickly, but in this art of today we can visualize the geometry much more clearly than we can in a portrait, although the same basis is there.

Terms

"Complementary"

Painters use complementaries the same as mathematicians do. This is a well-known term in geometry used to denote two adjoining acute angles to form ninety degrees. In painting it is used in combining colors to provide a certain effect of light. For example, black and

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[1] McIlhany, Sterling, American Artist, "A Close Look at Optical Art", June 1970, Volume 34, pages 34-37.

white are two opposing colors, but combined they will form physically complementary colors, representing the total presence of light. Various shades of colors provide attractions to the painting from light to dark or vice versa. This is how many artists give their paintings the illusion effect.

Complementary is also a principle of art, the sovereign one which underlies the essential integrity of any work of art. It is so perfectly fundamental that all other principles are only alternative ways of realizing it. Its singularity is that is belongs to not one style but to every style.

When an artist works in visual terms, he constitutes a visual whole. The parts of that whole stand it each other in a relation of complementarity. They form not merely an aggregate, but an organization in which the several members are mutually implicated in each other. All are necessary, none are dispensable, for the meaning of each is seen to reside in the relations which bind it to those others. That complementary of parts is what men understand when they speak of the "inevitableness" of a work of art: to take from it any kind of equilibrium which it has.

"Symmetry"

All composed paintings and mural paintings especially calls for an absolute control of accent. There must be rhythm--an order of lines, planes, and colors so calculated that the eye is carried easily and inevitably from one form to another.

Symmetric means something like well-proportioned, well-balanced, but it also denotes that sort of concordance of several parts by which

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they integrate into a whole. Beauty is bound up with symmetry. The image of this beauty provides a natural link to the sence in which the word "symmetry" is used in modern times: bilateral symmetry, the symmetry of left and right, which is so conspicuous in the structure of the higher animals, alias the human beings. This type symmetry is strictly geometric and is an absolutely precise concept. A human body is very definitely symmetric and is a highly-sought object for a modern figurine.

If we note the methods of old Greeks with regularity of form, we may observe that geometrical balance was the secret of their success. We have regained the same instinct of mapping out a surface with geometrical network and filling it with balanced forms satisfying to the eye. The beautiful decorations of modern artists are the product of diligent study of geometric design.

Symmetry is used in another way. An artist can center the attention on one person or thing by balancing people or objects around this attention seeker. Thus everything has a "partner," with the exception of the object in the center. This draws the eye to it and fades the remainder of the painting in the background.

An excellent example of this is The Last Supper by Leonardo da Vinci. In this painting there are thirteen people--the twelve disciples and Christ--seated at a long table. Even though there are quite a few objects in the painting, as is expected the eye is drawn to Christ in the center because the portrait is well-balanced and is pleasing to the eye.

Equilibrium is another word for balance. It is said that equilibrium in a picture is there to be seem, and not to be seen is the same as not to be.[2]

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[2]Weyl, Hermann, Symmetry, Princeton University Press, Princeton, New York, 1952, page 5.

The value of any artistic form will be found to depend upon norma-
tive equilibrium. That is the equilibrium needed in order for an object
to work its desired effect such as a mobile. It is the image of all art.

Painters are aware of the uses of the "vertical axis" in paintings.
This is an imaginary line which divides a painter into two nearly indenti-
cal parts. Figures and objects are distributed symmetrically at either
side of this axis. This way they can center the key of the picture
on this axis and attention is drawn to it. The attention will remain
on it no matter how many objects surround it as long as there is this
equilibrium.

Geometry, too, uses balance and symmetry, but not always in these
two words. A figure equidistant is also balanced, as there is exactly
the same amount on one side of the reference as it is on the other.
The term "symmetry" is used in geometry as such. It also means much
the same there as in art. There are three types symmetry in geometry--
point, line, and plane. Plane is used in a three-dimensional figure.
Therefore, in art only point or line symmetry would be used. There is
also bilaterial symmetry as already mentioned, which is the same as line
symmetry in geometry, as there would be found on one side the exact thing
as is found on the opposite side.

Terms in all areas are used dually and, of course, these are only
two examples of comparision. However, it is evident that terms in both
art and geometry are much the same.

Figures

"Circles"

There's a riddle which claims a circle has two sides--the inside and
the outside! This is true in a sence but in geometry we know it as

having no sides, at least no sides as would a quadrilateral. A circle
is an interesting figure, for it can be used in so many different ways.

Some modern artists use quite a few circles in their creations.
They may be hidden in objects like the sun or the moon, face shapes,
or wagon wheels, or they may be very visible as in some examples.

To a geometrist plate 1 would appear as a series of concentric
circles, but to Claude Tousignaut, the creater, it was a chromatic
increase, like in a chromatic musical scale. It appears that he named
his painting for what he saw as an artist--an accelerating scale. We
mathematicians see this scale as circles, one inside another, and to
us, we could say one accelerates to the next. Here, it's easy to see
how two views may be taken.

Plate 2 is another painting created with circles only, although
the eye can find other figures in it. Rogelio Polesello's Painting
combines a rigidity achieved through an absolutely symmetrical design
with dynamic rhythms of undulating line and vivid contrasts in color.
Nine equal circles are arranged to form a diamond, and the circles over-
lap at fixed points along their circumferences in a pattern of linked
ellipses around central diamonds with concave sides.

Individual circles are seen with our geometric eye. Also, there
are several sets of tangent circles here, as well as circles intersect-
ing the tangent ones. The colors used bring out the artist's point of
view, while of this were a black and white painting probably the geo-
metric viewpoint would rule. It's all in illusions and color here.

It isn't hard to compare something absolute as the concentric circles
of Tousignant, but it's when we come to non-absolutes that problems may
crop up. For instance, take two of the works of Sonia Delaunay, plates

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3 and 4. A geometric eye may have conflictions if it were looking for
perfect circles or semicircles. Delaunay used nearly perfect shapes
in his compositions. In plate 3 we find semicircles--some nearly com-
plete, others only fractional--but none have been perfectly constructed.
This is one of the examples of hidden figures. we can see them and
know what they resemble, yet they don't completely fit the clean-cut
definition we know to be true. Nonetheless, it is conceiveable that
these are semicircles in Carreau Noin, plate 4.

   Colored Rhythm No. 698 is one of a series of paintings that Sonia
Delaunay produced in the 1950's in which squares, triangles, and bisected
cirlces of color create a rhythmic movement along diagonal axes. In this
quasigeometrical composition the forms are soft-edges and though basic
shapes are repeated, the repetitions are approximate rather than precise,
and the proportions of each triangle, circle, or square vary throughout
the composition.

   Here again we are confronted with "nearly so" shapes. It is clearly
seen that these are free-handed cirlces; yet we know that only a com-
pass or some other pattern constructs a perfect circle.

   During a campaign season we have opportunities to see all sizes of
circles on coat lapels, shirt collars, or sometimes stuck in hats. Poli-
ticians have found buttons to be useful in campaigning. The handy circles
are just the thing on which slogans can be printed, so all followers may
pull for their special candiates.

   Park Place Gallory in New York had another type of advertizing in
mind with their buttons. During the grand opening show of paintings by
Leo Valledor in 1966, all kinds of buttons were passed out among people.

The buttons were simple circles with various geometric shapes on them. Plate 5b shows four facsimiles of these buttons distributed then.

Dean Fleming was one of the designers. (Another of his works can be seen as plate 8.) The buttons relate to the Park Place point of view and concern with liberating art and people's attitudes toward art. Fleming says, "The geometry and color involved in these designs allows universal interpretation . . . we must realize that the object of our enlightenment may be found anywhere, that the art spirit is in all shapes and locations, and its availability is governed only by the free receptivity of each individual."[3]

Fleming was true when he said the geometry and color allows universal interpretation. As I stated in the introduction, innumerable opinions may be taken, but one will stand out in the math world. These four buttons illustrated involve a figure inscribed in a circle. Button #1 has an inscribed equilateral triangle, but three isosceles triangles are formed from this first triangle, using each side as a base of each of the other three triangles. Thus, looking at the six sides formed from the isosceles triangles, we have an inscribed hexigon which is also seen in button #4. Button #2 is simply a parallelogram inside a circle and button #3 has an inscribed triangle. None of these four figures are strangers in our math world, and they obviously are at home in the art field as well.

In plate 6 we have a combination of circles. First we see a large circle inside but not inscribed in a square. Next we find a square inscribed in the large cirlce, but going further we again find a circle, this time inside the smaller square. Inside this circle are two inscribed squares.

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[3] Unknown, <u>Art in America</u>, "Park Place--Why Buttons?", November-December 1966, Volume 55, page 63.

Here we have two circles involved with several squares and rectangles. This is often seen in modern art. It is difficult to create a painting as the concentric circles all the time. In "pop" art you will find a combination of circles with squares, rectangles, and occasionally other quadratic figures. In this painting the sides of one inscribed square are extended to form long rectangle extending the large circle. The second inscribed square forms an effect of an Eastern Star. This series of inscribed squares and circles inside squares make an interesting and eye appealing painting for any decore. I deliberately skipped these extra figures in plates 3 and 4. Now I wish to back-track and explain the usage of these three and four sided figures in these two paintings.

"Triangles and Ouadrilateral--combined or solitare"

Along with the so-called semicircles in plate 3, we find what appears to be mostly squares. We do see, however, a few figures which lack maybe one quality for a geometric figure by definition. For instance, the second square down from the upper left has a green figure and a red figure separated by a quarter of a semicircle. These two figures could qualify as triangles except one side is curved due to the quarter semicircle. Yet, at a distance they appear to be qualified. This is another example of Delaunay's "approximate" figures. Squares appear over the top half of the painting, but close inspection reveals a corner or part of a side missing or possibly hidden under a neighboring block. Delaunay used a wide selection of "almost" figures for his Carreau Noir. Trapezoids, triangles, and rectangles are also present. In fact part of an entire cirlce appears to be hidden in the center. This is a true example of approximates and not totalities in geometric figure, but once they are uncovered it's not hard to find other basic figures in this painting's foundation.

Triangles are the main composition of plate 4, combined with the circles previously mentioned. Delaunay usually relied on these approximate rather than precise figures for his paintings. This tends to let the imagination flow smoothly, not restricting it to the one precise object, but leading the eye toward that conclusion.

The Dream of Constantine is a fitting name for the painting in plate 7b. The rectangle waved in half at the top and shaded appears to be a world beyond the blood-dripping moon or possibly a red setting sun. Nevertheless, the one definite circle in the center has attention drawn to it as the result of a corner of a triangle pointing toward it. These are the only precise figures. The various colored strips on each side resemble water falls or rainbows in the painting, but they may also be sections of a sphere as in a basketball. This makes a combination of precise and approximate in one painting. Truly, a work of art in both areas--paintings and geometry.

Three and four sided figures can be used alone to create great works of art. In plate 5a only two-dimensionality exists. This arrangement by Mondrian relies exclusively on horizontal and vertical lines, assembled at randon and without foundation. Through these ideas the dead end of all artistic and intellectual aspirations is reached.

Mondrian organized ths creation into a perfect asymmetrical balance of lines, areas, and colors that no change is possible without disturbing that balance. The lines are a balance of verticals and horizontals with no curve and no diagonal.

This art, concerned with one thing, form, provides a least common denominator for all the arts and has influenced them widely. This influence appears in the simple directness and the frequent asymmetry noticeable in

the plans, masses, and surfaces of modern architecture, in posters,
advertising, book design, and other industrial arts.

Art composed of lines and spaces naturally is noticed in today's
world in the various places just mentioned. The big catch is that it
appears also in geometry and thus the geometric figures are the basis
of creations in all areas of today's life. It is amazing at the num-
ber of things created with a geometric background.

Martha, Michael Egan's creation seen as plate 7a, is another example
of solitary triangles and quadrilaterals. Egan's combination of narrow
trapezoids are joined in such a way as to form four right triangles
as well as a square in the center. It has the appearance of a banner
of some type and it has a definite color patern. Egan knew what he
wished to produce in the line of modern art. In our geometric line
we see the figures as mentioned, and this is an example of them precisely
presented.

Dean Fleming was usually one of preciseness in his art work. You
will recall the definite fugures in the buttons (plate 5b). Here we
have much the same effect in his Snap Roll. Fleming described his
painting this way: "The situation is one of polar contrasts and their
inevitable interchange of spaces, the aggression or recession of a color
the ability of a single color to change in terms of values of dark and
light, redness and blueness when related to another. Formally, the
painting contains the tensions and lucid changes that exist between
the diagonal and the horizontal and vertical."[4]

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[4]Aldrich, Larry, Art in America, "New Talent USA", July-August 1966,
Volume 55, page 45.

Here Fleming has combined the three major lines of a quadrilateral—the diagonal, horizontal, and vertical. Any quadrilateral will be involved with these lines. Thus in this one drawing, Fleming used ingenuity to show them all at once.

For some art lovers Max Bill's painting show as plate 9 may give a monotonous effect. Its repeated forms and contrasting colors may confuse the eye the same as the indentical shapes and objects do.

It is obvious what one geometric figure Bill chose for his painting, yet he has arranged them so that if you look closely the monotonous first impression may disappear.

There are thirty-two individual triangles as the title says, but just one triangle may be added to the adjoining triangle and a chain reaction may result so that seemingly innumerable triangles appear. Also the triangles are divided so that eight rectangles are formed, and by pairing the triangles four squares are formed.

Attilio Salenme's strange art is mere introspective. Probably no other artist has ever used so strict a geometry to create so fanciful a world, where hieiatic figures built of blocks and triangles enact their obscure drama and confront each other in situations of unexplained psychological intensity. Yet it is the utter clarity and ordered logic of Salenme's world that makes it so believable. We accept the figures as more than symbols and the geometry as more than a formal device.

Salenme's Inquisition appears to resemble Nasa's Space Center or possibly a section of downtown New York featuring the skyscrapers. Imagination can get the best of the eye here, but barring this complication the rectangles and triangles really shine through. This painting is quite outstanding in the preciseness world.

Geometry used Elsewhere

We have been comparing paintings which obviously contain a geometric backgound, either definite or assuming. But geometry can be in a painting in other ways as the actual rectangle or triangle.

Cezanne's objective was to get upon the canvas his perception of forms such as their mass and solidity, and their place in deep space in relation to other forms. As he worked over them, gradually everything inessential faded away so that the form was reduced to something nearly geometric. "Everything in nature adheres to the cone, the cylinder, and the cube," said Cezanne.[5] He was simply carrying it one step further--into abstraction and geometry.

In the Mont Sainte-Victoire, plate 11a, having stated clearly the plane of the canvas by the tree and the decorative branches, he carved out a space upon whose basic horizontal plane he set each building, tree, and mountain, simply constructed as geometric units.

Although it isn't directly related to our subject, architecture is also leaning toward geometry in other ways than the box effect of the framework.

In his "Row of Houses" (plate 11b) built at the Hook of Holland, Oud passed through the stage of stark geometry under the influences of neoplastisists and that of the Russian constructivists, who were experimenting in problems of interrelated and interpenetrating spaces. By using concrete, brick, glass, and iron as well as accents of color and contrasting textures, and the complete absence of decoration, Oud created a building

[5]Gardner, Helen, Art through the Ages, third edition, Harcourt, Bruce, and Company, New York, 1948, page 708.

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whose refreshing clarity and conciseness, and whose sensitively realized proportions and related parts, produce a satisfying result. The long two-story block with a ribbon arrangement of windows, and a wise cornice over the first story, paralleling the unbroken horizontal of the flat roof, suggests its emphasis upon horizontality. Oud saved this rectangular building from the usual box by bending it at the end into cylinders and by playing subtly upon the theme of the cylinders in the details—as in the cylindrical supports—and upon the curved line, in contrast to the straight angularity of the rest of the building.

To an uneducated eye Oud's building would be much the same as usual with the exception of the curved ended resembling a cylinder. Today's world wasn't quite ready for the first skyscraper, but possibly the amazements came from lack of knowledge or instruction of the basis of these buildings. To really benefit from the modern architecture, one will simply need to understand the modern art appects in the geometric world as in the art world.

While Oud's building was more concerned with length than height, it stands to reason why it was based on horizontality. Skyscrapers emphasize height a great deal as would be expected. Thus the accent is on verticality, since these buildings are carried by vertical steel beams.

Not many buildings can have a double emphasis. Can you imagine a wide skyscraper? Strange foundations couldn't hold such a monstrosity! It would be interesting though, to go to the top of some central building and compare the geometric construction of those buildings surrounding the central one.

Plate 12a shows a Japaneze building which houses NEC Electronics. Not only the building is constructed geometrically, but take note of the

identical, evenly-spaced circles on each side. These circles are lights which constantly flash and are also used as an advertising technique of the company.

Advertising is also not totally related to modern art, although the reverse can be true. We have already seen how Park Place Gallory used buttons to advertise a showing. Plate 12b shows a paper bag used for the Museum of Modern Art. Here again we see the identical, evenly-spaced circles. This black and white approach for advertising is probably wise, since their carriers have just viewed a show with unusual blends of colors and illusions. With this type of bag the Museum is just carrying through the idea of a geometric basis for a great deal of modern art.

Modern art can be found in places other than museums, buildings, and advertising. Appendix II is a magazine with a section devoted to children's toys in the form of modern art under $20. (See page 65.) The illustrations come complete with easy instructions on separate pages. Chidlren are now being faced with actual knowledge of geometry long before they meet the class in the tenth or eleventh grade in high school. These toys resembling all forms of quadrilaterals, cones, cylinders, three-dimensional figures, and spheres make the child aware of certain figures and what the technical names are and all the different shapes they have. They may even create their own pictures by using tissue paper and a little imagination. Modern art in this form leads a child to become interest in other things of the world and give him a better chance to see things with a different viewpoint. Our world today is naturally more advanced than ever before. If it weren't, there would definitely be a discrepancy in our educational institutions. Minds are being developed at earlier ages, and toys are being invented to meet this change.

Conclusion

Through the previous pages we have seen modern art from nearly every angle possible. It is really amazing at the numerous varieties available in the field of modern art alone. I even went a step further to show how ideas of modern art are found in architecture and advertising as well.

A great number of artist wish to rely strickly upon the "feeling" of a piece and about how a painting is the result of a magnificent inspiration from the spirit world. They feel the only basis for a painting of this type is the idea being imprinted in the minds and the work of art results.

The twelve plates presented as Appendix I are twelve reasons for my believing this theory isn't totally true. I have seen too many great works of art that at a glance appear too much like a geometric problem or example. I don't completely overrule the inspiration theory, for even when it is common knowledge of the plan to use a geometric background, the decision of which figures combined and used in which way determine the quality of the painting. There is such a wide range of possibilities that one would almost have to be inspired in some way about putting it all together into one painting.

This may be what these artist referred to when they claimed to rely upon an inside feeling. The type feeling I just described I would agree with, but the idea of no sound or concrete basis is ambiguous.

The case has been presented and the jury is now deliberating. What will be the outcome?

To review the case we recall how circles were used alone as well as combined with quadrilaterals and/or triangles to form a painting.

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There was also the section on how these quadrilaterals and triangles could be used together or alone to create a splendid work of art. We also saw how these same techniques are used not only in paintings but also in architecture and advertising.

What foundation was used for the twelve plates presented as witnesses? By taking a quick review of the testimonies we should see clearly how each one of these figures are from the geometric family and thus is the motive for our work in modern art and the basis derived from it. Can we be guilty of false information?

The jury must make its decision and the outcome will soon be heard. Will it be that modern **art** can be seen through geometric **eyes?**

As I leave the courtroom I can still hear the rap of the gavel and the words "not guilty" ring in my ears.

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appendix I

to

MODERN ART THROUGH GEOMETRIC

EYES

Honors Project

Fall 1973

by

Jamie M. West

APPENDIX I

. to

Honors Project

MODERN ART THROUGH GEOMETRIC EYES

by
Janice M. West

Fall 1973
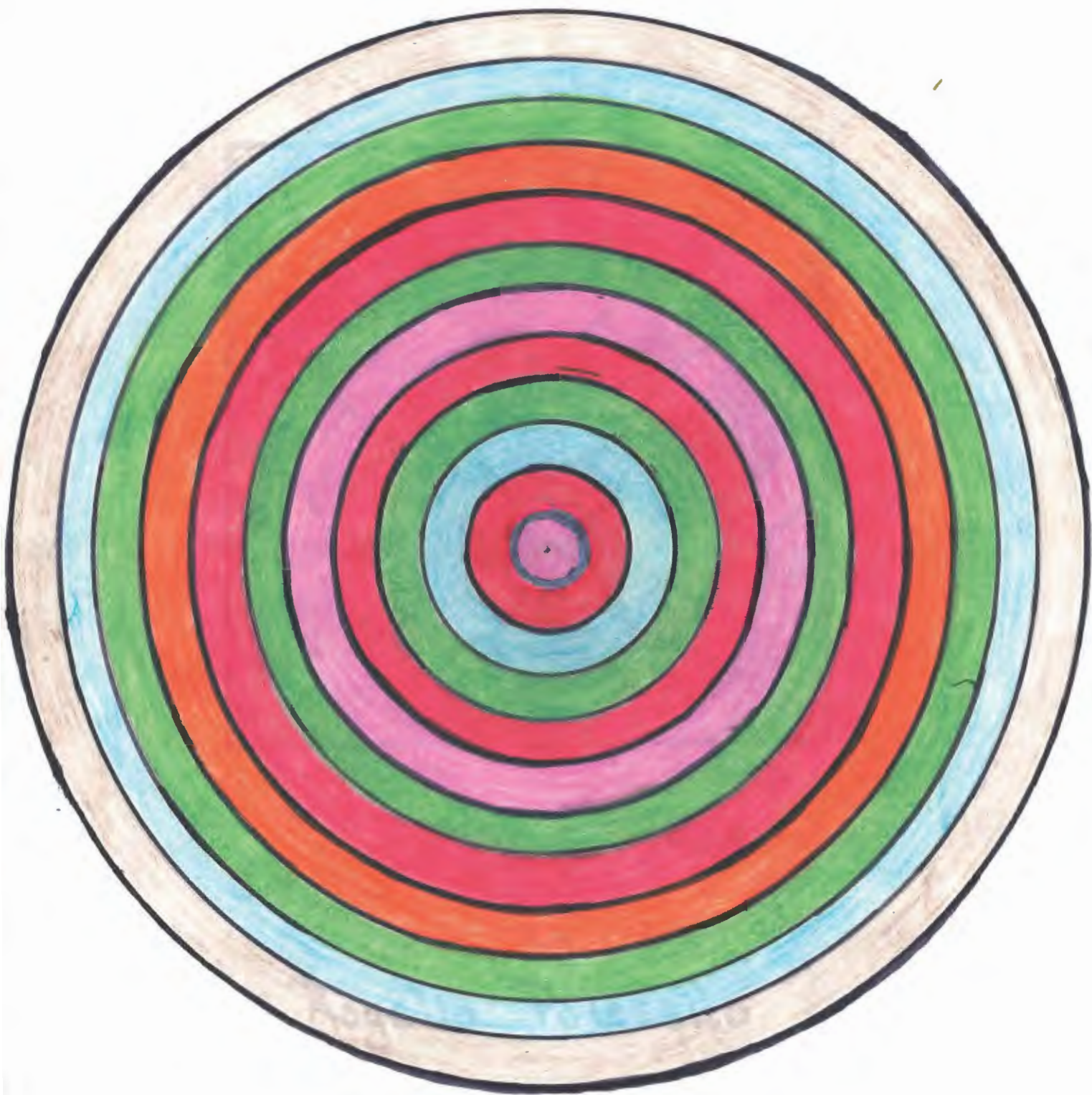
"Acceleration Chromatique"

by

Claude Tousignant

(Plate 1 a)

Painting , 1969

by

Rogelio Polesello

(Plate 2 b)

Sonia Delaunay,
Carreau Noir, signed lithograph,
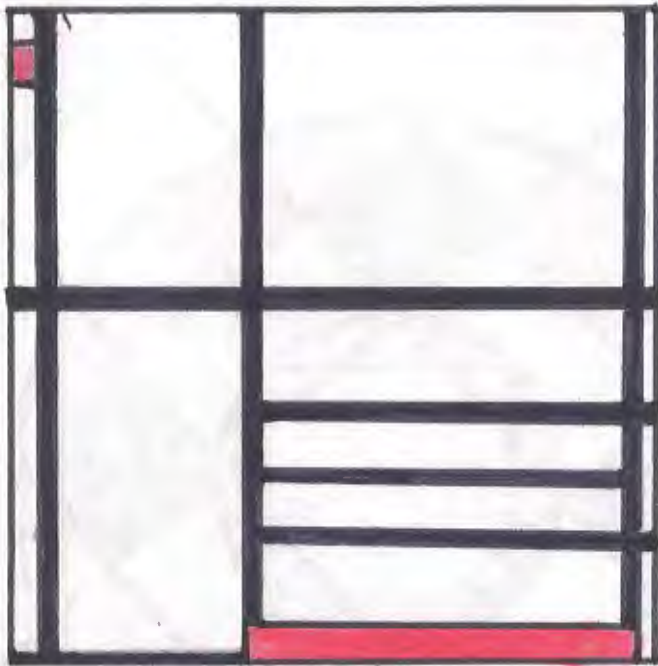edition of 100, 1969;
Gimpel-Welt-Zenhoffer Gallery,
New York $150

(Plate 3 C)

Colored Rhythm No. 698
1958

Delaunay

(Plate 4 d)

Mondrian. 1936

Museum of Modern Art

New York City
(Plate 5a ^{e})

Buttons
used to advertise opening
at
Park Place Gallery,
New York

1

2

3

4

(plate 5b ^{f})
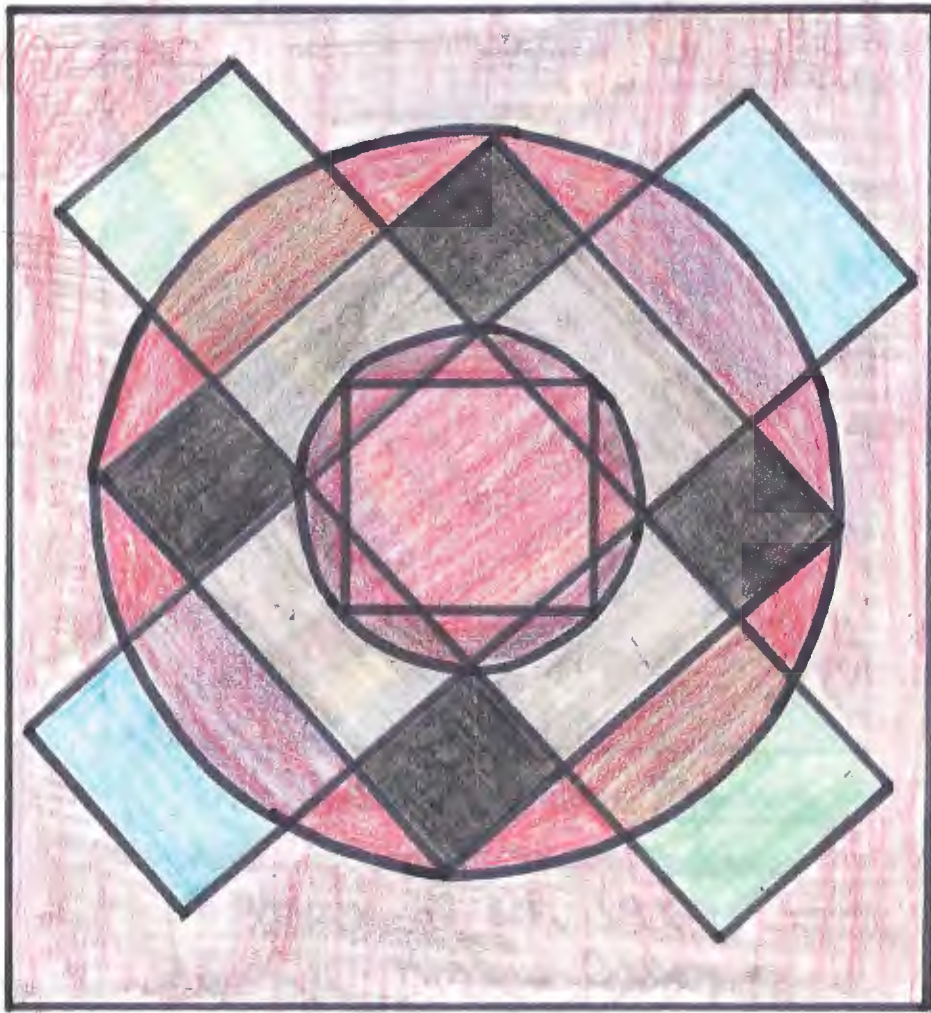
Gilldean ETTE

in Galerie Illien

Atlanta, Georgia

(Plate 6 9)
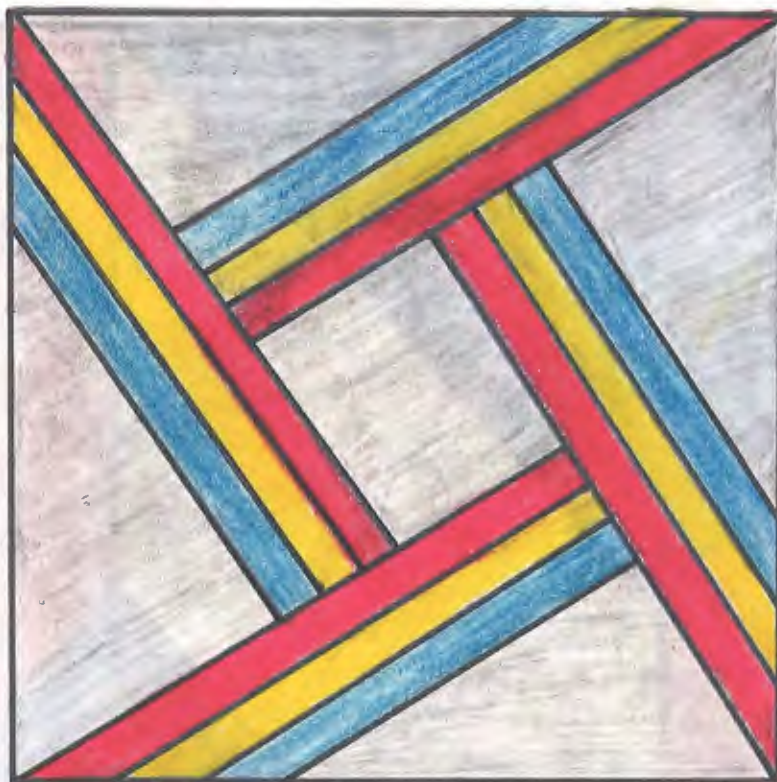
(Plate 7a ")

J. Michael Egan, _Martha_,
signed felt-on-canvas banner
edition of 30, 1967;
Harcus-Krakow Gallery,
Boston $250

(Plate 7b ")

Carol Summers,
The Dream of Constantine,
signed woodcut, edition of 75, 1969
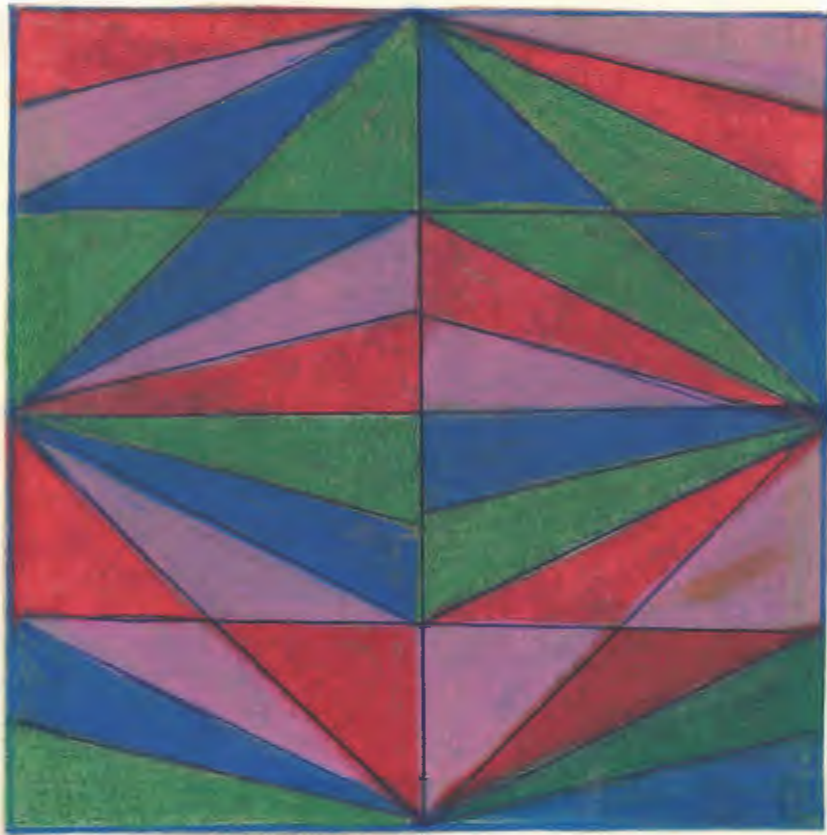Michael Walls Gallery, San Francisco $200
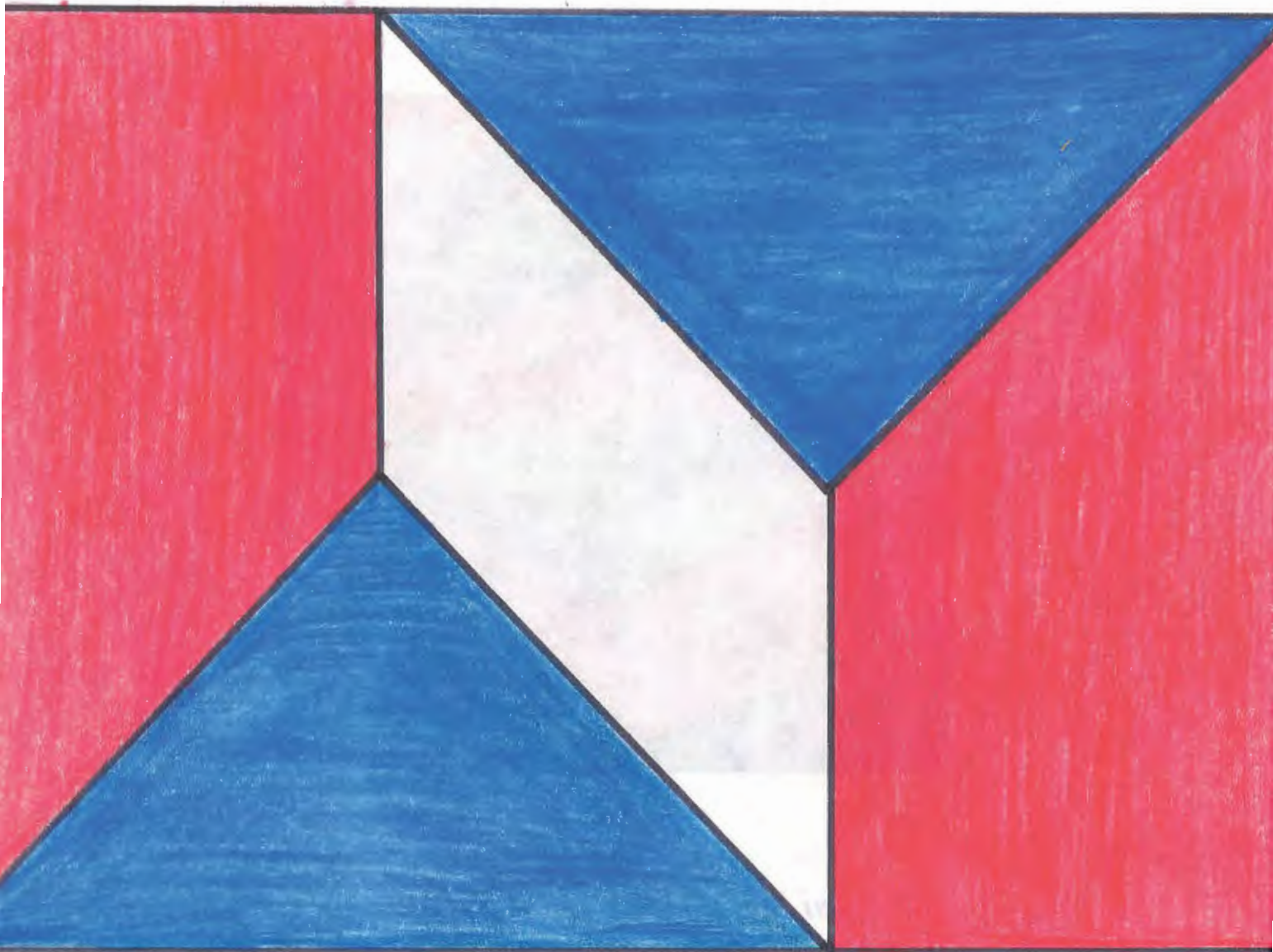
Dean Fleming : <u>Snap Roll</u>
acrylic, 1965

Park Place Gallery, New York

(Plate 8 ˙˙)

Field of 32 Parts in
4 Colors

1965

by

Max Bill

Plate 9

Attilio Salemme. Inquisition. 1952. Oil. 40 x 63.

(Plate 10 ᴸ)
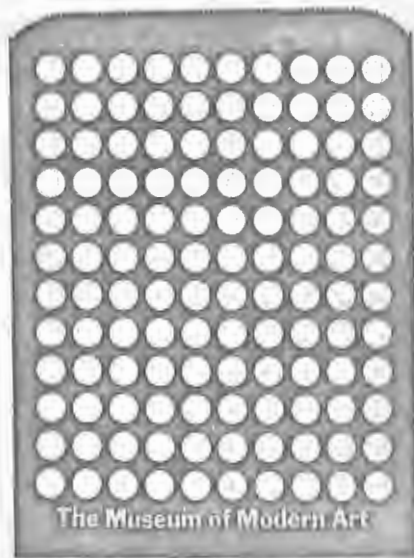
Mont Sainte - Victoire
by
Cézanne
(Plate 11a ᵐ)

Row of Houses
by
Oud

(Plate 11b ᵐ)

Japanese Office Building
Tokyo, Japan
(Plate 12a°)

(Plate 12b P)

Paper bag used by
Shop at
The Museum of Modern Art

FOOTNOTES FOR APPENDIX I

[a]Beelke, Ralph G., Today's Education, "Modern Art", March 1970, Volume 59, page 36.

[b]Albright-Knox Art Gallory, Collection of, Contemporary Art 1942-72, Praeger Publishers, New York, 1972, page 330.

[c]Piene, Nan R., Art in America, "Art under $500", May-June 1970, Volume 58, page 97.

[d]Op Cit., page 219.

[e]Meyers, Bernard Samuel, Art and Civilization, McGraw-Hill, 1957, page 632.

[f]Unknown, Art in America, "Park Place--Why Buttons?", November-December 1966, Volume 55, page 63.

[g]Gillette, Dean, Art in America, "Old Transparencies, Paintings, and Painted Sculpture"

[h]Op Cit., page 98.

[i]Ibid., page 97.

[j]Aldrich, Larry, Art in America, "New Talent USA", July-August 1966, Volume 55, page 45.

[k]Op Cit., page 237.

[l]Goodrich, Lloyd, and John I. H. Baur, American Art of our Century, Praeger Publishers, New York, 1961, page 250.

[m]Gardner, Helen, Art through the Ages, third edition, Harcourt, Bruce, and Company, New York, 1948, page 724.

[n]Ibid., page 708.

[o]McIlhany, Sterling, American Artist, "A Close Look at Optical Art", June 1970, Volume 34, page 37.

[p]Ibid., page 37.

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