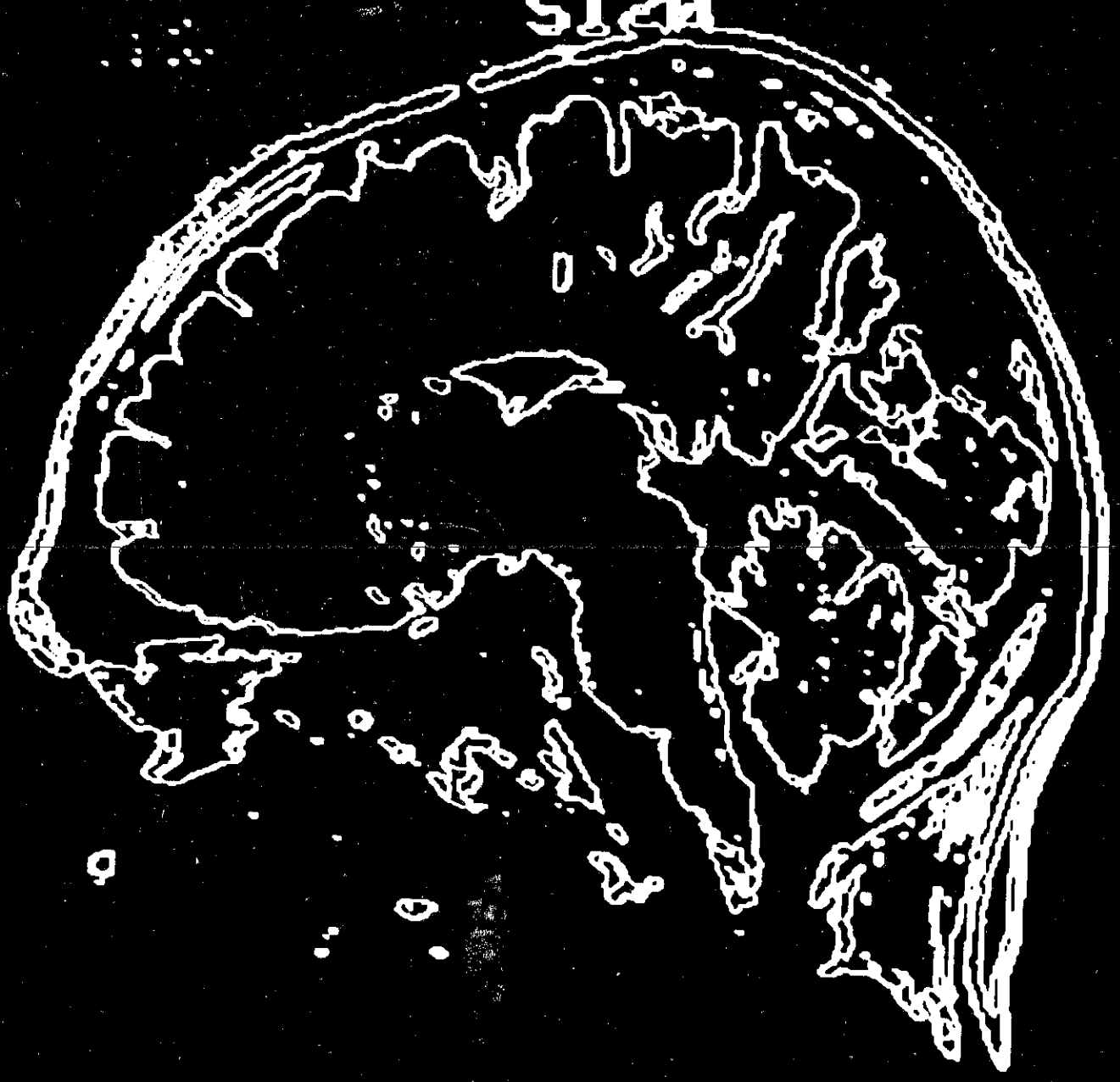
Phscolograms

by $(Art)^n$



Fermilab, November 11th, 1987 - January 6th, 1988

Since '77, many of the significant developments in art have been actively concerned with photography. That technology's 148-year tradition has continuously stressed its inherent connection to objectivity and truth, but in the early eighties this no longer appeared correct. Especially evidenced in the electronic media was the revelation that the truth - or what had been parading as truth - had been manipulated, even blantantly fabricated. The need to be vigilant followed that revelation. Scrutinize everything for the hidden agenda. History has come to be fiction. The prescient function of art was rejected. Even the authority of one's own perceptions have been reduced. Suspicion and question rule.

A look at art's recent buzzwords identifies our reorientation: simulation, appropriation, deconstruction, reification, contextualization, suspension, confalte, signify, collapse, rupture. And the overview of this decade's most critically regarded art - works by Prince, Sherman, Levine, Charlesworth, Lawler, Kruger, Welling, Brauntuch, and Koons - reveals this common ground - the examination of text/subtext, believability/fakery, and authority/multiplicity.

(Art)^n's phscolograms participate in this dialogue regarding the new reality. They present images which are not only more real and believable than those found in traditional photography, but also even more fabricated and fake. As with the works by the seminal artists already mentioned, the life of the art is dependent upon the willingness of the viewer to suspend his/her orientation and play both in the believability of lies and the falsehoods appearing true-to-life. When the subject of the phscologram is no longer an image of something in our tangible world, but rather a computer-generated deformation of a four-dimensional mathematical equation, the empirical indexing of the abstract image/object becomes further obfuscated by the clarity of its representation. How is it that a 4-D math equation is simulated as a 2-D image by a computer and then made to appear to be a 3-D form floating in the flat space of a photograph?

Familiarity and seductive appearance keep the viewer returning to this art which poses doubt and reflection at its core. Artists exploring this new photography achieve this by utilizing carefully selected formats, techniques, and images which were generated by advertising and entertainment agencies for their efficaciousness. With the use of this material, the art and artist participate in this system of manipulation. And the moment the viewers experience attraction to the art, they, too, are implicated. But, where the original purpose of the mass media images was to sentimentalize, capture, and, thereby, close-off the experience from question, this new photography represents this information so as to reveal the fake and redirect the examination onto the artist's agenda and the viewer.

Hudson, 10/87

Phscologram^{TM}: New Universes, New Aesthetic Focuses

by

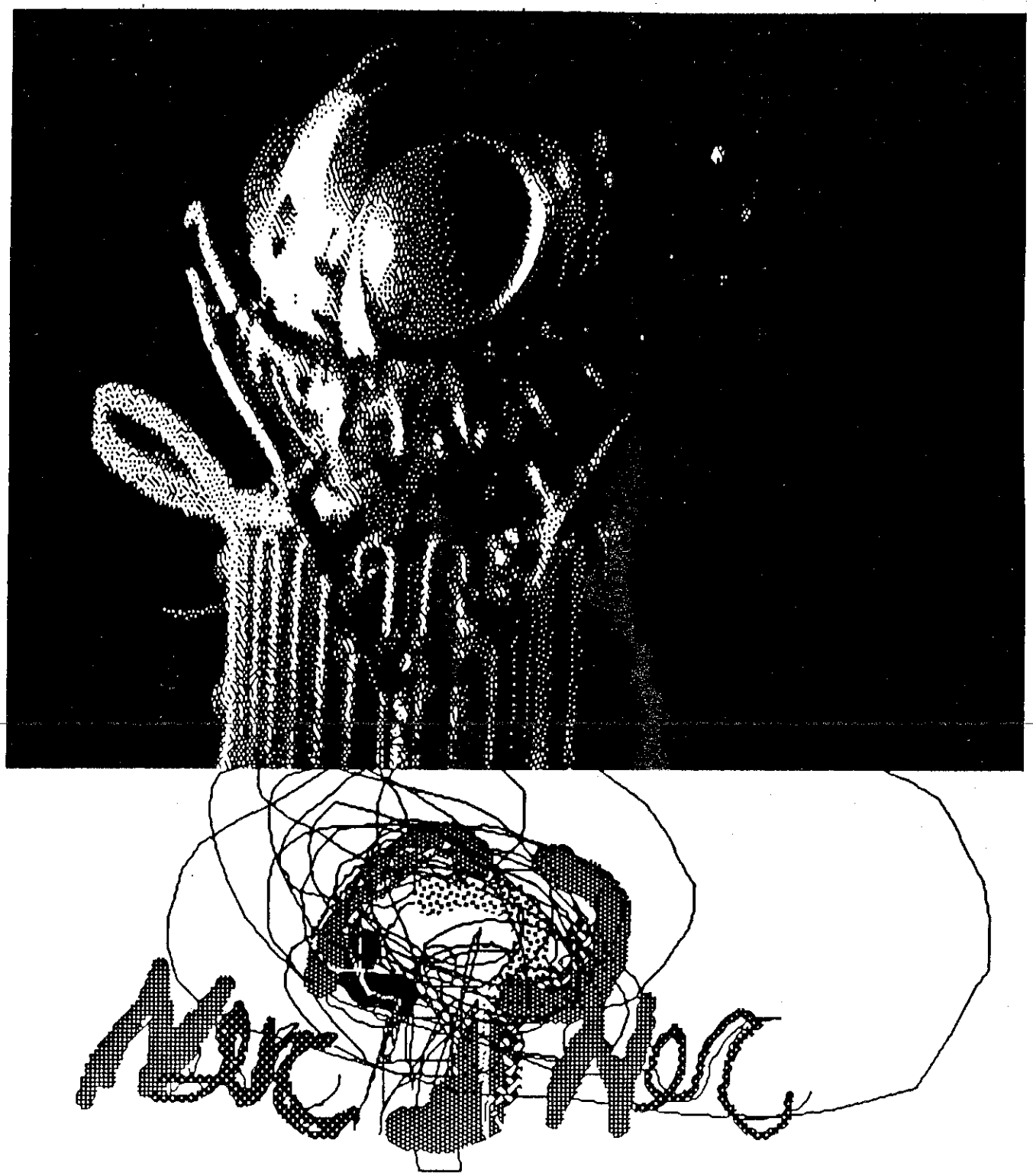
Michel Se'gard

Science and technology, through electronic image making, are redefining art, from what can be made to how and why it is made. The resourceful artist now has access to highly sophisticated machines that will allow the creation of complex images from nothing more than the manipulation of mathematical functions. Indeed, entire "alternative universes" can be created and projected onto three-dimensional Cartesian space. Science has given the artist the tools to create worlds that, just a few decades ago, only genius geometers like Escher could visualize. And with these new universes, whose immanence is in the realm of the conceptual rather than the tangible, come new aesthetic focuses.

But an image locked into the memory medium of a computer system and unviewable is not a work of art. An image only becomes a work of art when a viewer sees it and responds to it intellectually and emotionally. For those not accustomed to the environment, seeing a two-dimensional projection of a three-dimensional image on a small CRT in the laboratory is not really seeing the image, and the aesthetic response, for them, must necessarily be as partial as the apprehension. **(Art)^n** has developed a visualization system that liberates these images from the laboratory and allows them to be easily seen without the need for costly, complicated, and cumbersome hardware.

When Ellen Sandor founded **(Art)^n** in 1983, she had a photographic process that could produce large, back-lit, color transparencies that projected a three-dimensional image. And, she had assembled a dedicated group of technicians and artists who were stimulated by the creative, collaborative interplay between art and science that the technology had to offer. The early success of the group rested in their daring mix of technologies on an ambitious scale. One monumental-sized work, *Phscologram 1983*, contained five three-dimensional photographs created by Sandor, Jim Zanzi, Randy Johnson, and Gina Uhlmann; a video piece by Mark Resch with sound by Scott Constable; three holograms by Tom Cvetkovich and Steven Smith; and a kinetic sculpture by Gary Justis, all integrated into a huge superstructure designed and built by Justis. Another early piece, *(Free Markets)^n*, had a similar mix.

The group decided to call the products of their labors "phscolograms" (pronounced skōl•o•grams), after that early piece. Phscologram (derived from the beginning letters of the terms "photography," "holography," "sculpture," and "computer graphics")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implies a dedication to collaborative and cross-disciplinary approaches to the making of art. The name's Greek suffix signals the group's acceptance of scientific and technological processes as legitimate methodologies for the production of art. A phscologram is first a large, full-color, three-dimensional photographic image that is produced by a team of artists, but it is also an approach to making art that explores the aesthetic possibilities of technology (and reveals some of the parallels between aesthetic, scientific, and theological thought).

Under Sandor's guidance, the phscologram has evolved into a very powerful imaging tool. When **(Art)^n** was first formed, the only way to make a phscologram was to create a diorama of the desired image. The subject to be photographed had to be absolutely still for hours, because of the extremely long multiple exposures necessary to get the 3-D image. The five phscolograms in *Phscologram 1983* were created in this way and required weeks of model making by sculptor Randy Johnson under the conceptual guidance of Jim Zanzi before the images could be recorded on film.

Then, Dan Sandin, Co-Director of the Electronic Visualization Laboratory (EVL) and Electronic Visualization Program at the University of Illinois at Chicago (and inventor of one of the most widely used video image processors), became involved in **(Art)^n**. He and Mark Resch developed techniques to capture still video images on a phscologram and opened up a whole world of possibilities, including the imaging of people. Sandin even found ways to introduce limited animation into a phscologram, as in the triptych *Hedgehog I*. The center panel, sometimes exhibited separately as *Ellen Test #2*, contains a computer-generated, time-lapse representation of a moving cloud, encased in a cruciform grid. At each corner, there are paddle-wheel forms that rotate as the viewer moves.

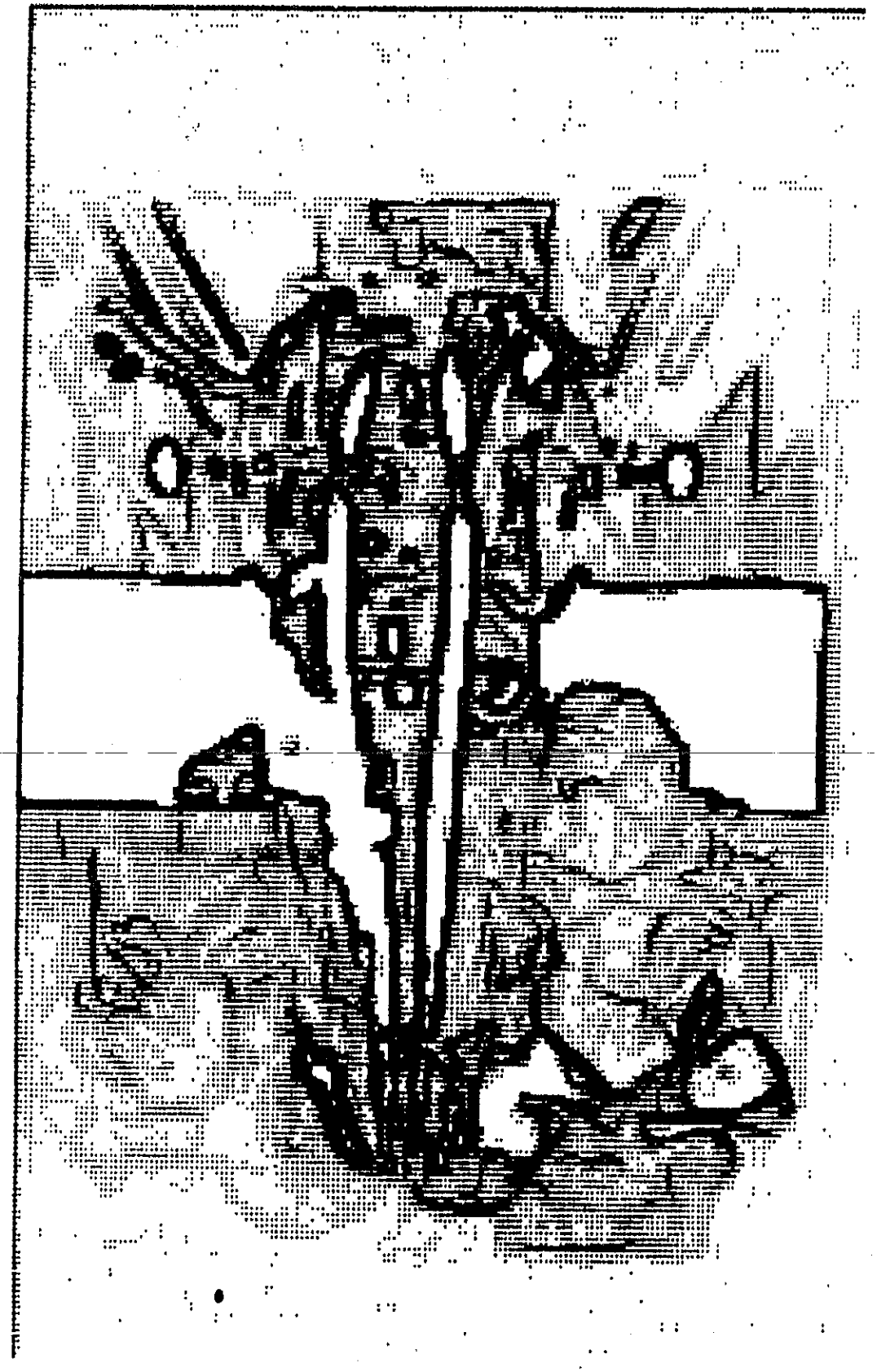
Once a phscologram could be produced from a series of images that could be projected on a CRT, the phscologram could be used simultaneously as an image-processing tool and as a "hard copy" output device for very sophisticated computer imaging systems. It didn't matter if portions of the image came from a computer graphics system and another part from an image-processed video; if they could be digitized, they could be integrated and the multiple images necessary to make the phscologram could be computed and brought up on-screen for subsequent exposure to film. And the only thing needed to view the full-color, three-dimensional final image was a bank of ordinary fluorescent bulbs used to back light the transparencies - an easily used "low tech" output for an extremely "high tech" image-making process.

The evolution of Donna Cox's computer-generated image, *Venus in Time*, into the phscologram *Etruscan Venus*, illustrates the process. Cox's two-dimensional image (or more properly, the program to generate the image) was created at the National Center for Supercomputing Applications (NCSA) at the University of Illinois at Urbana-Champaign on a Cray supercomputer. Sandin and Sandor, with the assistance of Tom DeFanti, mathematician George Francis, and programmer/artist Ray Idaszak, modified Cox's algorithm so that the Cray would compute the series of CRT images that were then sequentially photographed to make the three-dimensional phscologram at the **(Art)^n** Electronic Visualization Laboratory, now located at the Illinois Institute of Technology.

What is particularly interesting about this image is that its origin is really a mathematical function - the function for a three-dimensional projection of a four-dimensional figure called a Romboy Homotophy. The same function was used to generate *Achilles* and *Lotos* simply by changing some of the parameters. At no time did any of these images ever exist as objects in "real" space. They are photographic records of pure conceptual thought expressed through mathematics and given "substance" as a phscologram.

This series of images also illustrates a very important change in the way many electronic works of art are conceived, in contrast to the inspirational origins of more traditional works of art. *Etruscan Venus*, *Achilles*, and *Lotos* are different iterations of a single mathematical model. The parameters of that model were then manipulated to create iterations whose forms related to human cultural and historical experience. The process is essentially one of synthesis - structural invention, followed by enhancement, embellishment, and cultural contextualization through visual metaphor. This process is characteristic of much computer art that does not start with a scanned image. Artists such as Cox, Idaszak, and Sandin begin with "mathematical systems" and create visual universes.

In contrast, the primary direction of twentieth-century abstraction, until the emergence of computer-generated imagery, had been towards reduction - even though the act of painting, itself, is additive and synthetic. Early twentieth-century artists, especially so-called abstract artists, worked and thought in a reductive direction. Mark Rothko, for example, began with landscape and reduced it to a quasi-mathematical poetry. Similarly, Piet Mondrian started with the tree and evolved the branches into a grid. Jackson Pollock started with totemic forms and reduced them to personal gesture. Electronic technology has changed that reductive intellectual approach to a synthetic one by making the process of image synthesis from pure math-



ematics practical, allowing the aesthetic and physical (or technical) processes to flow in the same direction in a given art-making system. Phscolograms are well-suited to serve as an end-product for such systems because they, themselves, are the end product of a process that requires the artists to literally synthesize the image before it can be recorded. (Whether one builds the image as a diorama or as a series of computer-generated images does not alter the synthetic nature of the process.)

But the phscologram as an output device for computer-generated art also exemplifies two of the main critical problems of creating art with high-technology tools. First, the process required a great deal of both technical and artistic collaboration. The artists using phscolograms must be willing to create their universes by committee. But creation by consensus is an idea foreign to the romantic underpinnings of modern Western aesthetics. Even Walter Benjamin, in his famous essay, "The Work of Art in the Age of Mechanical Reproduction," could not cope with the collaborative nature of technological art in dealing with film. For him, the aesthetic responsibility rested with the director of a film, and Benjamin virtually ignored the aesthetic contribution of the actor, the cameraman, even the producer. (Think of the highly popular "Star Trek" series. Executive producer Gene Roddenberry's creative contributions are really what gave that program its flavor.) At **(Art)^n**, Sandor, Zanzi, Sandin, and Johnson take turns sharing the responsibilities of artistic director and producer. All are artists who have produced independent bodies of work, but when making a phscologram, each shares in the responsibility along with a number of constantly changing collaborating artists, which have included sculptor Gary Justis, photographers Harold Allen and Gina Uhlmann, video artist Mark Resch, interactive-systems artist Tom DeFanti, and computer-graphics artist Donna Cox.

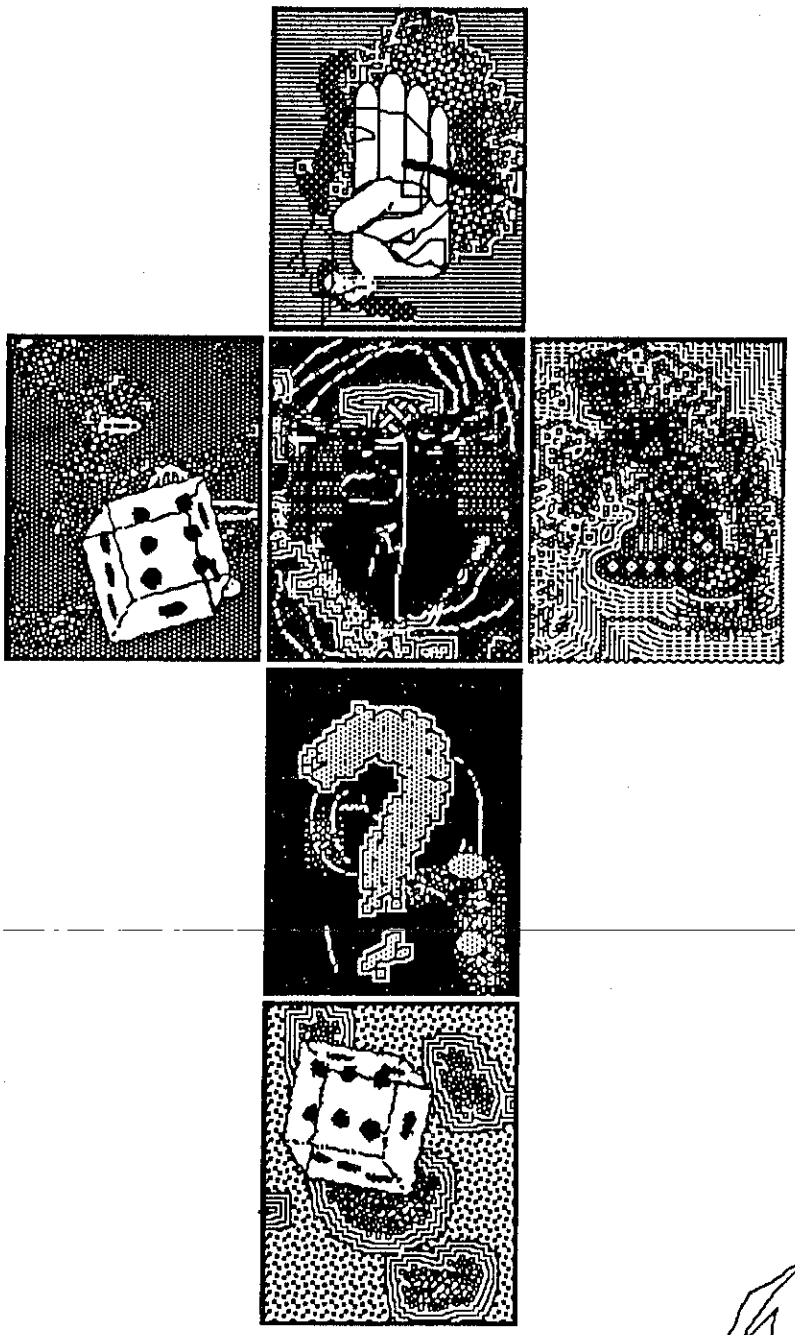
Could it be that monotheistic cultures have a difficult time conceiving of a creative act by a group? When Western civilization was still effectively polytheistic (under the medieval rule of Catholicism and all its saints), it produced great works of collaborative art in the form of religious architecture. When the notion of individualism began to dominate with the Renaissance and the subsequent advent of Protestantism, the modern notion of the artist as an individual personality and isolated creative genius emerged. Technology has forced a return to collaboration in nearly every phase of life, business, science, art - even, these days, procreation. Sometimes, the collaborative aspects of our life are not immediately obvious; the computer artist who sits alone at a terminal to create an image is actually interacting (at a distance in time and space) with the authors of the software who have prescribed the limitations of the system and the order and manner in which things may be done. So phscolograms created by **(Art)^n** bear the consequences of these collaborative efforts: they

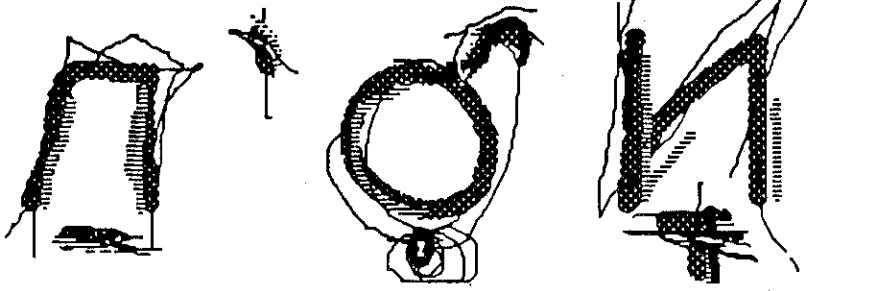
tend to be a little disjointed and "over filled" by traditional modernist standards. So is the facade of Chartre!

Second, these artists are "creating new universes." In so far as their "synthetic" universes model the "real" one and are able to inform the viewer about the world, their works of art operate very much like scientific theories. Scientific theories are dispassionate deductions about the real world (until the scientist declares that "God does not play dice with the universe"). But when passion is factored into the equation, very powerful works of art are created from structurally very similar intellectual systems. *Nuclear Necrophilia*, a work about child victims of war, and *Messiah*, a new work about the ravages and cultural consequences of AIDS, are two examples produced by **(Art)^n** that are no more dispassionate models of our culture than are the paintings of Goya. They are aesthetic equivalents of sophisticated war games that compute iteration after iteration of our plausible doom.

When one contemplates the images made possible through phscolograms, one begins to experience a disintegration of the boundaries between art, science, and theology - modern civilization's traditional separation of powers. There is no existing system of aesthetic thought that can cope with these three disciplines at the same time. Are Cox's and Sandin's mathematical images saying that mathematics, the language of science, is really art represented by numbers? Does Sandor's, Johnson's, and Zanzi's sensitivity to social and moral issues (displayed in their overall direction of the imagery of pieces such as *Nuclear Necrophilia* and *Messiah*) mean that art is visual theology? And what about the overlap of religion and science when one is able to create an entire mini-universe from nothing more than a concept expressed in numbers? Of course, all of these dynamics have been going on in art and science for a very long time. But, Renoir buried his rationality under a layer of sentimental subject matter, Michelangelo disguised (however thinly to the modern eye) his creative individuality with the veil of religious homage, and Einstein hid his religious faith behind the dispassionate facade of mathematical equations.

New imaging technologies, such as phscolograms, that allow the full force of electronic image processing to be felt are compelling us to reconsider how we think about art and its relationship to science and religious thought. Technology has made obsolete our culture's "separate but equal" attitude toward these three intellectual disciplines. Our dilemma is that we do not yet have new laws that allow us to integrate them.





Ellen Sandor and Phscolograms

by

Joel Snyder

Ellen Sandor's work as an artist seems always to have engaged photography as a means of creating works which are immune to the standards commonly used by connoisseurs and curators of photographs. Her work might be said to overwhelm, or better perhaps, to embody its photographic substratum in an always intelligent effort to engage some issues we might want to think of as sculptural and to transform the plane photographic picture into an integral component of a three-dimensional, palpable object.

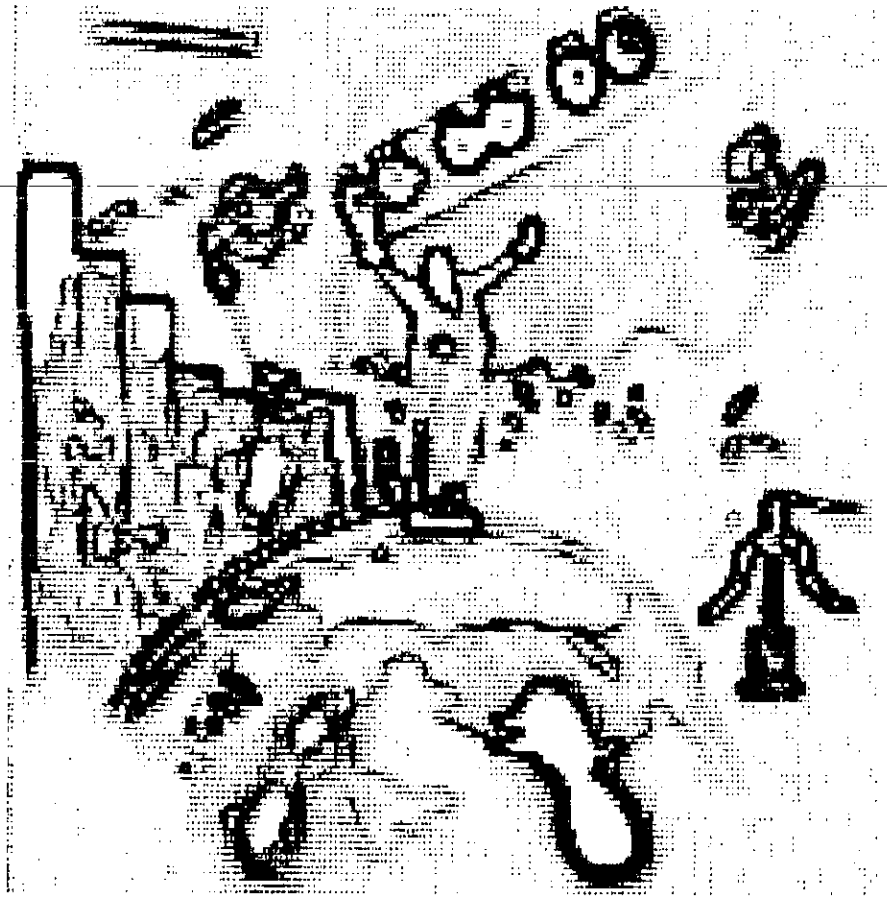
Artistic efforts like those exemplified by the most successful of Sandor's early mixed-media constructions provide a special problem for modernist critics who prefer their art "pure" and free of admixture. Such critics might say, for example, that some of her early photograph *cum* neon light pieces constitute neither sculpture nor graphics, and I suppose they would be correct in saying this, although it would be wrong to claim these works are both. Better to deny they are either and say rather that the aims of her art are just too large for this narrow system of classification. But saying this creates special problems for a critic who is trying to get some understanding of just what it is that Sandor is doing. The problem here is this: A critical judgement of the value of an artist's work requires an understanding of the issues that are supposed to be engaged by it. Knowing the work is neither sculpture nor graphic does not begin to indicate what it is, and without knowing that, a critic cannot begin to say if it succeeds or fails.

Ellen Sandor's new work - phscolograms, done with the collective group **(Art)^n** - are enormously valuable in helping a critic to see what she has been after all along. This new work engages questions of the visible and the tangible and provides me with a way of seeing that these are precisely the more abstract issues addressed in her older work as well. Sandor says she is a "post-modernist," but it seems to me that in her progress from mixed-media work to phscolography she has found an unexpected route back to modernism.

I say this work addresses questions of the visible and the tangible, but perhaps it would be more accurate to speak of the sense of tangibility that phscolograms aim at provoking by visual means. After all, these phscolograms are meant to frustrate or tease - to give the visual cues normally accompanying tangibility, while failing to pro-

vide anything touchable. They seem to stand away from their supports - phscolograms don't recede behind a frame in the way that Italian Renaissance cityscapes were said to - they don't draw us in, but rather come out to us. They aim at provoking responses about what is real and tangible and what is merely visible and apparent. And they do this with great effect. They provide us with a new way of addressing visual shape or form that goes beyond what can be addressed by a static object. This work shimmers, the objects they present, whether "real time" or mathematical in origin, seem to move as we move and we are challenged by the multiple shapes they project from moment to moment. These phscolograms should strike us as elusive, but they don't. I suspect that is a great part of their attractive power.

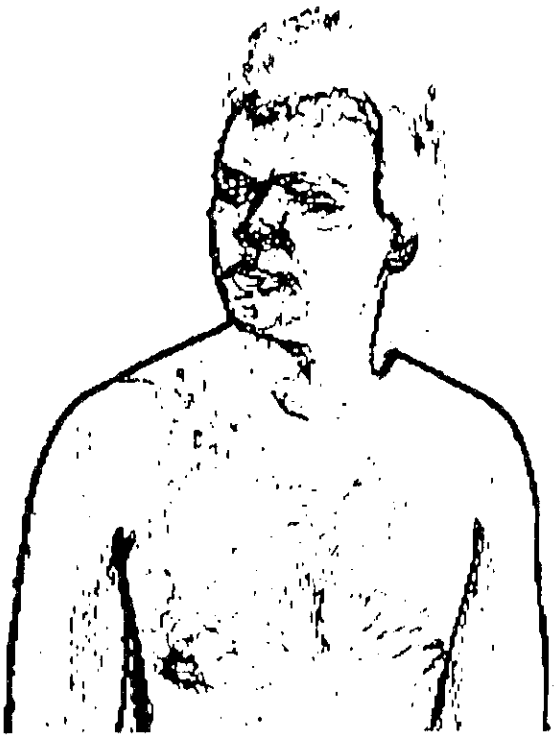
Ellen Sandor calls herself "Artist and Director" - the latter presumably because phscolography requires the joint efforts of sculptors, computer scientists, photographic technicians, and video artists. In this capacity she might be addressed in the way the medievals spoke of those artists who directed the creation of monumental mosaics - as a *pictor imaginatus* - an engine of imagination giving shape to the intangible.



(Art)n artists. Standing, left to right: Larry Smarr, Dan Sandin, Ray Idaszak, Tom DeFanti. Seated, left to right, Ellen Sandor, Donna Cox.

Ellen Sandor and Jim Zanzi.

Dan Sandin.



Mark Resch.

Gina Uhlmann.

Randy Johnson.

ARTISTS' STATEMENTS

MAXINE D. BROWN: JUST Words. My vocation is writing. I write about computer graphics. I write technical documents and promotional literature. And, until now, I have never been part of a team.

When one thinks of a team (in the techno-art sense), one thinks of artists and programmers. The artists apply their creative talents to the software and hardware that the programmers develop. Without the artist, the programmer wouldn't be doing art, and without the programmer, the artists would be having quite a difficult time working with computers. (Of course, there are a few Renaissance people capable of doing both, but they are clearly in the minority and not part of this general discussion.)

Without me, however, the artists wouldn't understand how to use the technical stuff that the computer people do. Without me, the media and gallery patrons wouldn't know about the latest artistic achievements.

When a colleague heard that I had been asked to contribute to this catalogue, he was somewhat surprised. After all, all I've done is write about phscolograms; my contributions have been "just words." I had nothing to do with the creative process or the technological tools.

Does it not matter that I appreciate both the art and the technology? Does it not matter that I had to understand the intent of the artists and the extent of their ability to visualize in 3-D? Does it not matter that one of the most powerful communication tools today is the printed word - and that a few lines of text can promote and publicize moreso than one gallery show? What about catalogues, press releases, technical descriptions, credits, titles, copyright notices, calendars of events, trademarks, and captions?

When invited to write something for this catalogue, I was specifically asked to talk about my contribution, the "verbal packaging" of phscolograms. I could have written about my anguish every time I sit in front of my blank computer screen and try to compose text, or I could have written about my frustration in verbalizing the visual. But I chose to write about the team, because I was surprised - and complimented - to be asked to contribute. I'm considered a team player, and I like it!

DONNA COX: The interdisciplinary research environment, coupled with supercomputer graphics, is affording new opportunities for collaborations between artists and scientists. Such interaction challenges C. P. Snow's dichotomy of "Two Cultures" and serves as a prototype of the "Renaissance Team" where specialists provide a broad spectrum of skills in the quest for discovery. This type of collaborative process is a mark of our era where knowledge has become greatly stratified and diversified such that a group of specialists can provide greater insights for complex problems than a single-handed individual.

A Renaissance Team does *not* mean "art or science by committee"; rather, a team can provide a critical mass of knowledge which can effectively address concepts, aesthetics, and technological advances. The Renaissance Team can be a powerful creative entity and depends upon the essence of communication, understanding, and mutual respect in order to be effective, productive, and creative. I can say with all sincerity that this group process of discovery and creative energy has engendered a loving bond with my colleagues; and I feel privileged to have had the opportunity to work with them on these projects.

```
/*
 * ART**n-ist Statement: Tom DeFanti 10/1/87
 */

main(argc,argv)
char **argv; /* might as well accept arguments */
int argc;    /* count of number of arguments   */
{
      float n;
      int i;
      double art, pow();
      void do_phscologram();

      i = argc;
      art = (double) rand();  /* get double random base        */
      for (n = 0; ; i = argc) /* for ever and ever             */
           while (--i)        /* as long as there's arguments */
              do_phscologram(pow(art,n++), argv[i]);

} /*  end main  */
```

GEORGE FRANCIS: Forms generated by elliptic ovals have fascinated geometers, artists, and astronomers ever since Appollonius, da Vinci, and Kepler. These "oval-esques" come from Topology and began their computer graphics existence on an Apple program in Forth.

RAY IDASZAK: To me, these images represent the culmination of a creative challenge fusing today's art, science, and technology. Conquering this art involves nothing short of Ph.D.'s, M.F.A.'s, and XMP's.

RANDY JOHNSON: I've always been interested in objects that are fantasies of the future - robots, ray guns, cars of the future like you could find in *Mechanics Illustrated*. It's fascinating to see how these projections of the future acquire a sense of age. When the "future" objects that these illustrations depict become real, the objects look nothing like what the illustrator imagined, and the images acquire a sense of age. They become artifacts of the time in which they were conceived. I like to use found objects in my sculpture in a way that captures that sense of artifact by trying to completely transform their original function. It's a little bit like folk art in that the materials become a sign for other things and lose their original meaning. I'm happy when you can no longer recognize what the object used to be. When that happens, the clue that the depicted object is a "false" prediction of the future will come only from the fact that the depicted object bears no visual resemblance to the eventual reality.

When I make a robotic form, like the clown in *Nuclear Necrophilia*, it pleases me that the thing doesn't really work. It's a kind of simulation of function like the famous classical painting of the grapes that the birds tried to eat; it provokes the viewer into thinking about reality and function. Phscograms add another layer to the process because the sculptures lose their objective reality altogether. They not only simulate function, they become simulations of the object themselves - projections, both physically and conceptually.

DAN SANDIN: I want to make the invisible visible. Make higher dimensional objects visible to us mortals apparently stuck in three dimensions. I also want to fully utilize our 3-D perceptual systems by presenting 3-D images.

ELLEN SANDOR: When I graduated from the School of the Art Institute of Chicago, I was interested in powerful, sensual, real-time objects - neon sculpture and photo-murals with neon. I have always been fascinated with the juxtaposition of popular culture and high art, and it has been one of the main sources of subject matter for my

work - Picasso in neon, the piggy bank as a neon sculpture. We live in a media age that is ruled by popular culture, but popular culture can sometimes be shallow, hypocritical, and repetitious. Although on another level I love its trivialities and contradictions, and some of the best art that I have seen has been in the realm of popular culture (film, video, advertising). A work of art needs to transcend the mundaneness of much popular culture but keep the excitement of entertainment. Searching for that something extra is what attracted me to art that deals with simulations. Popular electronic media is all about simulation - the simulation of theater seems better than real life.

I also love being a pioneer, that sense of being early and at the limit of what is possible. And, today, what is possible is discovered through simulation, both in culture and in science. Phscolograms have given me the means to create and experiment with such simulations. No other system can give the user such a dramatic sense of three dimensions with such color intensity and yet have an image that is completely insubstantial. When you turn on the light switch, a phscologram suddenly comes into being with its dazzling color where before there was only a murky gray panel. And when you don't want to see it anymore, you can shut it off just as dramatically, just like switching channels or turning off the television set.

Being a pioneer means that you have to live with imperfection and failure. Everything new is still partially unformed, uncodified, uninhibited, but imperfect. Sometimes it's frustrating dealing with these flaws inherent in pioneering. But the pioneering aspect keeps me an active participant in this bizarre polygamous marriage of high art, garage art, and high technology.

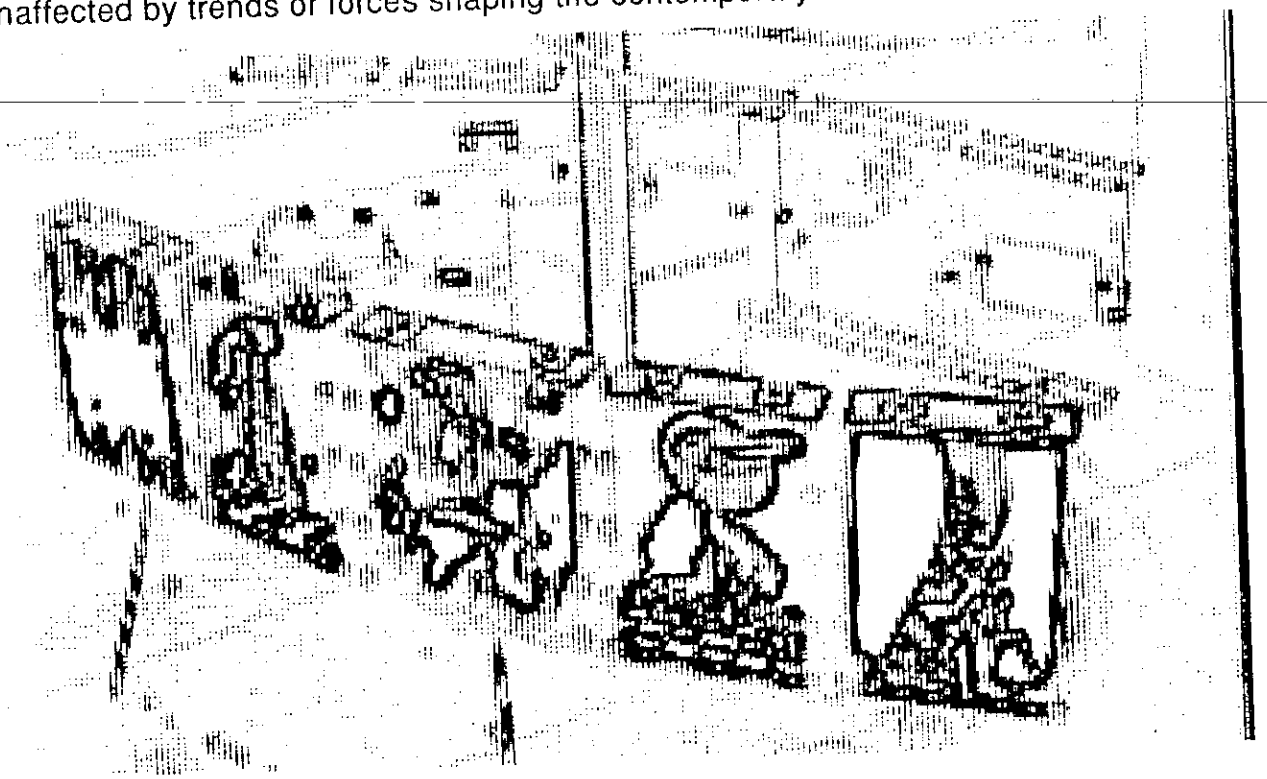
GINA UHLMANN: Working on *Phscologram 1983* was a complexity of emotions. The thrill of pioneering and contributing to art history, paying tribute to great artists and all that was involved in learning their histories, and the enlightenment of the collaborative effort.

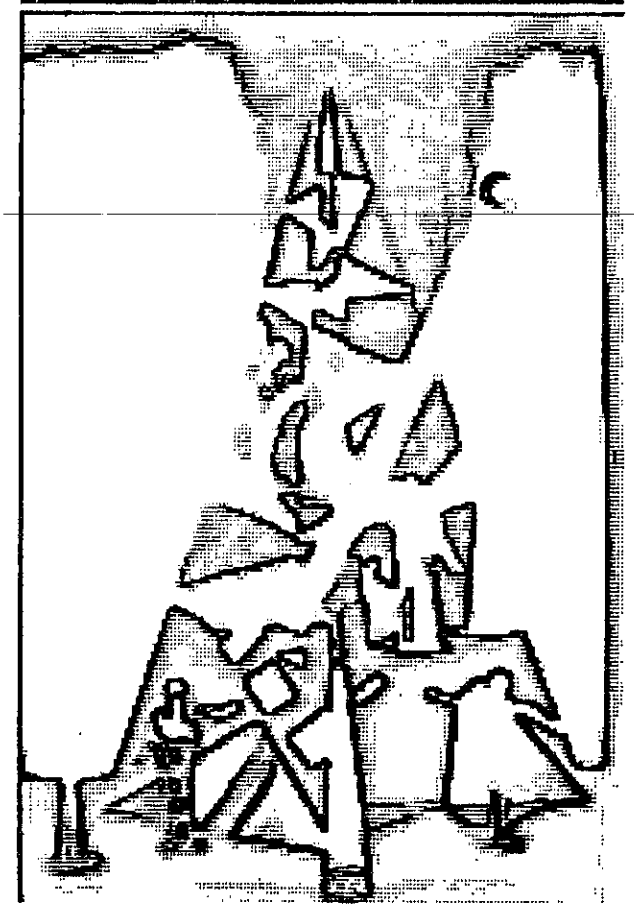
JIM ZANZI (Interview by LISA STONE): **(Art)^n** began in 1983 with a monumental piece, *Phscologram 1983*, a series of five panels incorporated within a sculptural tower. The panels are commemorative of various masters of the modern movement who had great influence in the areas of photography, sculpture, painting, and certain conceptual issues.

It has been the mission of sculpture through time to record and remember persons and events. Knowing how things are lost in time, one of our main concerns was to pay tribute to some of the most creative artists of the period. We worked to develop a process capable of creating a union between photography and sculpture which would have contemporary relevance while satisfying the traditional mission of sculpture - to be narrative and fulfilling. We were inspired by the Pioneer Space Probe, and were attempting to condense significant events of the modern movement and conceptually send it off into space and time.

Our primary concern was with Man Ray, who we have felt has not received due recognition, considering the scope of his work. He was to photography what Picasso was to painting, and was eventually able to bridge the gap between photography and the plastic arts, one of the challenges of **(Art)^n**.

The artists honored in *Phscologram 1983* were chosen for their individual contributions; however, the piece created a fraternity of **(Art)^n** by isolating individual forces which singularly changed the direction of art history, and combining them into a single cohesive statement. Included were Man Ray, Georgia O'Keeffe, Louise Nevelson, Marcel Duchamp, and a final composite panel dedicated to the outsider artist unaffected by trends or forces shaping the contemporary art world.





BIOGRAPHIES

Harold Allen was born 29 June, 1912, in Portland, Oregon, but grew up in Blackfoot Idaho. Graduating from high school in 1930 (the first year of the Depression), he worked for several years in the potato business and on hay and cattle ranches in Idaho and Wyoming before coming to Chicago, in 1937, to attend the School of the Art Institute of Chicago. He studied industrial design and photography, and during World War II served as an Army Air Force photographer in the United States, England, and France. After the war he spent two years helping revise the third edition of Helen Gardner's *Art Through the Ages.* In 1948 he began studying History of Art (on the G.I. Bill) at the University of Chicago and also began teaching photography at the School of the Art Institute, where he taught until 1960.

From 1960 to 1966 he worked part time for the Oriental Department of the Art Institute of Chicago, did research in art history, sold fuel oil (Sinclair Refining Company) and Oriental art (S. H. Mori Gallery), and took many photographs, serving two summers (1964, 1965) as official photographer for the Historic American Buildings Survey, Chicago Project. In 1966 he returned to the School of the Art Institute to teach photography and remained until he retired in 1977. In 1971 he was named Frederick Latimer Wells Professor at the school, and in 1972 the school published his book, *Father Ravalli's Missions*, photographs and text documenting two early Jesuit Indian mission churches in the Northwest.

Harold Allen's best and most abundant work has been in architectural photography. He has always worked with a press-type 4"x5" camera, beginning with a Speed Graphic and later using a Linhof Technika. His architectural photographs have been published in books, magazines, and encyclopedias, and his prints are in various museums and private collections.

Maxine D. Brown, Associate Director of the Electronic Visualization Laboratory (EVL) at the University of Illinois at Chicago, received her M.S.E. degree in Computer Science from the University of Pennsylvania. Ms. Brown was formerly Documentation Director at Digital Productions in Los Angeles, a member of the marketing communications and documentation departments at ISSCO in San Diego, and a software-development engineer for Hewlett-Packard in Cupertino.

Donna Cox is an Adjunct Professor at the National Center for Supercomputing Applications and teaches computer animation and photographics at the University of Il-

linois at Urbana-Champaign. Her computer art work has been shown in many exhibits in the last three years, including the Frick Art Museum, the Milwaukee Art Museum, the Bronx Museum, and the Museum of Science and Industry in Chicago. Her art work has been published in several publications, including *Time* magazine. Her article, "Using Supercomputers to Visualize Higher Dimensions: an Artist's Contribution to Science," will appear in *Leonardo* in 1988 and she will appear on PBS's "Infinite Voyage" series.

Thomas DeFanti, Associate Professor of Electrical Engineering and Computer Science at the University of Illinois at Chicago and Adjunct Professor at the NCSA, is co-founder and Co-Director of the Electronic Visualization Laboratory which brings together artists and scientists. He has been designing interactive graphics-based teaching machines since the early seventies, and, with Dan Sandin, is implementing "The Interactive Image," a state-of-the-art computer graphics exhibition at the Museum of Science and Industry, Chicago.

George Francis, Professor of Topology and Mathematics at the University of Illinois at Urbana-Champaign and Adjunct Professor at the NCSA, is a pioneer of descriptive topology and has published many articles regarding this topic. His recent book, *The Topological Picture Book*, is a tribute to his eclectic interest in art and mathematics.

Hudson is Director of Feature gallery and an artist.

Ray Idaszak recently graduated from the University of Illinois at Urbana-Champaign with a B.S. in Computer Science and Electrical Engineering. Known since high school for his extraordinary talents at computer graphics and computer science, he is a computer programming specialist at the NCSA and has been an active participant in both the scientific and artistic output at the NCSA.

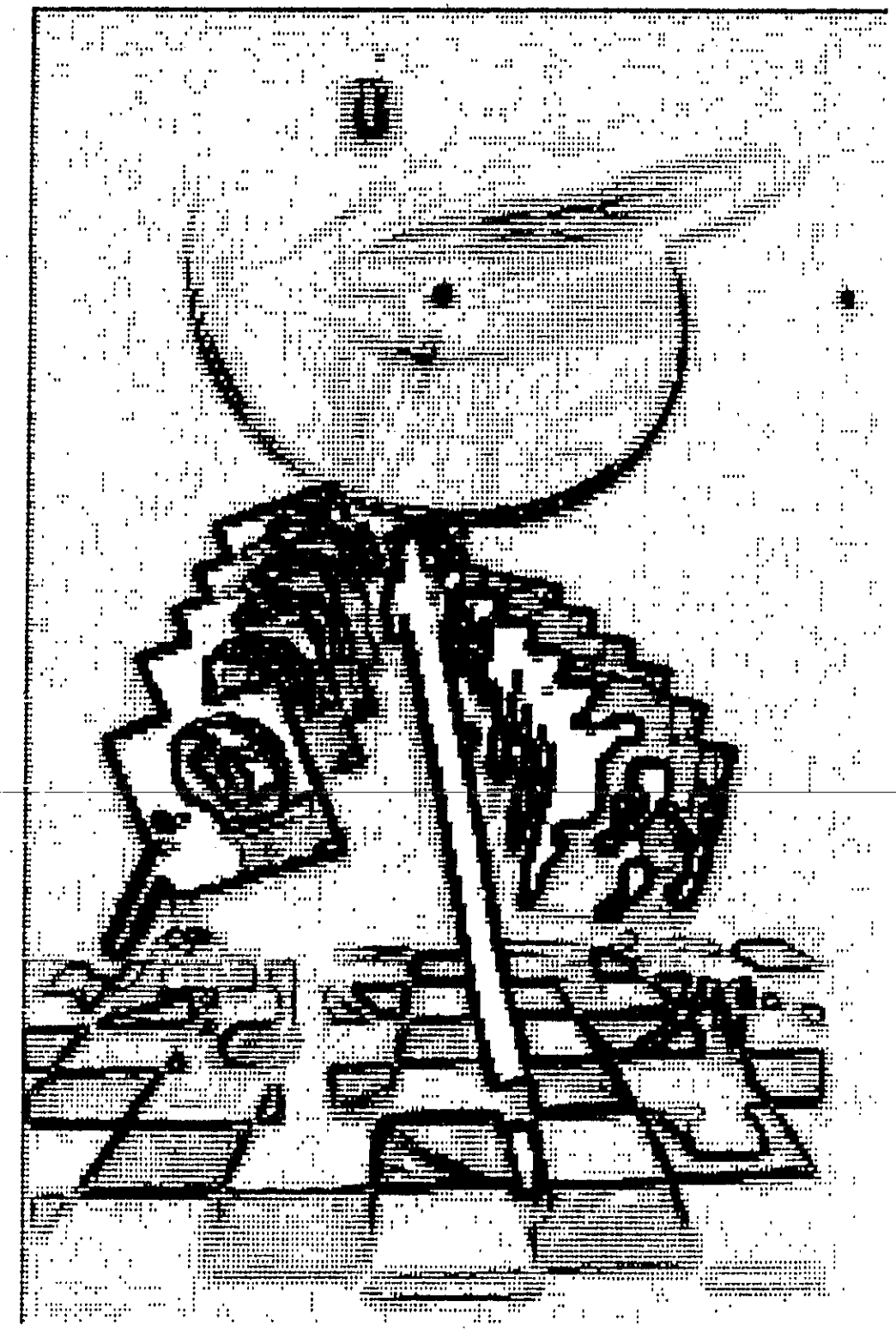
Randy Johnson, grandson of circus-banner painter Fred G. Johnson, graduated from the University of Illinois at Urbana-Champaign with an M.F.A. in sculpture. He has exhibited internationally, including Imagining Antarctica, Linz, Austria, 1986; Rated X, A Group Experience, Neikrug Gallery, New York City, 1987; Seeing is Believing, a traveling exhibition that has been at the Fort Wayne Museum of Art, the Palo Alto Junior Museum, and the Dayton Art Institute, and will travel to the Heckscher Museum, the Detroit Science Center, and the Maryland Academy of Sciences. He has also won awards from the International Personal Robot Congress, the University of Illinois at Urbana-Champaign, and the Maurice Spertus Museum of Judaica. Currently, he works with **(Art)^n** Laboratory as Director of Real-Time Objects.

Gary Justis, sculptor and experimentalist in the area of kinetics, has lived and worked in Chicago for over ten years. Works by Mr. Justis have been exhibited at the Whitney Museum of American Art at Philip Morris, New York; the Museum of Contemporary Art, Chicago; the New Museum of Contemporary Art, New York; the Art Institute of Chicago; and the CompassRose Gallery in Chicago, among others. Writings about his work have appeared in the *New Art Examiner, ARTFORUM, Art in America*, and *Art News* magazine. Mr. Justis is currently interested in experimentations in the "abstracted landscapes" inspired by the technology of Imagination.

Mark Resch graduated with an M.F.A. in video and sculpture from SAIC. He is Assistant Professor of Computer Art at Rensselaer Polytechnic Institute (RPI), Troy, New York, and Director of Video at **(Art)^n** Lab at IIT in Chicago. He has recently completed two lecture tours of the People's Republic of China and is currently developing the computer-art area of RPI's IEAR (Integrated Electronic Arts at Rensselaer) Studios.

Dan Sandin is a Professor of Art in the School of Art and Design at the University of Illinois at Chicago, an Adjunct Professor at the NCSA, and co-founder and Co-Director of the Electronic Visualization Laboratory. His early interest in computer graphics, video image processing, and interactive computing environments motivated his pioneering work in video synthesis and continues to direct his research efforts in the field of 3-D phscolography. He has exhibited world-wide and is the recipient of fellowships from the Rockefeller Foundation, the Guggenheim Foundation, and the National Endowment for the Arts. His work is included in the inaugural collection of video art at the Museum of Modern Art in New York.

Ellen Sandor, founder and Director of **(Art)^n** Laboratory at the Illinois Institute of Technology and a Research Associate at IIT, received her M.F.A. in sculpture from the School of the Art Institute of Chicago. She is also an Adjunct Artist/3-D Visualization at the NCSA at the University of Illinois at Urbana-Champaign. A pioneer in 3-D phscologram imaging, Ms. Sandor's work and that of **(Art)^n** Laboratory have been exhibited throughout the U.S., Europe, and Japan, including SIGGRAPH 1987 and 1985; The Non-Spiritual in Art. Abstract Painting 1985-????, Chicago, 1987; High Technology and Art 1986, Japan; Rated X, A Group Experience, Neikrug Gallery, New York City, 1987; and Seeing is Believing, a traveling exhibition that started at the Fort Wayne Museum of Art and will finish touring in 1989. **(Art)^n** work is represented by Feature, Chicago, and can also be seen, currently, at the Bronx and Everson museums in New York and the Museum of Science and Industry in Chicago.



Michel Seʹgard is an assistant professor at the Center for Advanced Studies in Art and Technology of the School of the Art Institute of Chicago. He is contributing editor to the *New Art Examiner*, and a member of the board of directors and past president of the Chicago New Art Association. He is a member of the Broadcast Advisory Committee of the Church Federation of Greater Chicago, for which he serves as art critic and does periodic television programs on the spiritual content of contemporary art.

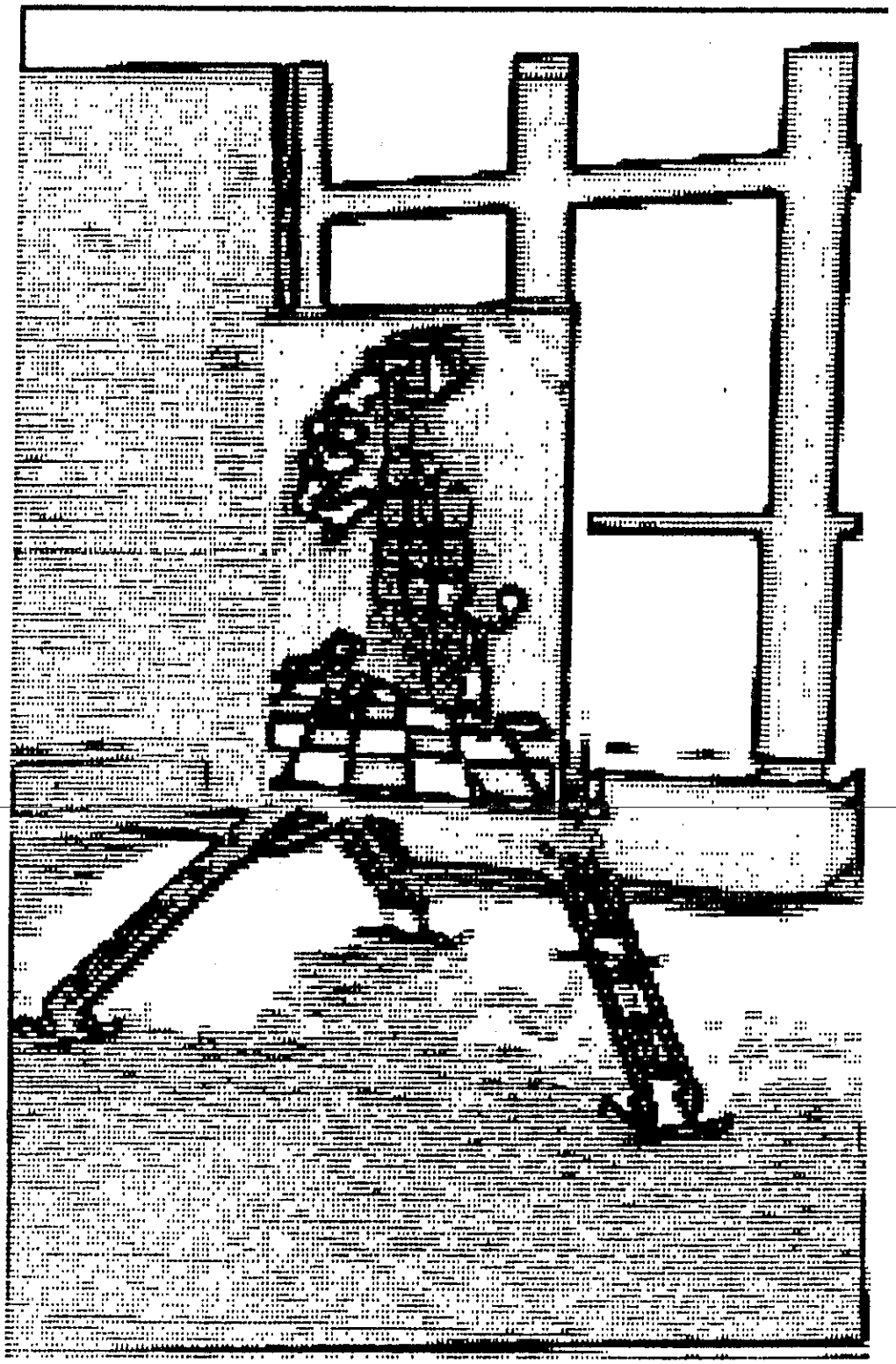
Larry Smarr, Professor of Physics and of Astronomy at the University of Illinois at Urbana-Champaign, and Director of the National Center for Supercomputing Applications, is an internationally recognized astrophysicist. He is a pioneer in the movement to obtain support for supercomputing power at U.S. universities to support basic scientific research. *Esquire* magazine named him one of the "Best of the New Generation, Men and Women under Forty Who are Changing America."

Joel Snyder is Chairman of the Committee on General Studies in the Humanities and Professor of Humanities at the University of Chicago. Dr. Snyder is an editor of *Critical Inquiry* and has written for *Studies in Visual Communication*. He is current editor of the *Oxford International Encyclopedia of Communications* and the *Cambridge University Studies in the History of Photography*.

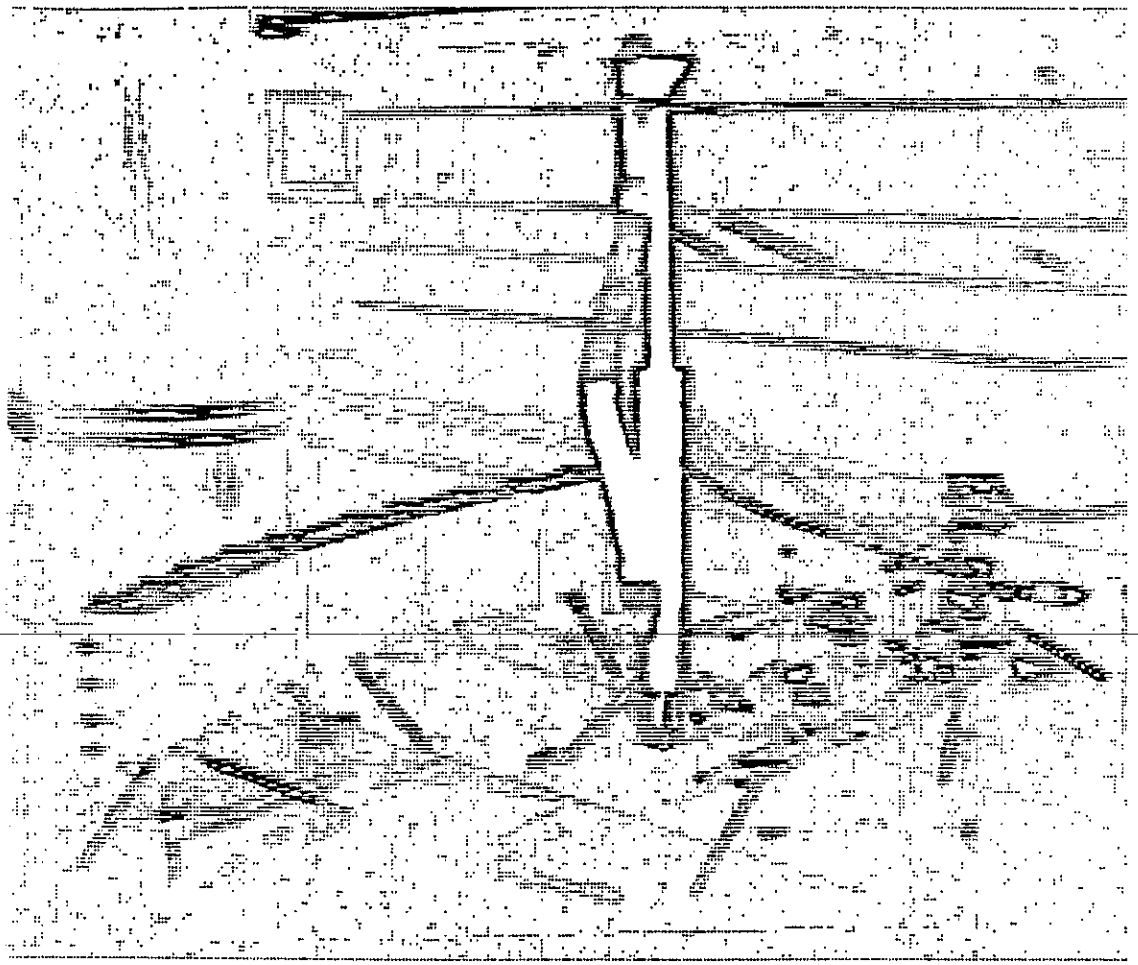
Lisa Stone has traveled throughout Wisconsin and Illinois in a continuing study of examples of art, architecture, and culture within the natural landscape. She has concurrently studied social history, literature, and cuisine. At present, she is Project Manager and Co-Director of Spin City Restorations, and Assistant Director of the Carl Hammer Gallery. During the summer she works in collaboration with Jim Zanzi teaching a class, through the School of the Art Institute of Chicago, which explores extraordinary examples of the built and natural landscape. She is a writer, photographer, and sculptor.

Gina Uhlmann is a professional fashion photographer working in Chicago. She received her B.A. in Studio Arts from the University of Colorado and is the recipient of a Gold Addy Award for her commercial work. Her work has been exhibited and published nationwide.

James Zanzi has been teaching sculpture at the School of the Art Institute of Chicago for the past 20 years. He has been responsible for introducing the early programs in Art and Technology and securing their place in the curriculum. A strong interest in photography and sculpture has lead Zanzi in many directions including an extensive exploration of the Midwestern landscape with regard to important architectural and sculptural statements often overlooked by more formal academicians. Zanzi



is currently Chairman of the Department of sculpture at the School of the Art Institute of Chicago where his energies are directed to the development of programs for graduate students. During the summer months he teaches a travel class, "The Artist in the Landscape," an exploration of extraordinary examples of the built and natural landscape of the upper Midwest. He is Director of History and Concepts for the **(Art)^n** Laboratory.



CREDITS

Phscolograms courtesy of Feature, Chicago.

(Phscologram is a trademark of **(Art)^n** Laboratory)

Front cover: detail from *Messiah*, 1987. **(Art)^n** artists: Randy Johnson, Dan Sandin, Ellen Sandor, Jim Zanzi, with special thanks to Dr. Roberta Glick and Karmi Weinzweig. Image processing by Dan Sandin using RT/1 software.

Back cover: **supercomputer phscolograms**, 1986, 1987. **(Art)^n** artists: Donna Cox, Tom DeFanti, George Francis, Ray Idaszak, Dan Sandin, Ellen Sandor, with special thanks to Larry Smarr. **(Art)^n** artists for **video nude phscolograms**, 1987: Mark Resch, Dan Sandin, Ellen Sandor, with special thanks to Raul Zaritsky and Gina Uhlmann. Line extraction by Dan Sandin using RT/1 software.

Page 3: *Nuclear Necrophilia*, 1987. **(Art)^n** artists: Randy Johnson, Ellen Sandor, Jim Zanzi, special thanks to Stephan Meyers, Dan Sandin, Tom DeFanti, and Richard Walski. Graphic: Randy Johnson using Mac Full Paint.

Page 6: *O'Keeffe II*, 1986. **(Art)^n** artists: Randy Johnson, Ellen Sandor. Edge detection filtering contrast enhancement by Howard Dreizen and Tom Grace using silicon video image processing.

Page 9: *Messiah*, 1987. Same credits as front cover except: graphic by Randy Johnson using Mac Full Paint. Real-time object (sculpture) by Randy Johnson.

Page 11: *World Wide Free Markets*, 1983. **(Art)^n** artists: Randy Johnson, Mark Resch, Ellen Sandor, Gina Uhlmann, and Jim Zanzi. Edge detection filtering contrast enhancement done by Howard Dreizen and Tom Grace using silicon video image processing.

Page 12: **(Art)^n** artists group portrait. Line extraction by Dan Sandin using RT/1 software.

Page 13: **(Art)^n** artists portraits. Line extraction by Dan Sandin using RT/1 software.

Page 18: *Phscologram 1983*. Same credits as page 11. Sculpture by Gary Justis.

Page 19 (left): *O'Keeffe I*, 1983. Same credits as page 11.

Page 19 (right): *Keeping Time with Fashion*, 1983. Same credits as page 11.

Page 23: *Man Ray 1983.* Same credits as page 11.

Page 25: *Battle to the Death at the Ice Palace*, 1983. Same credits as page 11 except: real-time object (sculpture) by Randy Johnson.

Page 26: *Phscologram 1983.* Same credits as page 11 except: sculpture by Gary Justis.

ACKNOWLEDGMENTS

Fermilab wishes to express deep gratitude to the following people for their involvement and assistance with the Phscologram exhibit:

The artists of the **(Art)**^{n} Laboratory and especially Randy Johnson for the real-time objects created for this exhibit.

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