

OSCILLONS

ELECTRONIC ABSTRACTIONS

by Ben F. Laposky



A NEW APPROACH TO DESIGN

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RS 11/20/74

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Book design, text, photography (except photo of oscilloscope by Phil Salsbery, P. 2), and electronic circuitry construction used in producing the oscillon designs in this book and the Electronic Abstractions exhibit are all by the author.

(For information regarding purchase of prints of the designs in this book or the exhibit, write the publisher at address below, mentioning numbers of the designs.)

(COVER ILLUSTRATION FROM EXHIBIT GALLERY NOTES)

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Title Panel of Exhibit

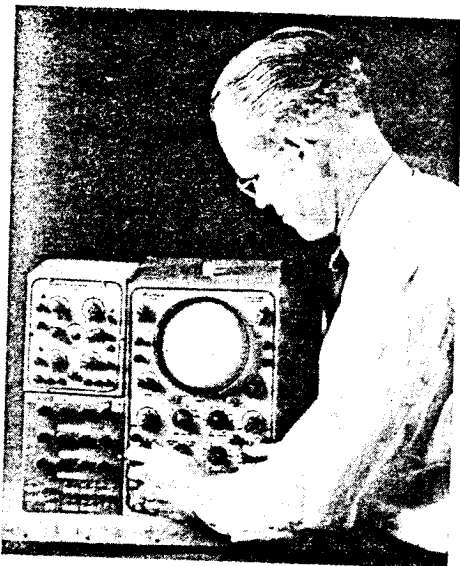
Science and art may sometimes be combined to produce visual effects of strange beauty. In this book is a brief account of such a combination—the composition of abstract designs by means of electronic forces. While mathematics, electronics and photography are involved in this endeavor to various degrees, its main object is the creation of forms of artistic appeal.

Since the travelling exhibit, "*Electronic Abstractions*," is about these electrical compositions, the explanatory material

and the designs appearing in it make up the major part of this book. The following paragraphs are all from the introductory panels of the display.

"*Electronic Abstractions*" are abstract art forms, traced by intricate electrical waves on the screen of a cathode-ray oscilloscope. They are originated and fashioned by electronic circuits and displayed by the glowing beam of the electronic picture tube. While the elements which make up these creations are basically geometrical and mathematical, the resulting design forms are abstract in that they are not meant to depict any recognizable objects. They are compositions of electrical vibrations in light as pleasing to the eye as compositions of sound vibrations in music are pleasing to the ear. These beautiful visual rhythms and harmonies of electronic abstract art may be recorded by means of photography. The fifty pictures of abstractions in this exhibit are photographs—none were drawn by hand or made in any other way. All were composed as far as possible for design by the selection and control of the electronic instruments involved.

The device for displaying electronic abstractions is the cathode-ray oscilloscope, an instrument widely used by radio and television technicians, as well as by electronics en-

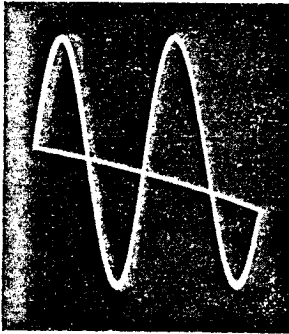


Laposky operating an oscilloscope, showing a simple "abstract" trace. Other instruments are two of the many used to compose Electronic Abstractions, or oscillons—that is, electronic oscillogram designs. (From introductory panels of exhibit. Reprinted from DESIGN, 1953.)

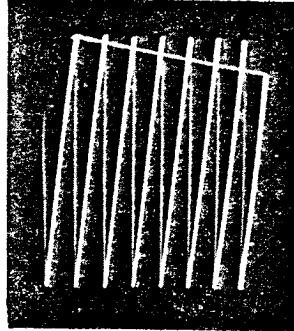
engineers and other scientists. It is utilized to study electrical wave-forms, voltages, current and so on. The oscilloscope is similar in many ways to the "picture" part of a television receiver, since it uses a cathode-ray or picture tube; the indicator screens of radar are forms of oscilloscopes, too. Oscilloscopes are used in atomic research and some kinds of mathematical computers use them to show results of computations. The oscilloscope is highly versatile and has a number of controls which modify the size, shape, brightness and position of the traces which appear on the 'scope screen. This trace is formed by the impact of a beam of electrons on the inside of the phosphorescent face of the picture tube. It travels very fast across the screen, but because it retraces itself many times a second and because of

the nature of the screen a continuous line or form is seen by the eye or camera.

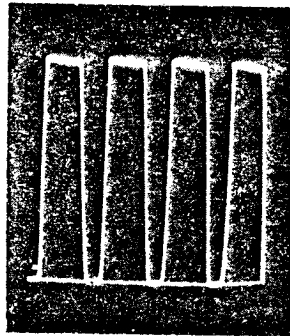
The circuits within an oscilloscope itself would produce only a very limited variety of wave shapes, so other electrical and electronic circuits are connected to it to create the almost infinite variety of forms it will display as electronic abstractions. These circuits may be simple or very complex—they are all similar to circuits of radio, TV, radar and other applications of electronics. "Oscillators" are basic since they produce the electrical waves which are the fundamental forms in electronic abstractions. One type of oscillator makes "sine waves" which are identical with the circular curves of trigonometry—they are also like the 60-cycle per second waves of house current. Another kind of wave is the "saw-tooth"—this is also used as the sweep circuit of the oscilloscope and television set, sweeping the electron beam across the face of the tube and back again. A number of other wave forms is possible, including even a "square wave." All these may



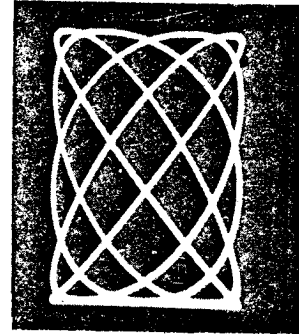
Sine-wave



Sawtooth



Square Wave



Lissajous Figure

Traces shown in introductory panels of exhibit

be combined and modified in many ways by electronic instruments to form designs or patterns, so that the operator of the variously assembled setups has a large measure of creative control over the resulting tracers which appear on the oscilloscope screen.

Most electronic abstract forms as seen on the face of the picture tube are dynamic—that is, they are in some way moving, shifting or pulsating within themselves. In some cases the fine wave lines undulate across the pattern—in others parts of the outlines of the form may recede or expand or otherwise change harmoniously as the electrical and magnetic fields interact. Because of this factor, and others, fast camera lenses are required to record the design forms at their best balance or composition. (The photographs in this exhibit are all enlargements of single-frame 35mm negatives—except for pictures of oscilloscope. To obtain the best contrast all were photographed without any other light on the scope screen—which explains why none of the oscilloscope itself shows up in them.)

Electronic abstractions are related to other kinds of designs traced by oscillations and waveforms. Such are the mathematical graphs known as "cyclic-harmonic curves," formed by the combinations of rolling circles and other polar curves. The geometric engraving lathe, which uses somewhat similar movements, traces out lacy network patterns sometimes used on currency and bonds. A swinging pendulum describes intricate patterns of curves—these have been recorded photographically, too, either by a

camera or by a light ray from a pendulum exposing photographic paper directly. Both the oscilloscope and a compound pendulum will trace almost identical patterns known as "Lissajous Figures." These are the result of two sine-wave forces acting on each other at right angles. Some of the designs of electronic abstract art in this exhibit are variations or distortions of Lissajous Figures. There is a very much wider variety of form and texture possible by use of electronic circuits than by any of the mechanical means mentioned above, however, and a greater amount of choice in shaping the final compositions.

(End of exhibit explanatory text.)

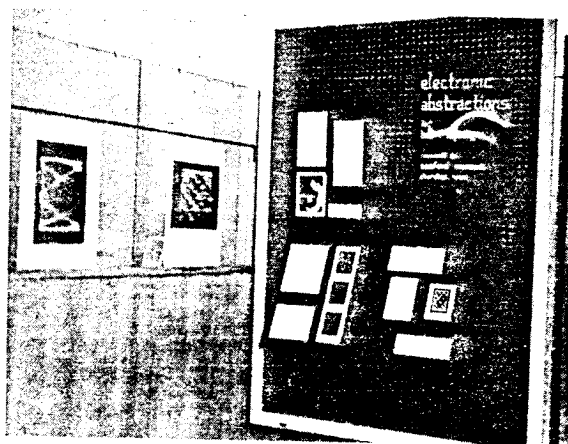
(In the illustration on page 2 reference is made to "oscillons." This is an alternative name for electronic abstract designs, or electronic abstractions. Oscillons are defined as electronic oscillograms composed for design, and may be photographed, drawn or otherwise depicted. This is to distinguish them from other oscillograms observed by scientists, engineers and technicians for various theoretical or practical reasons.)

Each of the pictures in the actual exhibit is an 11x14 inch photographic enlargement in a 16x20 inch salon mount. The picture below shows the arrangement of the introductory sections and mounting of the photographs. Fourteen of the designs are presented horizontally—twelve of these are grouped together on two pages of the

following section, and two others are marked by asterisks in the vertically numbered groups.

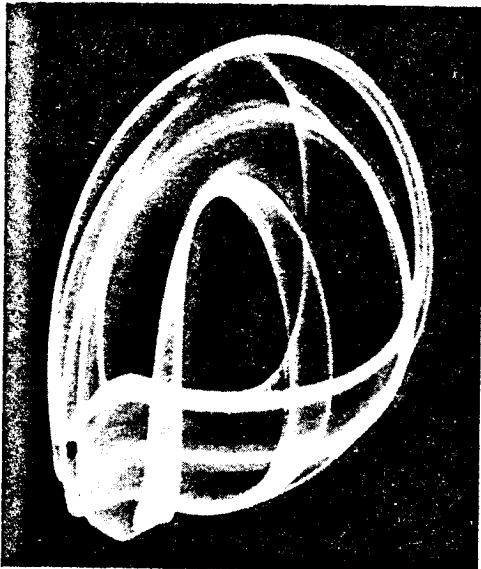
The exhibit was organized and mounted by W. D. Frankforter, director of Sanford Museum, and by Laposky.

The first 50 designs, or oscillons, on the following pages are from the exhibit. (Numbers correspond to the print numbers in the display.)

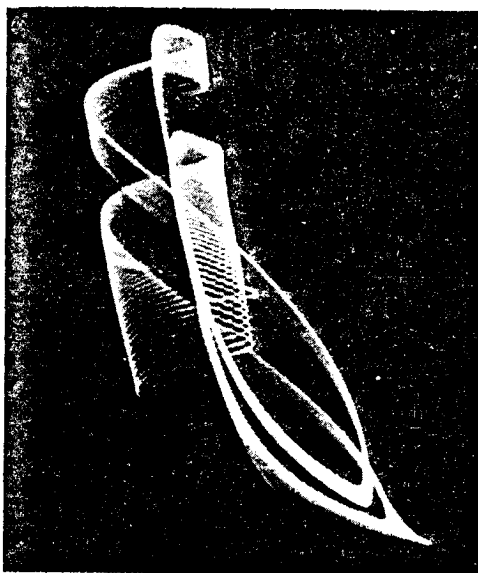


A part of the Electronic Abstractions Exhibit as shown at the Des Moines Art Center, March-April, 1953.

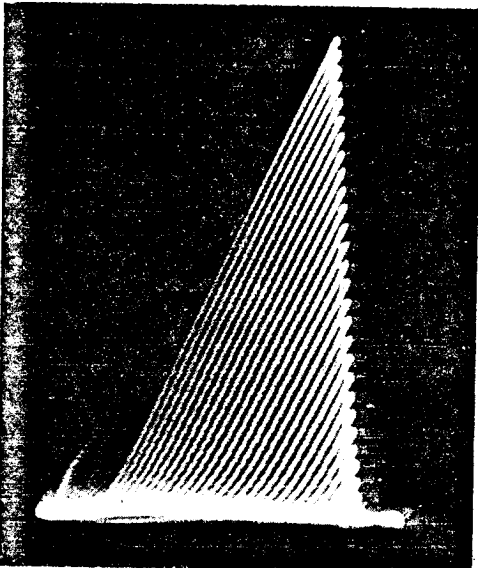
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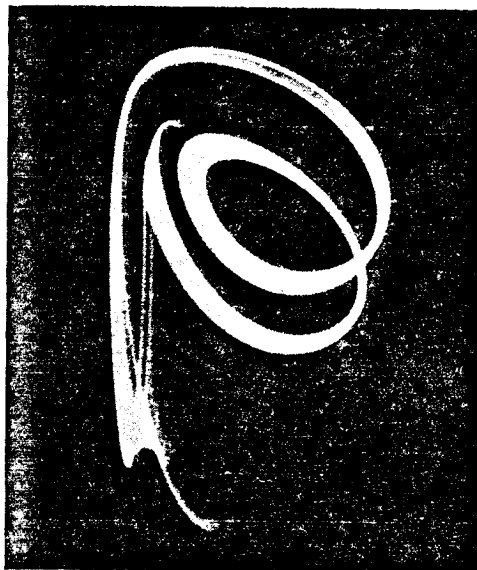
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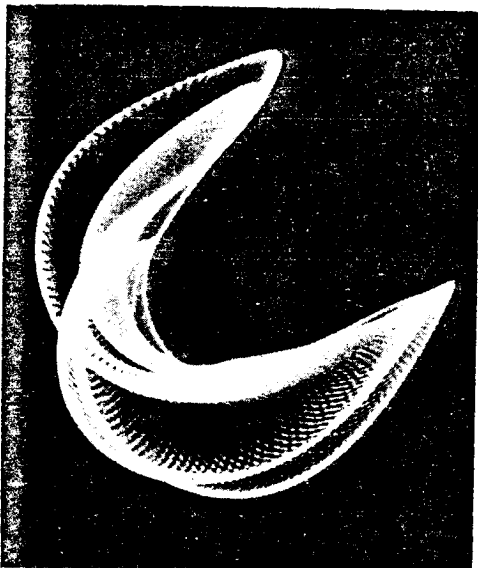
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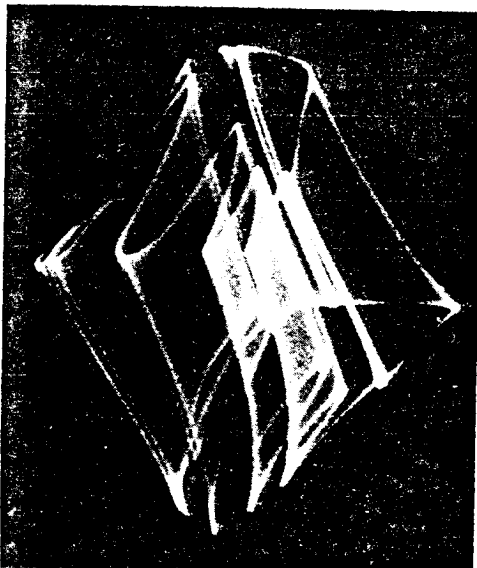
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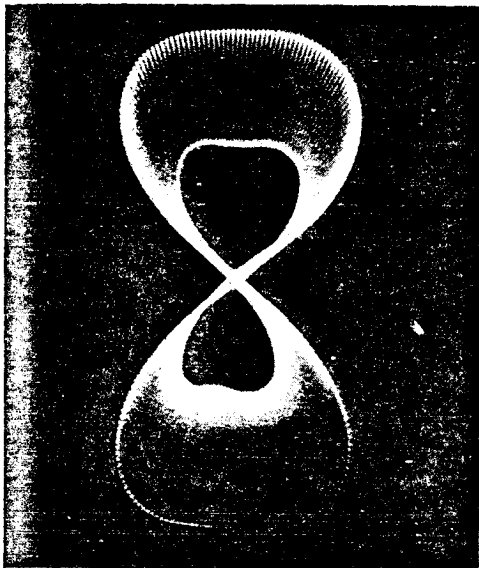




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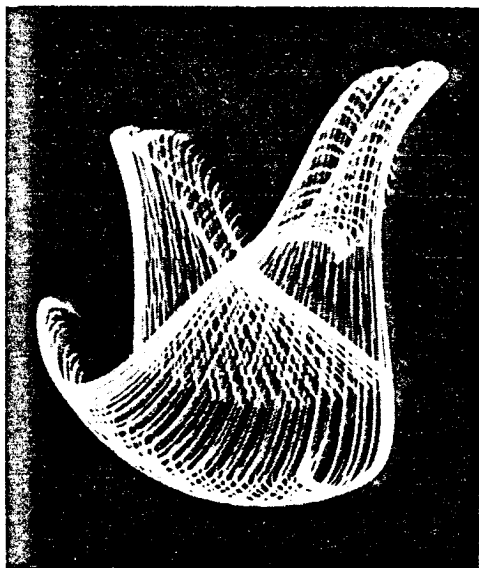
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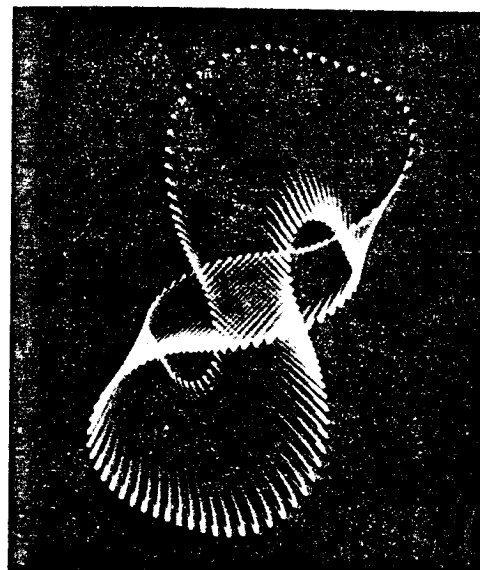
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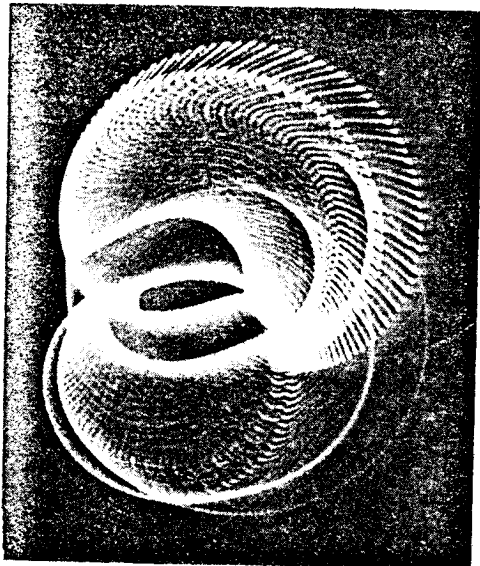


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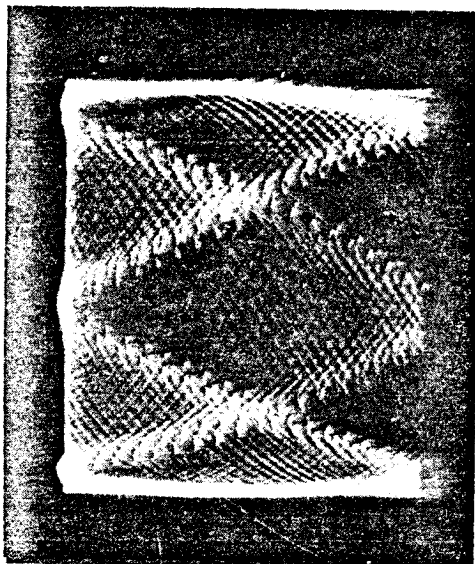
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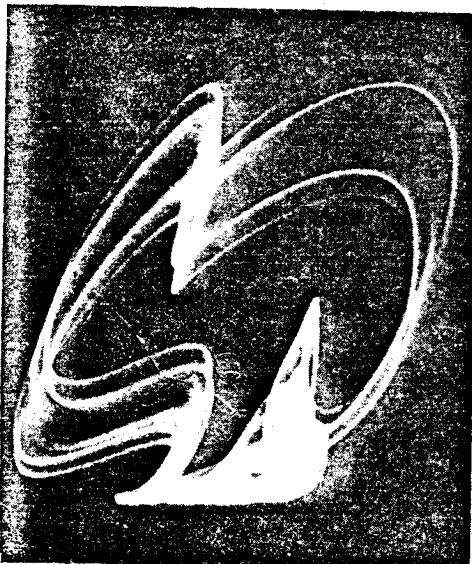
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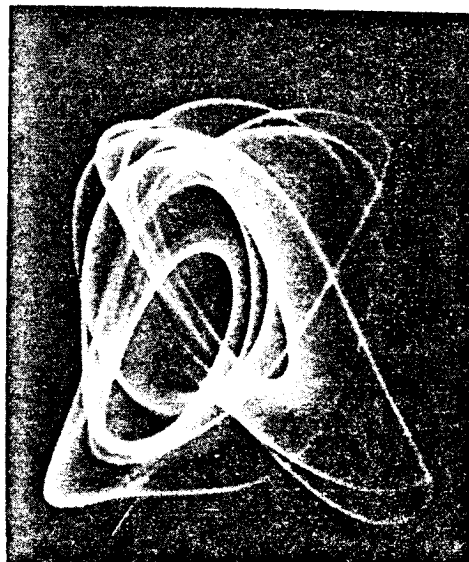
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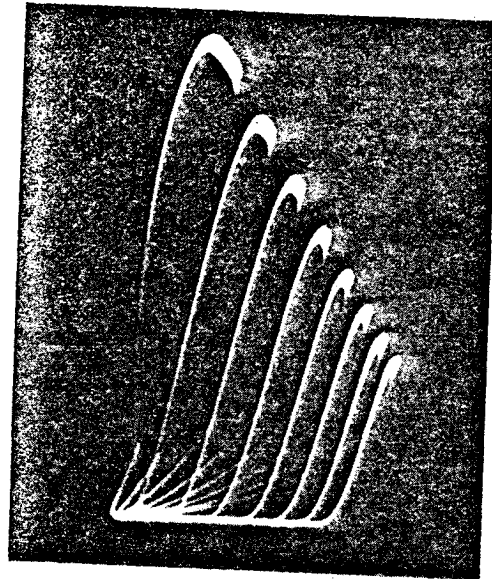


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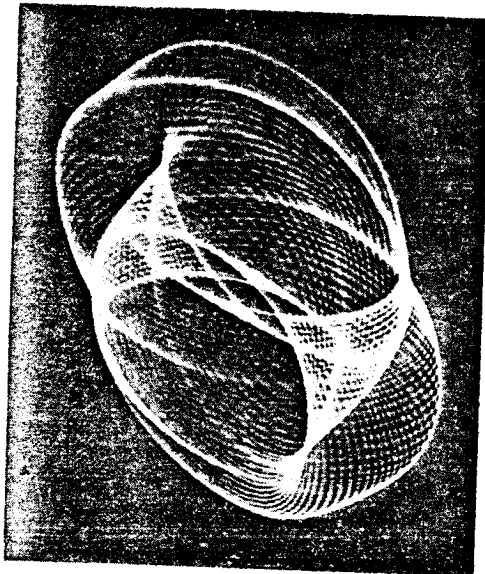




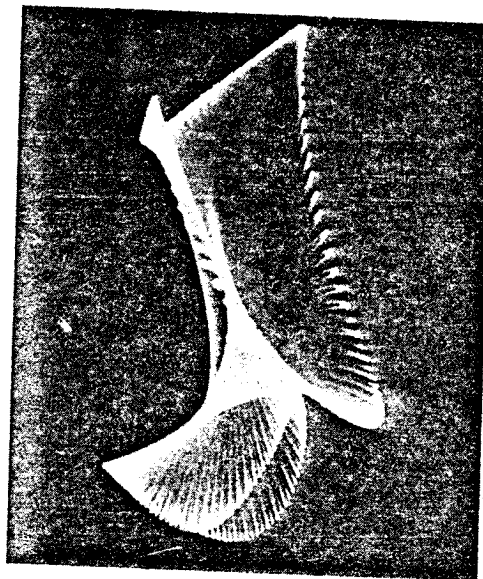
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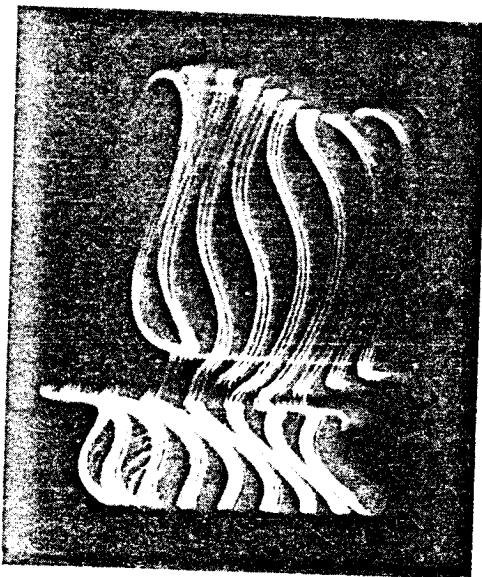
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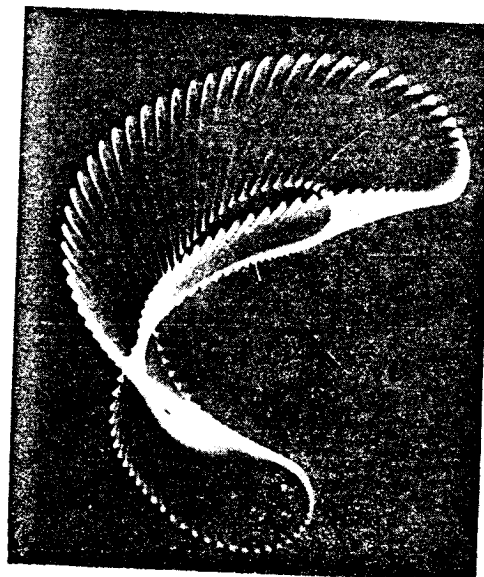
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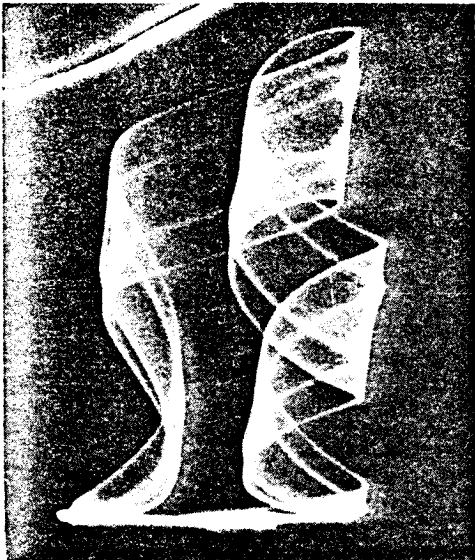
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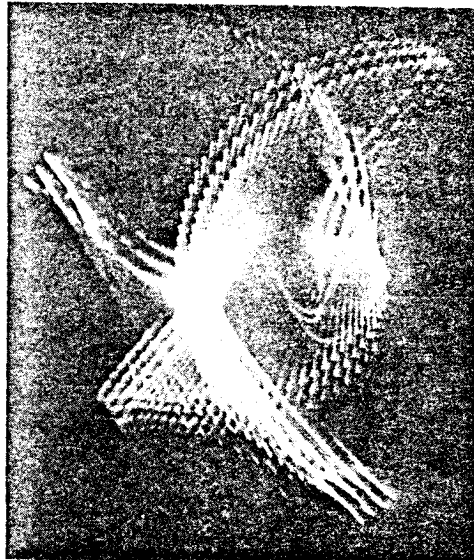
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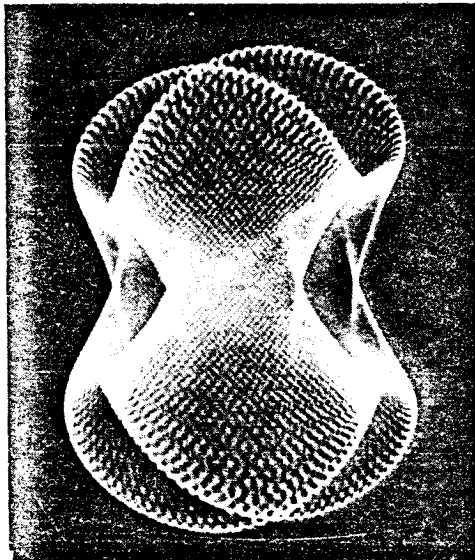
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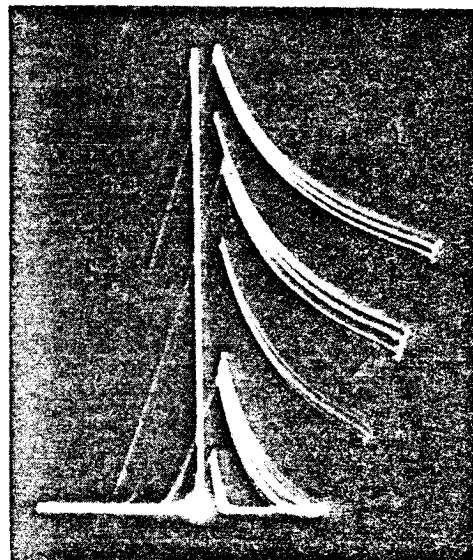
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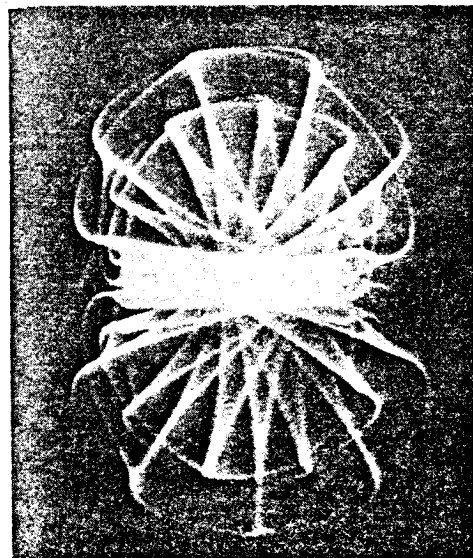
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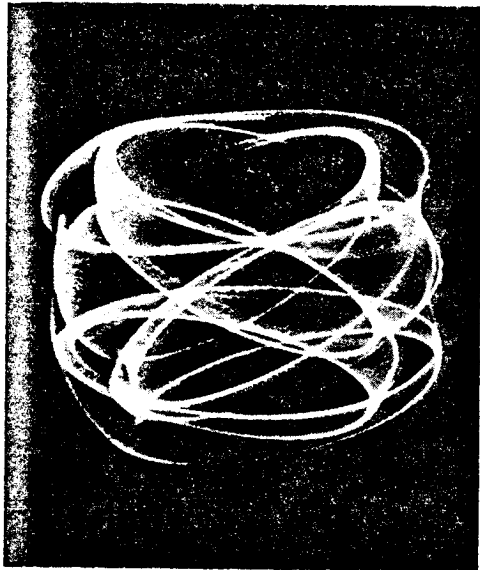
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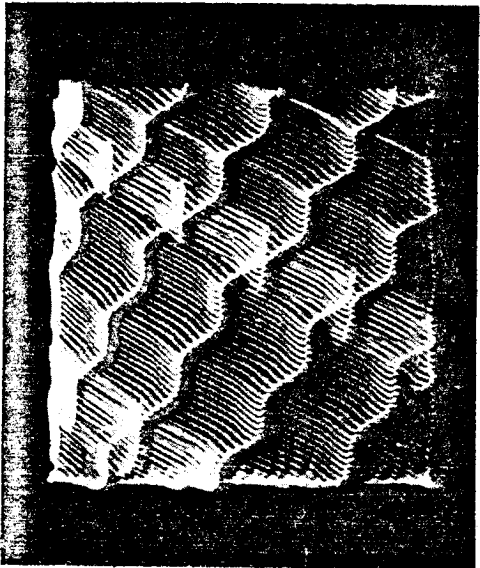
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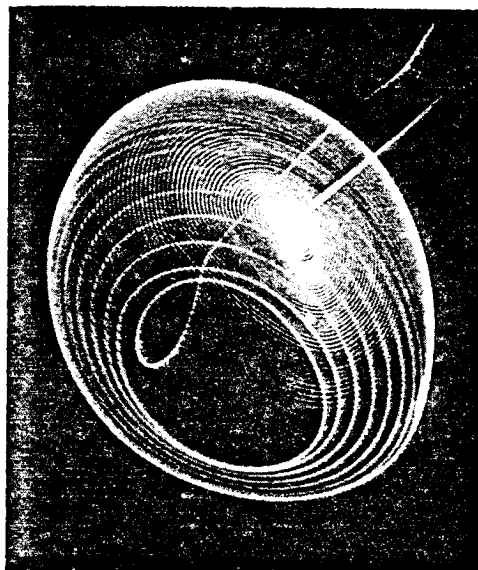
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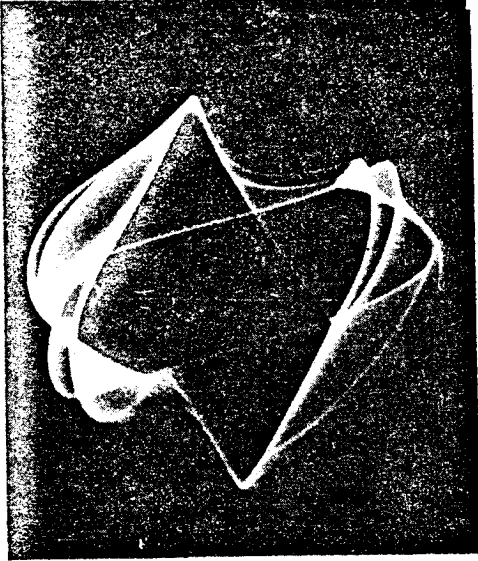


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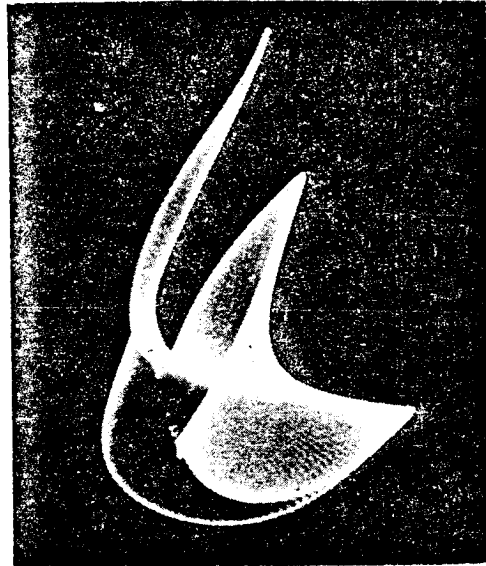


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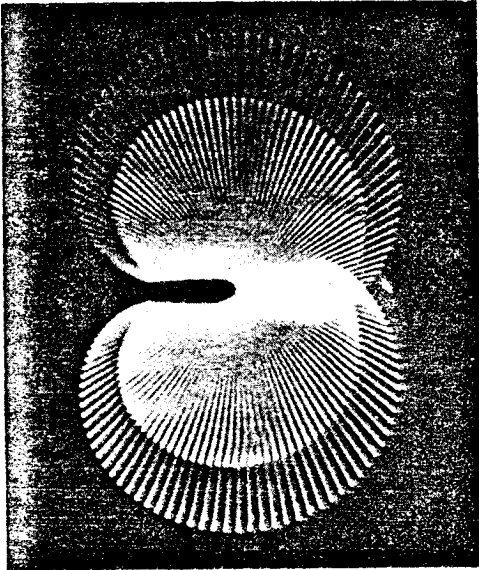
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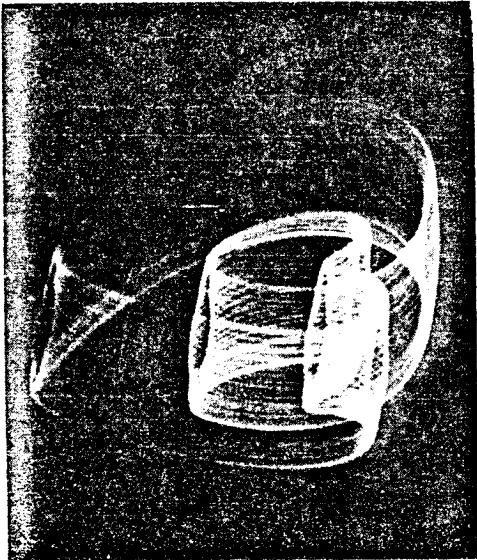
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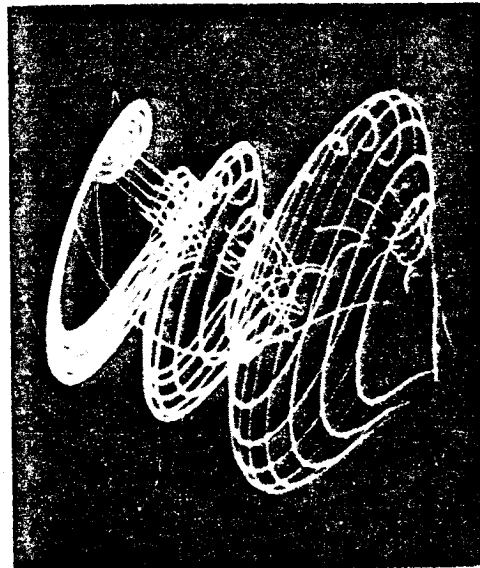
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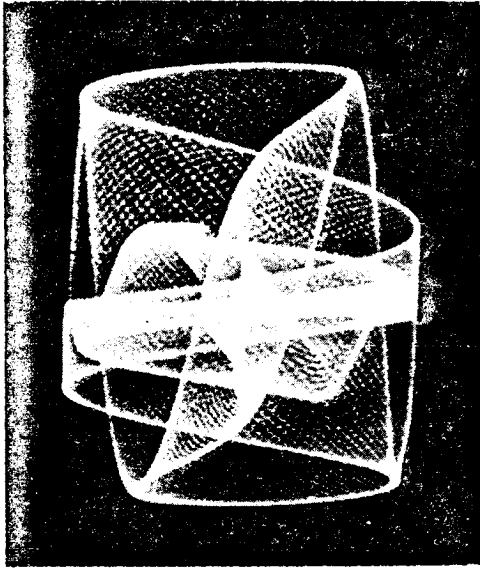


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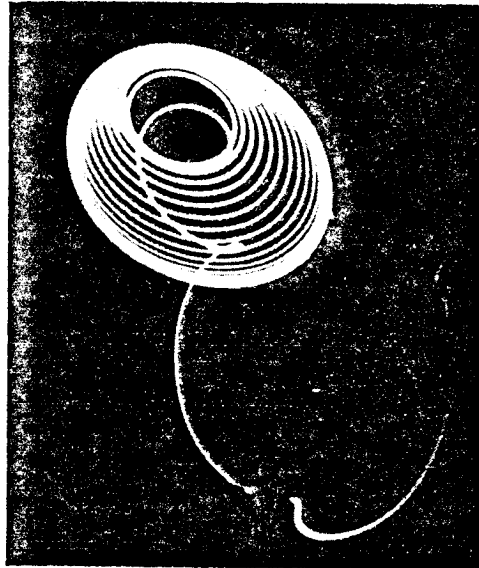


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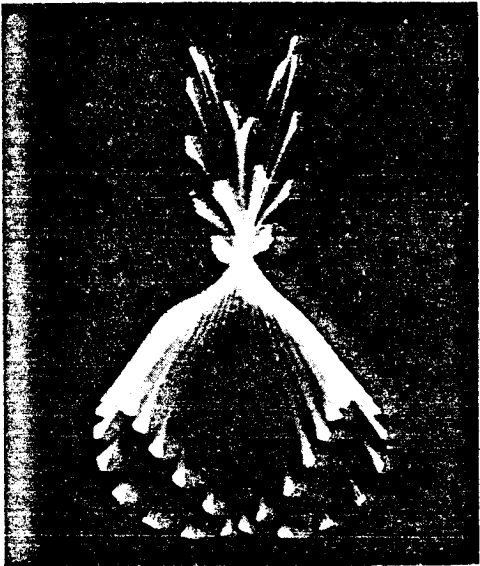




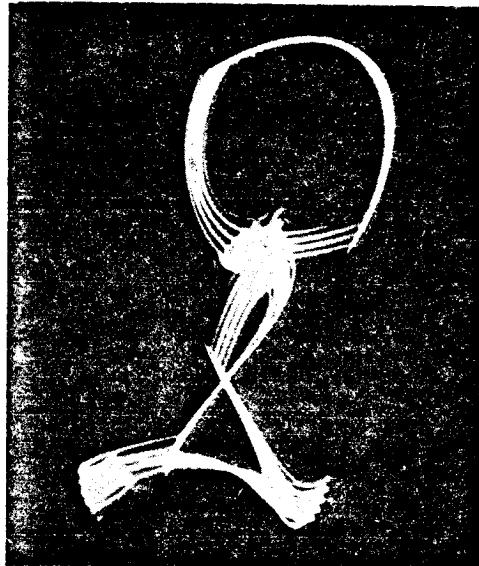
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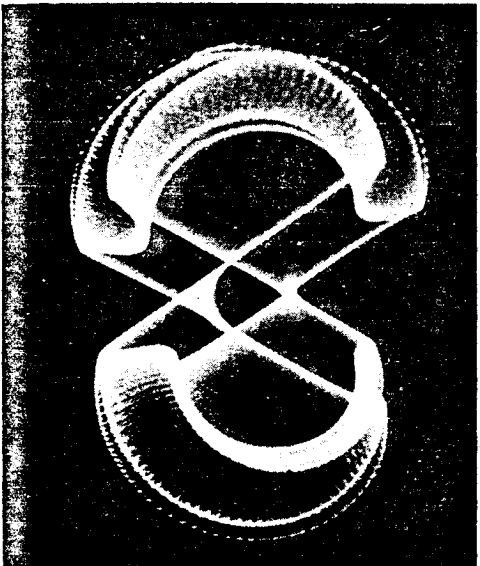
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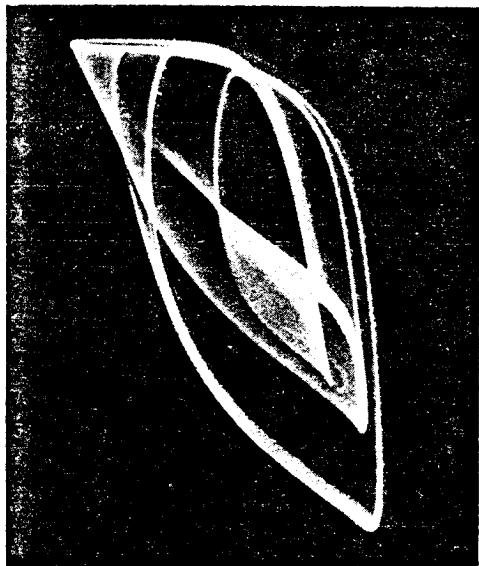
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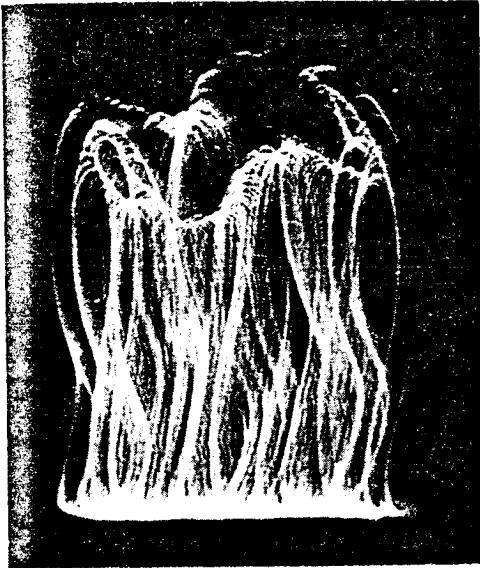


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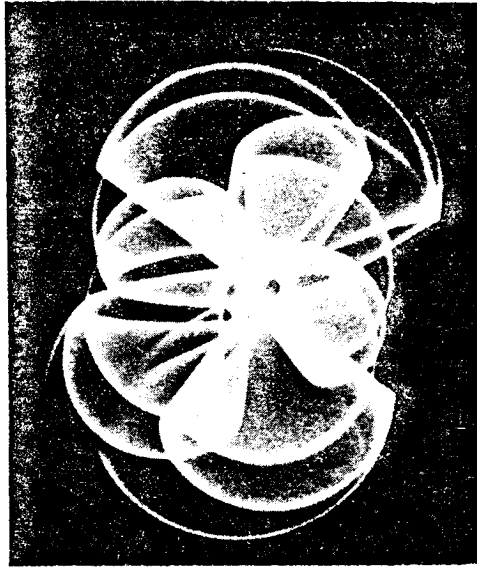


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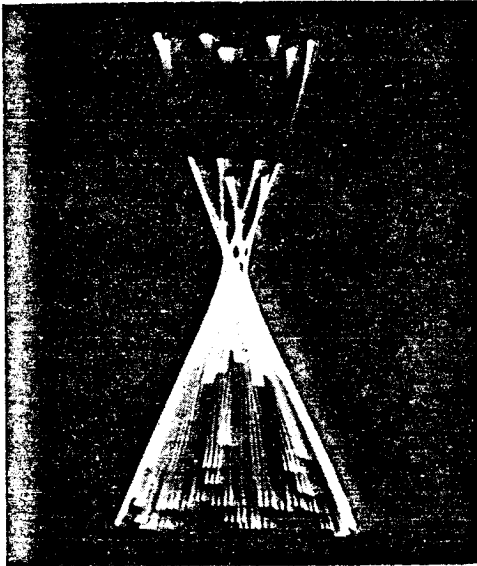
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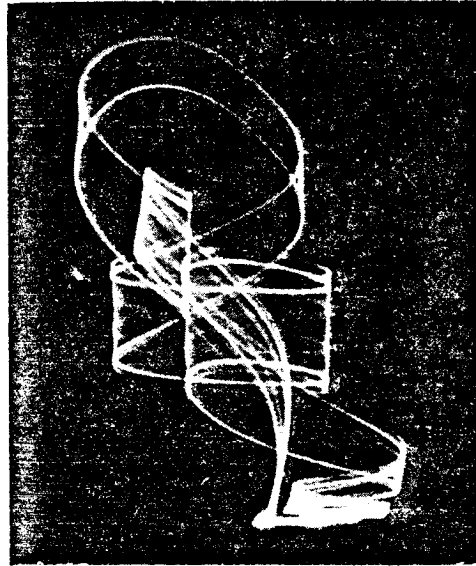
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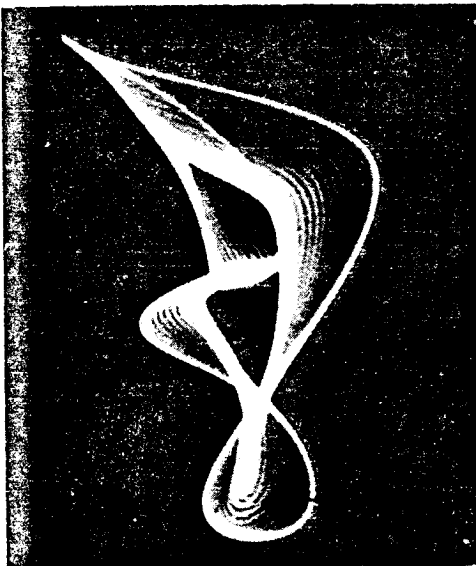
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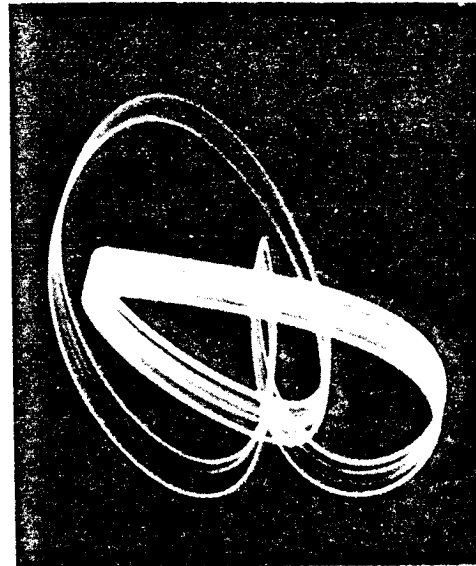
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53



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Among the items published about the Electronic Abstractions or the exhibit, the following are of special interest.

From *Scripta Mathematica* magazine:

Designs numbers 7, 10, 35, 38 and 50 were published as full page plates in *Scripta Mathematica*, September-December, 1952, issue pages 305, ff. A brief note on "Electronic Abstractions" appeared on page 314 describing them, and included the following: "The mathematical aspect of these electronic creations is found in the basic wave patterns which compose them."

As part of its Pictorial Mathematics series on postcards, numbers 1 and 51 were published as "Electronic Abstract Designs" by *Scripta Mathematica*. (This magazine is a quarterly journal devoted to mathematics, especially in its cultural aspects, and is published by Yeshiva University, New York. It has been featuring groups of designs based on various mathematical forms or ideas.)

From *Design Magazine*:

The photograph of the oscilloscope setup on page 2 and two oscillons were published with an article "Design by Electrons, Science Creates a Micro-World of Art, by Ben F. Laposky" in *Design*, May 1953, p. 151. Excerpts follow:

"The wild gyrations of electrical wave forms were responsible for the unusual designs reproduced below (numbers 52 and 53 on page 13). A cathode-ray oscilloscope created these strangely beautiful patterns, no two of which are likely to be exactly the same.

"The author calls his art photographs *oscllons*. They are especially composed for design or abstract values, and have been photographed with a high speed camera lens on fast film. An artist may prefer to capture their unique compositions in the form of sketches or paintings.

"The expensive electronic equipment is not within the reach of the average individual. For this reason the medium is not likely to enjoy popular adaptation, although it may one day prove a useful source of inspiration for professional designers. They will have to be something of a radio "ham," however, as the equipment requires a degree of technical knowledge. Currently an exhibition of fifty such oscillons is being planned for circulation among art museums. At this writing* the one man show can be seen at Sanford Museum in Cherokee, Iowa."

(Reprinted from *DESIGN*, 1953.)

*February, 1953

(DESIGNS 15, 18 AND 54 WERE PRINTED IN THE CHEROKEE COURIER, A NEWSPAPER, DEC. 15, 1953.)

The idea of composing abstract designs on the screen of an oscilloscope was developed as a part of a larger investigation into designs or patterns based on natural forms (as crystals, for example), curves due to physical forces (such as swinging pendulums), or curves based on various mathematical principles.

The only previous published reference (prior to 1952) found in regard to the use of an oscilloscope as a possible source of design was in a brief article in *Popular Science Monthly*, December, 1947: "Even Necktie Designers Can Use Electrons." General Electric engineers suggested the use of television test instruments, that is, oscilloscopes, to display patterns which might be useful to designers as a source of ideas for textiles, etc.

To create all the electronic abstractions in this book, 37 electronic instruments of various types especially constructed or modified for this work were connected in different combinations to the 'scope. They were then controlled so as to compose the resulting wave forms in the best ways for design. The 56 patterns included here are from nearly 6,000 composed and photographed thus far.

As observed in the exhibit explanation, there is an interesting parallel between these art forms and music. The operator of an electronic setup creating them may almost be said to play a kind of "visual music" with it, especially when the moving traces on the oscilloscope screen pulsate rhythmically or harmoniously expand and contract in a kind of crescendo and diminuendo. Since much music is not representational of any sounds in nature, and so is abstract, the analogy with these electronic designs follows in yet another way. (It is interesting to note, also, that many electric organs and other electrical musical instruments incorporate electronic oscillators, amplifiers, and other circuits which are similar to those used in this visual technique.)

In regard to the mathematical aspect of these art forms, while many of their simpler curves may be plotted or analyzed by means of the equations of algebra, trigonometry or calculus, this procedure is not used in the case of those composed purely for design. After planning on the combinations of circuits he wishes to use, the operator of the electronic instruments can by employing their controls obtain much more artistic feeling in the designs as they appear on the 'scope screen than would ever be possible by calculation alone.

(The illustrations in this book do not show in some designs the high contrast, tonal range, or all the fine details as they appear in the photographic prints in the exhibit.)

Following are the art museums showing the first series of the Electronics Abstractions exhibit, 1953-54:

SANFORD MUSEUM, CHEROKEE, IOWA
DES MOINES ART CENTER, DES MOINES, IOWA
MASON CITY PUBLIC LIBRARY GALLERY, MASON CITY, IOWA
DRAKE UNIVERSITY ART DEPARTMENT, DES MOINES, IOWA
SIOUX CITY ART CENTER, SIOUX CITY, IOWA
BLANDEN MEMORIAL, FORT DODGE, IOWA
JOSLYN ART MUSEUM, OMAHA, NEBRASKA
HACKLEY ART GALLERY, MUSKEGON, MICHIGAN
NEVILLE PUBLIC MUSEUM, GREEN BAY, WISCONSIN
SLATER MEMORIAL MUSEUM, NORWICH, CONNECTICUT
SKIDMORE COLLEGE ART DEPARTMENT, SARATOGA SPRINGS, NEW YORK
ADDISON GALLERY OF AMERICAN ART, ANDOVER, MASSACHUSETTS
PHILBROOK ART CENTER, TULSA, OKLAHOMA
OKLAHOMA ART CENTER, OKLAHOMA CITY, OKLAHOMA

Additional places showing the Electronic Abstractions exhibits, 1954-1961:

CRANBROOK INSTITUTE OF SCIENCE, BLOOMFIELD HILLS, MICHIGAN
J. B. SPEED ART MUSEUM, LOUISVILLE, KENTUCKY
RICHMOND ART CENTER, RICHMOND, CALIFORNIA
WUSTUM MUSEUM OF FINE ARTS, RACINE, WISCONSIN
CURRIER GALLERY OF ART, MANCHESTER, NEW HAMPSHIRE
DAVENPORT PUBLIC MUSEUM, DAVENPORT, IOWA
CAYUGA MUSEUM, AUBURN, NEW YORK
OSHKOSH PUBLIC MUSEUM, OSHKOSH, WISCONSIN
BIRMINGHAM MUSEUM OF ART, BIRMINGHAM, ALABAMA
NORFOLK MUSEUM OF ART AND SCIENCE, NORFOLK, VA.
WARTBURG COLLEGE, WAVERLY, IOWA
UNIVERSITY OF VERMONT, BURLINGTON, VERMONT
COOPER UNION, MUSEUM FOR THE ARTS OF DECORATION, NEW YORK, N. Y.
ROCHESTER ART CENTER, ROCHESTER, MINNESOTA
VASSAR COLLEGE, POUGHKEEPSIE, NEW YORK
UNIVERSITY OF NORTH CAROLINA, CHAPEL HILL, N. C.
NEWARK PUBLIC LIBRARY GALLERY, NEWARK, N. J.
DALLAS MUSEUM OF FINE ARTS, DALLAS, TEXAS
GEORGE EASTMAN HOUSE OF PHOTOGRAPHY, ROCHESTER, NEW YORK
UNIVERSITY OF PITTSBURG, PITTSBURG, PENNSYLVANIA
COLORADO COLLEGE, COLORADO SPRINGS, COLORADO
UNIVERSITY OF MAINE, ORONO, MAINE
WESTERN MICHIGAN UNIVERSITY, KALAMAZOO, MICHIGAN
MINNEAPOLIS SCHOOL OF ARTS, MINNEAPOLIS, MINNESOTA
INSTITUTE OF DESIGN, ILLINOIS INSTITUTE OF TECHNOLOGY, CHICAGO, ILL.
And Others

A duplicate set of the Sanford Museum traveling exhibit was shown in France at LeMans and other places by the Cultural Relations Section of the United States Information Agency.

Smaller groups of prints from the exhibits were also shown at: Ohio Wesleyan University, Delaware, Ohio; Photographers Association of America Convention, Chicago (1955), and other places.

*EXHIBIT LIST NOT COMPLETE. PART ONLY OF OVER
210 TOTAL PLACES*