TOOLBOX ILLUSTRATOR STUDIES

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Abstract:

TOOLBOX is a graphics program designed to explore the potential image-making capabilities of the computer-powered display medium. It consists of a coordinated set of graphic tools which provide a wide range of form construction options for use in testing machine illustration concepts. The TOOLBOX system is operated by means of a graphic keyboard which commands the various tool functions. The main body of this report documents two professional-level user studies which were conducted using the TOOLBOX system, and includes a description of user experiences, research conclusions drawn from the studies, and a comprehensive presentation of the artwork accomplished.

Key Words:

Toolbox, Illustrator, Graphics, Display

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The TOOLBOX project was originally undertaken to find out how to provide the Ginn text-editing system (Gypsy, Cypress, etc.) with some machine-based graphical capabilities. Following early experimentation with graphic tool programs that attempted to simulate conventional media (i.e., pencil, pen and ink, paint, etc.), it was decided to abandon medium-imitation in favor of medium-invention -- that is, to view the computer-powered display system as a new medium in itself, and to develop and explore its inherent capabilities and limitations as an addition to, rather than a replacement for real-world illustration practices.

This report will communicate the current research findings of the TOOLBOX project. Part I is a discussion of the **MACHINE ILLUSTRATOR**. Part II is a brief description of the **TOOLBOX SYSTEM**. Part III is an account of the **USER STUDIES** which were conducted. Part IV is a summary statement of **CONCLUSIONS** based on the study results. Part V presents three **PORTFOLIOS** of artworks done with the TOOLBOX system.

I - THE MACHINE ILLUSTRATOR

The professional graphic arts world is as compartmented into specialized roles as is any other conventional field. There are specialists in pencil drawing, pen and ink rendering, painting, airbrush, pasteup, mechanical drafting, etching, etc. Some illustrators concentrate their professional careers within one medium, and often within one style or subject matter. Others become skilled in a variety of areas. TOOLBOX is designed to explore graphic specialization within the computer-powered display medium. The underlying implication (and intention) of this approach is a new role in professional graphics: that of the illustrator who creates images with computer machine tools rather than conventional hand tools, in other words, a "machine illustrator".

Contrary to some popular beliefs, machine methods are not a new experience in the world of fine and applied arts. Machine technology is used in many art-related media, including photography, film, video, lithography, etching, letterpress, silkscreen, woodwork, welding, casting, weaving, plastics, pottery, jewelry, typesetting, glass, drafting, architecture, etc. The computer-powered display system is simply one more machine-based medium.

The major purpose of the TOOLBOX project is to develop the machine display medium as a new area of specialization for the illustrator, and to discover some basic insights about the possible tools, techniques, and image-making capabilities of this "machine illustrator".

II - THE TOOLBOX SYSTEM

System Description

TOOLBOX is a research device, not a product design. It is an integrated collection of diverse graphic tools which are easily accessible, and which taken together, offer a wide range of form construction options for application to machine illustrator studies. In effect, TOOLBOX is an active proving ground for future graphic system designs.

Five tool functions provide a basic graphical form vocabulary. A sixth tool enables typographical control. Each of these tools can be modified in its use by one or more of four sets of variables which can affect its color tone, line weight, grid spacing, and/or functional mode. In addition, two utility functions allow for fine-scale editing of form details, and for reset of the tool program. Typed file functions permit the saving and recalling of form "drawers" or entire picture areas. The display screen cursor is best controlled by a pen and tablet, but can also be controlled with a mouse. Except for drawer and picture files (which are typed on an alpha-numeric keyboard), all commands are enabled by a graphic keyboard, which shows all the tools and their variables, plus utilities. A photograph of the graphic keyboard appears on the following page.

Tool Functions

In summary, graphic keyboard commands enable the following functions:

DRAW - enables freehand line drawing.

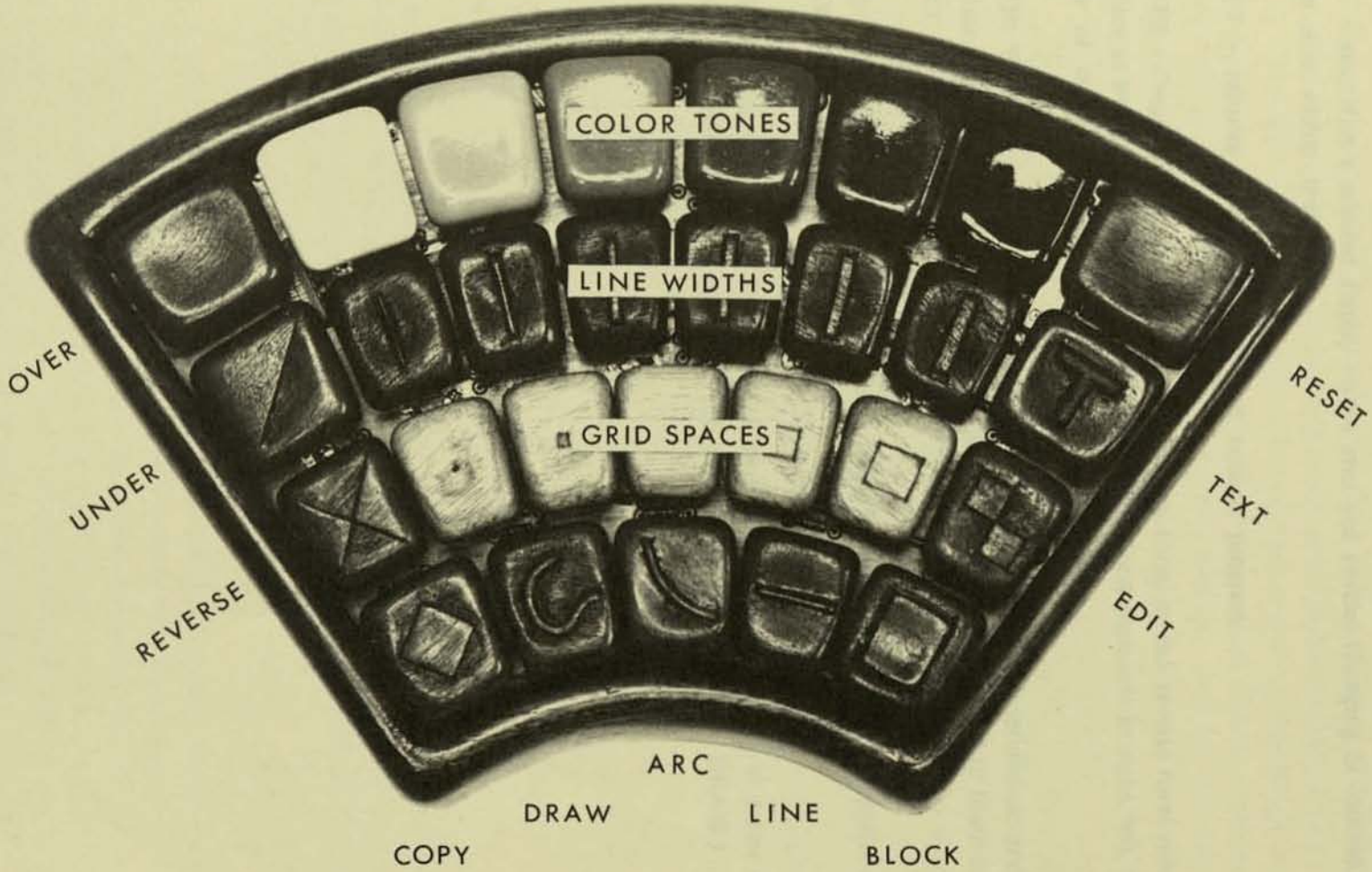
LINE - enables straight line construction between two selected points.

ARC - enables 90-degree arc construction between two selected points.

BLOCK - enables solid rectangles formed on selected upper left and lower right corner points.

COPY - enables continuous copying from a form source within a previously selected rectangular area.

GRAPHIC KEYBOARD



TEXT - copies from a linear text source.

EDIT - magnifies a selected display screen area and enables changing of individual screen dots within that area.

RESET - restores default variables and restarts program.

MODES - Create new form over or under existing form, or can reverse form color. (Applies to BLOCK and COPY. TEXT modes align text segments to right, left, or center of cursor.)

COLOR TONES - create form in black, white, or one of four intermediate grays. (Applies to all tools except DRAW, LINE, and ARC, which are limited to black and white.)

LINE WIDTHS - create linear form in one of six different widths. (Applies to DRAW, LINE, and ARC.)

GRID SPACES - Locate cursor-controlled form on the display screen in terms of one of five different grid modules. (Applies to all tools except DRAW.)

Preliminary Graphic Experiments

During the programming of the TOOLBOX system, and prior to user studies, a series of image-making experiments was conducted, both as active input to the evolving design of the system and as a preliminary test of its capabilities. The main purpose of these experiments was to explore the potentials of the machine tools for enabling a variety of graphic strategies for image design and execution. Some of these strategies resembled conventional graphic techniques; however, most of them turned out to be quite unique to the machine medium.

The pictures that grew out of these early experiments are reproduced as a portfolio in Part V of this report. They are included not as an exhibition of art, but rather as a demonstration of the range and depth of graphic language effects that can be had with TOOLBOX, and as a frame of reference for the user study images represented in the other two portfolios.

As a result of this preliminary testing, it was decided that TOOLBOX was both stable and capable enough for meaningful user studies.

III - USER STUDIES

Method of Approach

In order to take a practical step toward investigating the concept of the machine illustrator, two user studies were conducted. Each study employed the services of a professional graphic artist for a period of five days. The studies involved task assignments, as follows:

Study 1

Exploration of computer-based tools as a medium for personal image-making. Here, the motive was to push TOOLBOX to its graphical limits, to assess not only its own imaging capability, but also that of the display screen system. In this case, creative imagination was more important than constrained tasks in discovering the widest range of graphic interactions and formations possible within the system. Howard Foote was the artist chosen for Study 1. Howard is both a practicing artist and a college art teacher. He has many years of experience in a variety of

traditional media, although most of this work has been concentrated in the areas of etching and stone lithography. He holds a bachelor's degree from the San Francisco Art Institute, and a master's degree from Stanford University.

Study 2

A conventional illustration project, in which the practical constraints of client needs, economy, relation of pictures to text materials, etc., were factors. The preparation of illustrations for learning research project books, intended for actual use by children, provided a practical occasion for this study. Jane Oka was the artist chosen for Study 2. Jane is a professsional illustrator with many years' experience in the publication world, particularly in the area of children's book illustration. Her work has appeared in a number of well-known periodicals, as well as in several standard textbooks. Jane's accustomed media are tempera and gouache. She holds a bachelor's degree from the San Francisco Art Institute.

Neither Howard nor Jane had ever worked on a computer terminal before this time.

Research Questions

Obviously, many interesting graphics research questions could have been addressed in the course of these studies. In order to achieve some basic insights within the limits of a manageable user project the following questions were explored:

1. What does the illustrator-user personally feel about the machine, and its components?
2. Is TOOLBOX professionally useful in the context of practical illustration tasks?
3. Can a specific communicative aim be effectively conveyed through a TOOLBOX image?
4. What are the specific graphic advantages of TOOLBOX over related conventional media?
5. What are the specific graphic disadvantages of TOOLBOX in comparison with conventional media?

6. What kinds of execution techniques maximize the value of the various machine tools?

7. Where does the illustrator encounter recurrent problems in (TOOLBOX) graphic execution?

8. Which tools are used most, and for what graphic purposes?

9. Is the command and control system compatible with the habits of a graphics specialist?

10. How clearly do the command symbols and control signals operate as visual cues?

11. How hard is it to learn how to use TOOLBOX efficiently?

12. What other kinds of tools might a graphics user want?

Answers to these questions were sought through observation of the artists' work processes, personal interviews, and examination of the artwork produced. The information presented here is necessarily edited or generalized, for reasons of clarity and economy. Complete authors' notes, tape recordings, and disk picture files are available to anyone who is interested.

General Observations

Each artist spent a total of 40 hours time on this project, between March 9 and April 15, 1976. The distribution of time for both was roughly: 2 hours initial instruction, 35 hours of illustration, and 3 hours total interview time. The activities and experiences of the artists were observed and recorded by the authors. General observations which applied more or less to both artists are as follows:

1. It took approximately 2 hours to learn TOOLBOX; however, some review of tool operations continued to be necessary throughout the first day.

2. After the first day, no help was required to start the machine (with disk) or to do artwork.

3. Work periods of 4 to 6 hours were tolerable; no more than ordinary illustration fatigue was reported.

4. The mouse was used during the first 2 days, and proved to be a poor form-control device. It was replaced with a pen and tablet, which greatly enhanced the accuracy of the work. (However, faulty tablet surfaces continued to cause some difficulty in manual control.)

5. The black cursor was frequently lost within black form areas on the screen.

6. The speed of form execution by the program was reported as adequate to fast (and occasionally too fast).

7. Tool commands on the graphic keyboard were easily learned and remembered.

8. DRAW, COPY, and EDIT were well understood, and were the most frequently used tools.

9. The DRAW tool could not be controlled well enough for "quality" drawing purposes. Clean organic line form was difficult, if not impossible to achieve. This also made conventional design sketching somewhat unmanageable, and both artists eventually resorted to area build-ups (tonal/textural massing, using the COPY tool) as a graphic design strategy.

10. COPY and BLOCK modes (over, under, reverse) were frequently misunderstood during the first day or two. However, all were used extensively after the second day.

11. LINE, BLOCK and ARC were the least used tools. This was partially due to the non-geometrical subject matter that both artists tended to favor.

12. ARC was extremely difficult to operate, largely due to the inadequate relation of visual cues to resulting form.

13. There was some initial difficulty in selecting BLOCK rectangles with the upper-left/lower-right corner procedure. This problem disappeared by the third day.

14. The RESET function was used regularly to clear the drawer area for new COPY form sources.

15. LINE WIDTH and COLOR TONE were well-understood and used extensively without problem.

16. The GRID SPACE function seemed to be only vaguely understood, and was used only rarely.

17. Both artists concentrated their efforts on purely graphical problems. Consequently, the TEXT tool was never used.

18. DRAWER and PICTURE filing procedures were easily managed; however, on one occasion, a picture file was lost by mistyping "save" instead of "show". A name safeguarding function could have prevented this loss.

19. The graphic keyboard appeared to be manually convenient. No hardware problems occurred while it was being used.

20. During the period of the artists' work, no breakdowns were experienced in the TOOLBOX software system.

Observations which applied separately to each artist are presented in the following two sections, along with interviews and picture evaluations.

Study 1: Howard Foote

The following is a brief summary of Howards' personal interaction with the TOOLBOX system during the first three days of his work, as it was observed and noted by the authors.

1. Howard was enthusiastic, curious, and eager to explore the medium from the time of his first encounter with the TOOLBOX system. This positive attitude increased as time progressed.

2. He produced 4 pictures on the first day with relative ease.

3. His personal concentration was intense. When working he would often not hear questions addressed to him.

8. Picture work on the system begins by "energizing" the entire display surface (with grays and textures).

A final tape-recorded interview with Howard was conducted on the fifth day of his work. The following is an edited transcript of that tape:

Q. Keyboard, tablet, (tablet controller) box, computer...what do you think about all that stuff?

A. I just accept it all. The computer is still a great mystery to me. Sometimes I am aware of the tablet controller.

Q. The noise of the tablet controller doesn't bother you, does it?

A. No. I have no fantasy about what is going on with the machine.

Q. Did you have any trouble dealing with the equipment, like loading disks, etc?

A. No, I just do things from memory.

Q. How easily can you illustrate something that another (person) wants?

A. I think I could do it quite easily...it's a new thing to me. It seems as though it would be as easy as with any other medium.

Q. How easily can you get what you personally want...your kinds of images?

A. Not quite as easily as with other media...like 90 percent. Still, there is a little detail that is hard to get. Just lacks a little bit of control. The line was still jumping because of the tablet. Under pressure that might be really disturbing.

Q. In what ways is the machine system better than other media?

A. You can sit down and just start right in. No concern about what paper, etc. Far less work than working in a physical medium like lithography or etching. You can see the result immediately, with a plate there is a time period before you can see the result.

Q. How about speed?

A. It's faster by anywhere between a half to a third of the time. With paper it takes so long just to establish the grays. It is harder to please myself on paper in the same time period.

Q. What is it that makes it seem so much faster?

A. The depth of the screen...the patterns of gray...I am always after depth, and there is depth already. That can be established so fast.

Q. In what ways is the system worse than conventional media?

A. The size of the screen. I don't know of any (other) limitations.

Q. How about the drawing tool?

A. That could be smoother. I notice that I am pressing down with the tablet. Maybe it is the scratching that is irritating.

Q. Did your control over the freehand (DRAW) tool improve with time?

A. It's easier and it gets me into the drawing faster to lay down a texture or tone.

Q. (What about) starting the picture with line versus texture?

A. I think that is a personal thing rather than characteristic of this medium.

Q. What personal techniques did you develop and use the most?

A. White over a gray was important to everything that I did. I don't feel that I invented any techniques. Creating the brushes. The texture pulsates...the whole image area is in a state of flux. It leaves you conscious of the whole surface.

Q. What problems did you encounter?

A. The problems are eliminated by the speed. Mistakes are easy to fix. I was confused sometimes by the mode keys. No big problems. Trying to put

the cursor where you wanted it was a source of frustration. Fishing around on the screen to get the cursor where I want it. The (tablet) and the screen don't correspond. The middle of the (tablet) is not the middle of the screen when I lay the pen down. The (pen) cord gets in my way sometimes.

Q. Which tools did you use the most and for what purposes?

A. I used every thickness of line. White lines were not as erratic as the black ones. Heavy white lines were easier to use...they didn't cause disturbing things to happen. I used the drawing tool...the select and copy tools. And then the mode keys.

Q. How important was the copy tool?

A. It was very important...(a long discussion about speed control).

Q. Would it be useful to control the speed of the copy tool?

A. It would be very helpful...sometimes it is too fast.

Q. Was the graphic keyboard easy to use?

A. No special problems.

Q. How about the pen and tablet?

A. The bubbly surface (was a problem).

Q. How about the screen symbols (in the lower left-hand corner)...did you find the symbols useful?

A. For the most part they were easy to understand...I always found myself checking...it was hard to get used to that infringement on the image, but eventually I got so that I didn't drop the image down that far.

Q. Which (symbols) were the hardest to identify?

A. The magnify and the box (BLOCK) were the hardest to remember. I am still not familiar with the gridding...I didn't use them because I was

satisfied with what I had...I couldn't make the arc go correctly...I used the straight line some...like to make a frame. I used the block for solid block and for reversing...that is really neat.

Q. How hard was it to learn how to use the system?

A. It wasn't nearly as hard as I thought it would be...I thought it would be difficult to remember.

Q. What kind of tool would you like to have that is not here?

A. It's hard to say...maybe hooking directly into my brain and just thinking images. No, I can't think of anything...oh...a tool that would draw a circle.

Q. What would you use that for?

A. To draw the disk (which he drew freehand in one of his pictures)...oh, that is in perspective so it would not really be useful. That would not be as useful as I thought.

By the end of the fifth day, Howard had completed a total of 23 pictures, at an average of one and one-half hours per picture. Sixteen of those pictures are reproduced as a portfolio in Part V of this report.

The overall quality of Howard's work speaks for itself. What may not be immediately evident is that the scope of his work traversed several historically well-known "schools" of image-making - from Renaissance classicism and nineteenth century naturalism on one end of the spectrum, to modern impressionism and expressionism on the other. His form vocabulary was wide, and included a rich use of line, shape, texture, and tonal value. His texturing technique, in particular, created unique graphic effects uncommon to other media. He was able to represent his subjects with a remarkable loyalty to physical realities when he wanted to, and at the same time seemed able to maintain a flexible control over compositional features. Geometrical forms and exact technical mastery of fine detail seemed to be the only major areas of pictorial interest that he did not choose to deal with. Howard produced a set of pictures which are artistically sophisticated by any standards, and which compete favorably with artwork produced in any conventional medium.

Study 2: Jane Oka

Jane was first introduced to her client, who presented her with the specifications for the learning research illustration project. She then began the project, using TOOLBOX.

The following is a brief summary of Jane's personal interaction with the TOOLBOX system during the first three days of her work, as it was observed and noted by the authors.

1. Jane was initially interested and willing to work with the TOOLBOX system. When she found, however, that the machine would not accommodate her work habits, her attitude became mildly negative.

2. She practiced on the first day, producing no pictures.

3. Her personal concentration fluctuated from high to low, usually as a result of succeeding or failing at an intended graphic operation.

4. She shied away from random exploration of some of the machine tools, and required frequent hints to develop graphic strategies.

5. The initial effects of a linear approach to image-making were crude. She continued to persist with the DRAW tool despite the fact that she could not create the kind of sophisticated curved line quality that she was accustomed to with conventional media.

6. During the third day she was asked to shift her technique from line structuring to area build-up, a move which resulted in a fair improvement in the general character of her imagery.

An informal interview with Jane on her third day produced the following interpreted comments on the TOOLBOX machine system:

1. She experienced "incomplete discovery" of the full range of TOOLBOX capabilities.

2. The system "takes longer" than paint/paper media, due to form control problems.

3. Line work is "harder" than in conventional media.

4. Textures and large area forms are "easier" than in conventional media.

5. Changes and corrections in the picture are "easier and cleaner" than in conventional media.

6. There is a problem of "not seeing" pen-to-form creation (separation of pen surface and display image).

7. For practical professional use, the system needs a "new illustrator attitude", "a larger screen", half-bits (higher screen resolution), a "non-flickering" cursor, and an elimination of the pen cord.

8. "Going behind black" (under mode) is useful.

9. "Black cursor on black dot" (EDIT tool) is a problem.

A final tape-recorded interview with Jane was conducted on the fifth day of her work. The following is an edited transcript of that tape:

Q. When you sit down and use this, what do you think these various boxes (tablet controller, etc.) do?

A. I don't know at all.

Q. What do you imagine?

A. That is a difficult question to answer. I usually block those things out. The pen is the important thing. Although it doesn't do the same thing as a pen on paper, it is my tool. I don't see anything else as being relevant except for perhaps this (the graphic keyboard) and the typewriter because it saves and calls back. As far as this relationship (is concerned) I don't think about that.

Q. What happens between the tools and the screen?

A. The pen draws. I guess...it just calls up dots...

Q. Those disk cassettes...what do you think about that?

A. It's like a phonograph disk with a needle that moves back and forth. The

project best.

Q. In what ways is the TOOLBOX program better than conventional media, and in what ways was it worse?

A. Better in that you can work on the illustration as long as you like. Erase and change is easy. Textures and patterns are better. Very difficult to create and repeat the same pattern in conventional media...the problem is the line. The mouse is awful and the tablet buckles and it is slow. The ink flows out in a continuous line. It makes me continue the line rather than lifting the pen. Getting used to the speed of it...I can visualize the drawing on the paper before I begin drawing...on the screen you can't. It must be the detachment that (occurs because) the drawing appears somewhere else other than the end of your pen. I think that you have better control with the pen and the surface on the same plane simply because you are used to it. Although, different skills could be developed. I seemed to improve over time.

Q. What kind of personal techniques did you find yourself developing while you were using the (machine) tools?

A. I put the background in first, which I usually do not do. And working back and forth between the background and the foreground (area build-up).

Q. Why?

A. Probably because the foreground shape can be altered easily. Also, putting the background in gives you a surface to work on, so that you can find your forms.

Q. How did you get the background in?

A. I could visualize better with the background in.

Q. Why?

A. Well, with the line you are carving against a surface which I don't do on paper. I feel as though I am carving along an edge...like cutting the form out, which is completely different from what I am used to. Once I put

the background in I could begin to see the shape. And I could easily change the shape...like building up on it. It was an advantage to put textures in back of things without destroying the subject. The ability to make a paintbrush in any shape and size that you like.

Q. What were the recurring problems?

A. Control. That was the main thing. And I guess the separation of the pen and the actual drawing. But that is minor in comparison with the control.

Q. What do you feel about it as a drawing medium?

A. It isn't very good.

Q. Which tools did you use the most?

A. (COPY) and the line (DRAW). I used the brush (COPY) for shape and textures and the line for definite shape and drawing shape. The bit editor is good. I didn't use the LINE and ARC. I used the BLOCK to take out areas I didn't like. I didn't use the GRID.

Q. Was the graphic keyboard easy to use?

A. Yes.

Q. What about the symbols at the bottom of the screen?

A. I had no trouble with them.

Q. Do you need the symbol of the tool in the lower left corner?

A. Oh, I need it sometimes because I push the wrong button.

Q. What about the size of the symbol?

A. It could be smaller by about half, but absolutely necessary.

Q. How hard was it to learn the TOOLBOX program?

A. About three hours. That first afternoon was the learning period. For the

simple tools at least. But even after a week there were a lot of things I haven't used.

Q. What would you have explored?

A. I don't know. I saw you do some things but I don't know where to find them. Some more demonstrations would have helped. This week has been about the basics.

Q. Would you really want to go on using this?

A. I think it would still be interesting to pursue.

Q. Do you think it is professionally useful?

A. I think it is still in the experimental stage. I don't think the art is good enough for reproduction because the resolution is too low. Half again smaller would be O.K. to get some fine lines.

Q. What about reducing the image with a camera setting of 50 percent?

A. It would be exactly what I was saying before.

Q. How would you feel about working double size?

A. Oh, that's how I normally work.

Q. If you were going to continue with this, what other tools would you like to have?

A. A thick-thin line depending on pressure. Enlarge and reduce. And a tool to move. I don't do that often, but once I lost a picture because it was too low and I couldn't move it.

Jane's perception of the client expectations was apparently unclear during most of the project. While she did succeed in producing a variety of illustrations appropriate for a child audience, she was not successful in satisfying the particular client needs (which were modest). By the end of the fifth day, she had completed a total of 14 full-screen pictures, at an average of 2 1/2 hours per picture. Twelve of these pictures are reproduced as a portfolio in Part V of this report.

Those who have seen the excellent published illustration work that Jane has created in other media will be quick to recognize the loss of quality her work suffered in this project. While the decorative elegance of her style is still evident in the design of many of her pictures, their ragged execution seriously weakens their visual impact. This problem reflects the inability of the TOOLBOX system to produce the kind of graceful organic line quality upon which Jane's style depended. Her work did not deal with complex pictorial ideas, but this was due to her expressed considerations for the child audience for which the pictures were intended. Jane's pictures could be considered successful (and quite useful) from the viewpoint of intermediate illustration design; that is, as "comprehensives" which are traditionally submitted to publishers for critique prior to the execution of final artwork. As finished artwork, however, they would not be acceptable.

IV. CONCLUSIONS

On the basis of the preceding studies and the following illustrations, we present the following research conclusions:

1. *The idea of a machine illustrator specialist is a realistic concept.* Howard Foote's successful experience with TOOLBOX confirms the expectations which were suggested by the early graphic experiments with the system: namely, that the machine medium has an enormous range and depth of graphic language capabilities which are peculiar to its own nature. If handled with skill, the medium can be used to create professional-level imagery. Howard's ability to transfer his etching/lithographic skills into the new medium was probably a factor in his success.

2. *The machine medium will not serve all graphic needs.* Jane Oka's mediocre experience with TOOLBOX raises serious doubts about the capability of the machine medium to effectively replace certain traditional media, such as paint, etc. In Jane's case, her professional style was so identified with the paint medium that she could not (or would not) do her job effectively on the machine. From a professional point of view, a particular medium (or a particular illustrator, for that matter) is selected in order to get a particular kind of job done. When the machine medium fits that job, it can be used. When it doesn't, it can't.

3. *Machine illustration can meet market standards.* A selection of TOOLBOX pictures was recently reviewed by Ginn Publishing Company, and was evaluated as publication-quality illustration. At Ginn, the minimum price for a one-page black and white illustration is $65.00. Both Howard and Jane receive a middle-range fee of $25.00 per hour for their services. At that rate, the pictures Howard did in this project cost $43.48 each, or $21.52 under the Ginn price. The pictures Jane did, adjusted for full-page content, cost $71.42 each, or $6.42 over the Ginn price, still within the market ballpark. While this evidence is by no means decisive, it does indicate that machine illustration has the potential for meeting market standards not only for quality, but for price as well.

4. *TOOLBOX is not an ideal system for professional use.* While it is clear from the user studies that TOOLBOX currently operates with some measure of effectiveness, it is equally clear that the system lacks the simplicity, balance, and precision that a good illustration machine should have. It is, in fact, no more than it was intended to be: a research tool. Certain functional concepts have been proven to work well, in the research context. In the professional context, however, no illustrator in his right mind would depend upon this system for his livelihood. Insights from this experience would be best used as criteria for a better illustration system design.

V. PORTFOLIOS

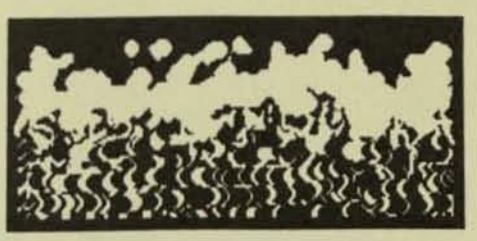
The final part of this report presents three portfolios of TOOLBOX images. They were photographed directly from the display screen, and reproduced full-size using offset lithography. The pictures are arranged in chronological order.

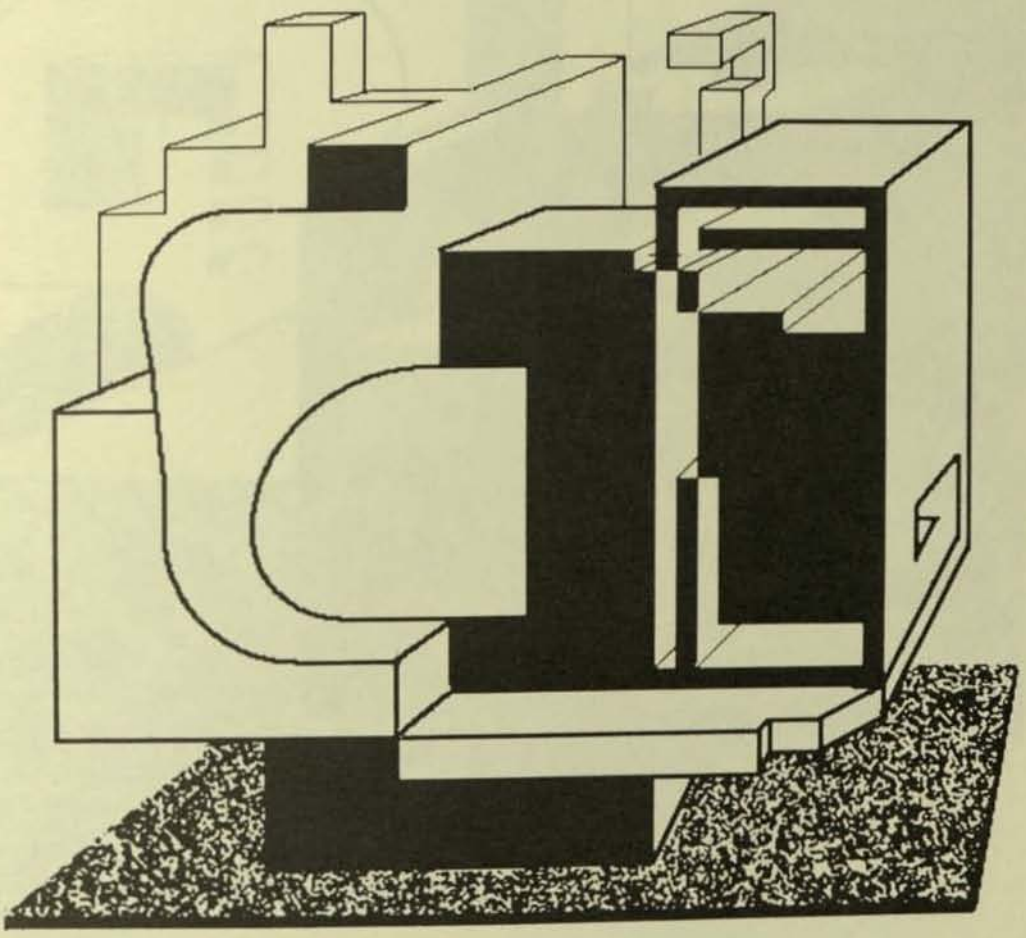
The first portfolio contains a selection of the experimental images referred to in Part II. As mentioned before, these images merely represent a preliminary exploration of graphic vocabularies and strategies possible within the TOOLBOX system.

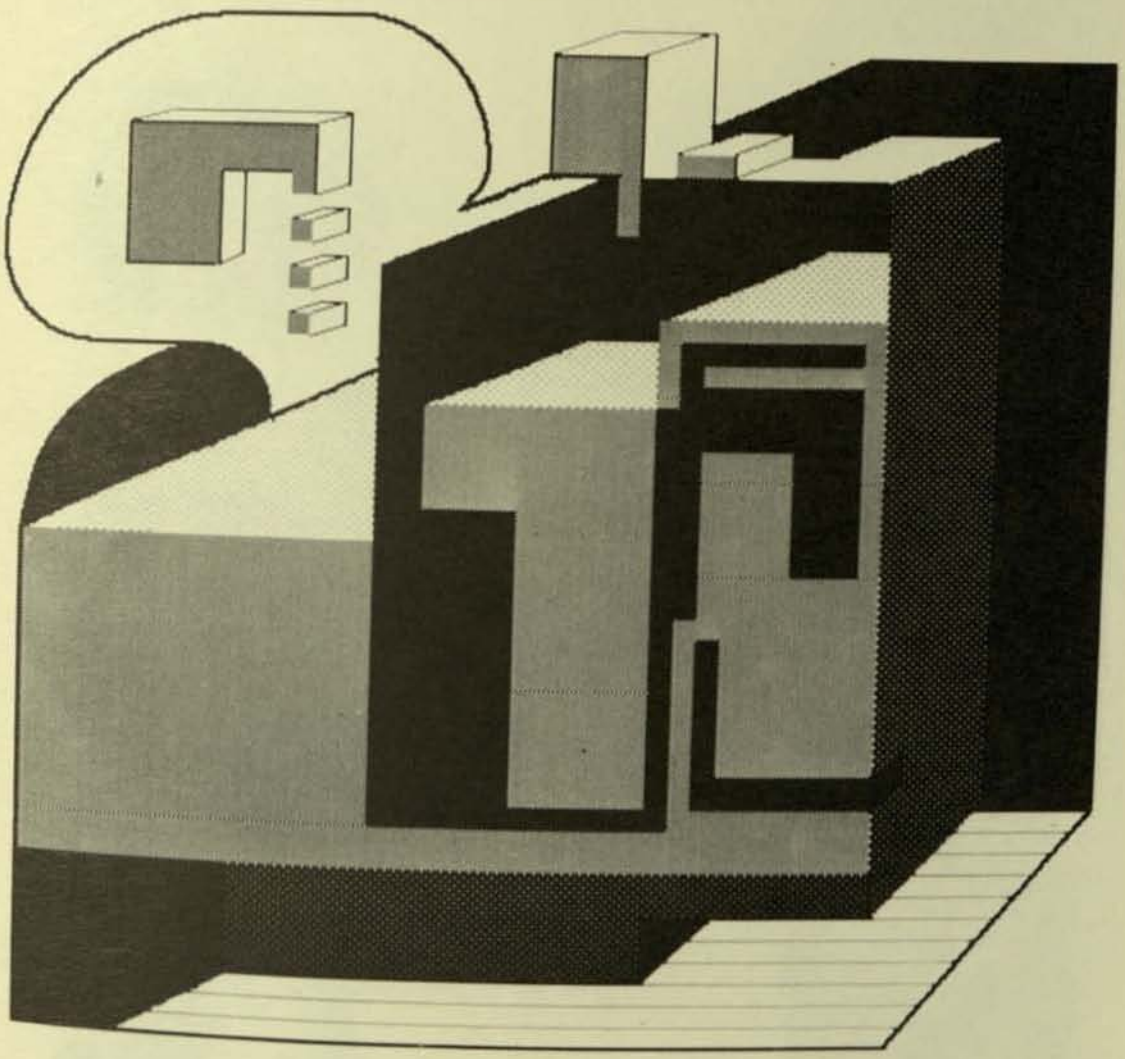
The second portfolio contains 16 of the 23 pictures designed and executed by Howard Foote. Their general intention is to explore possibilities for representational imagery, with a specific emphasis on human subject matter.

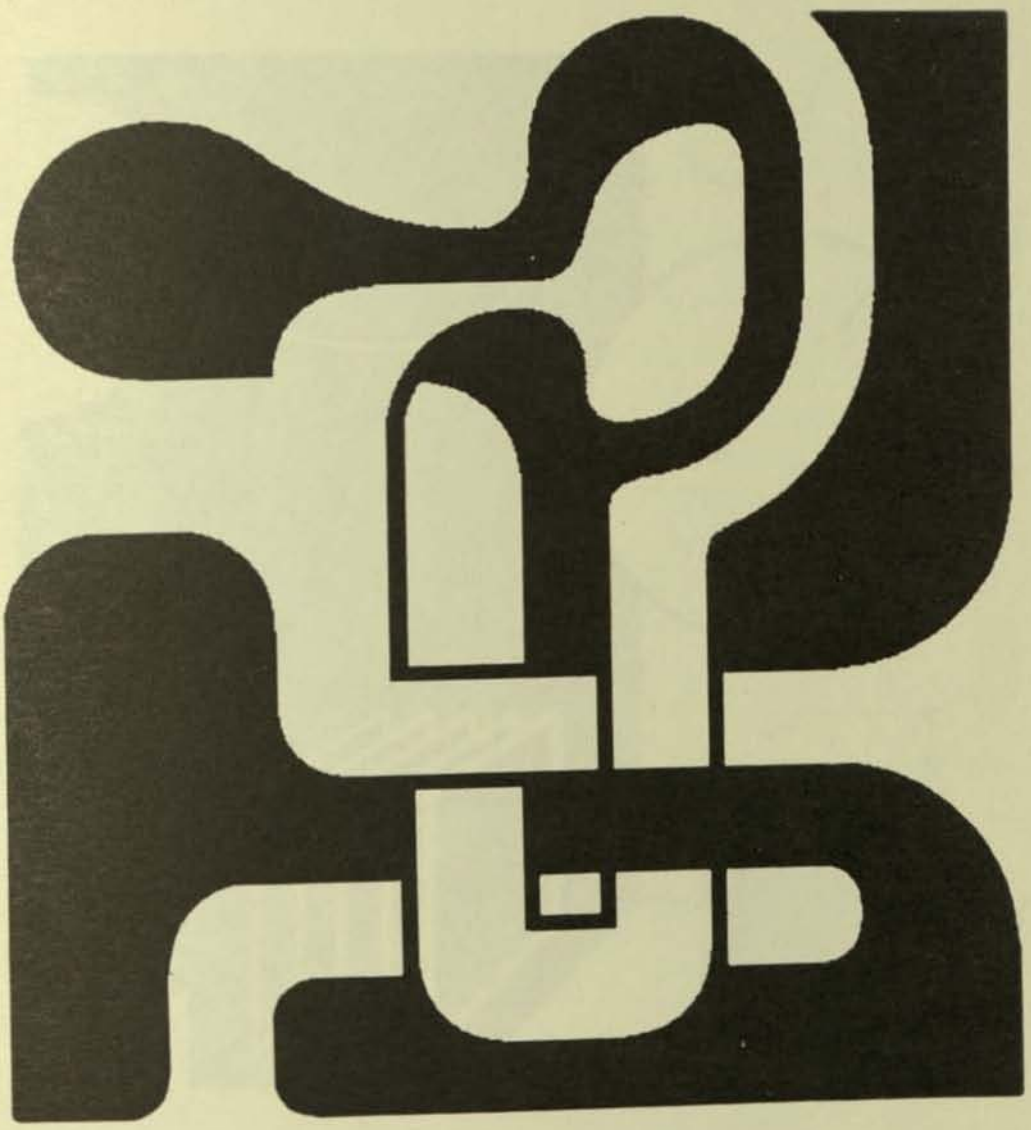
The third portfolio contains 12 of the 14 pictures designed and executed by Jane Oka. Their

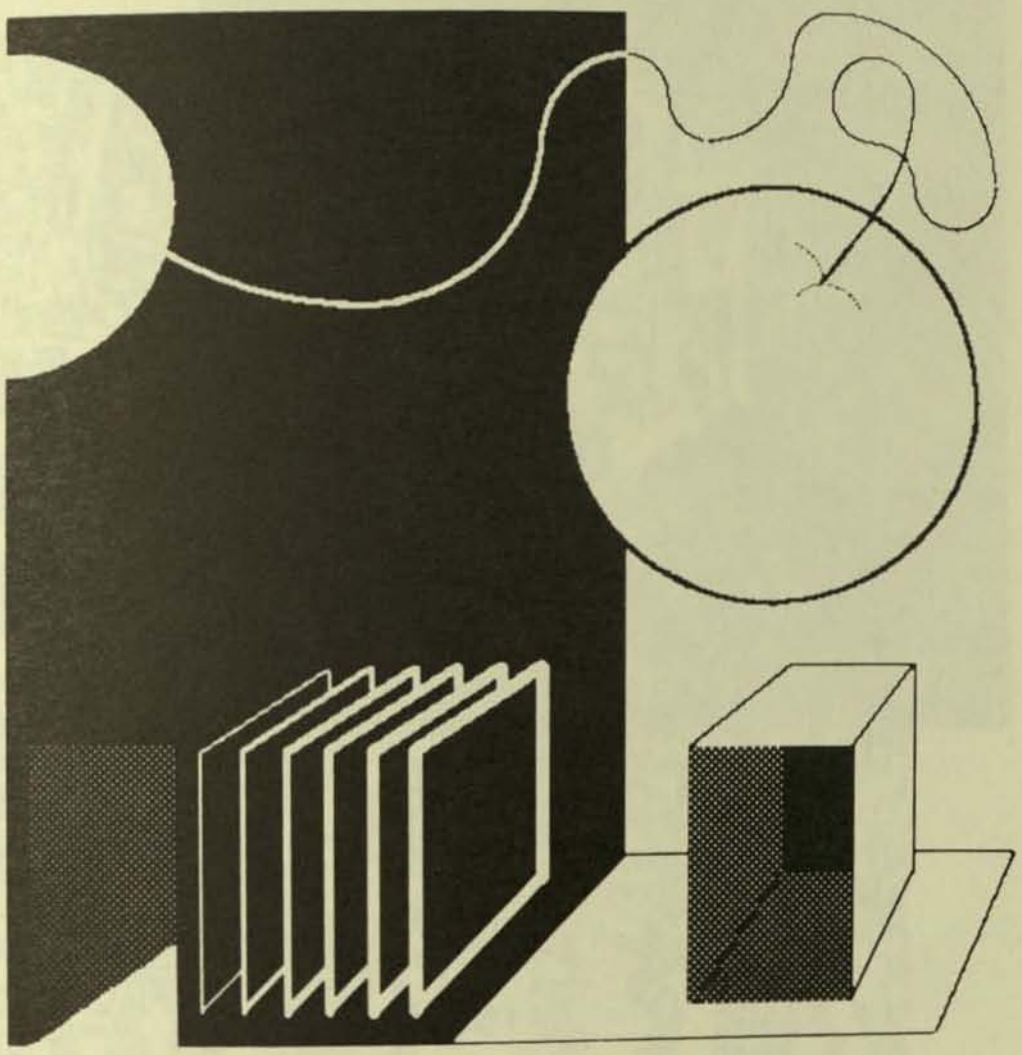
intention is to illustrate a variety of subjects for a child audience.

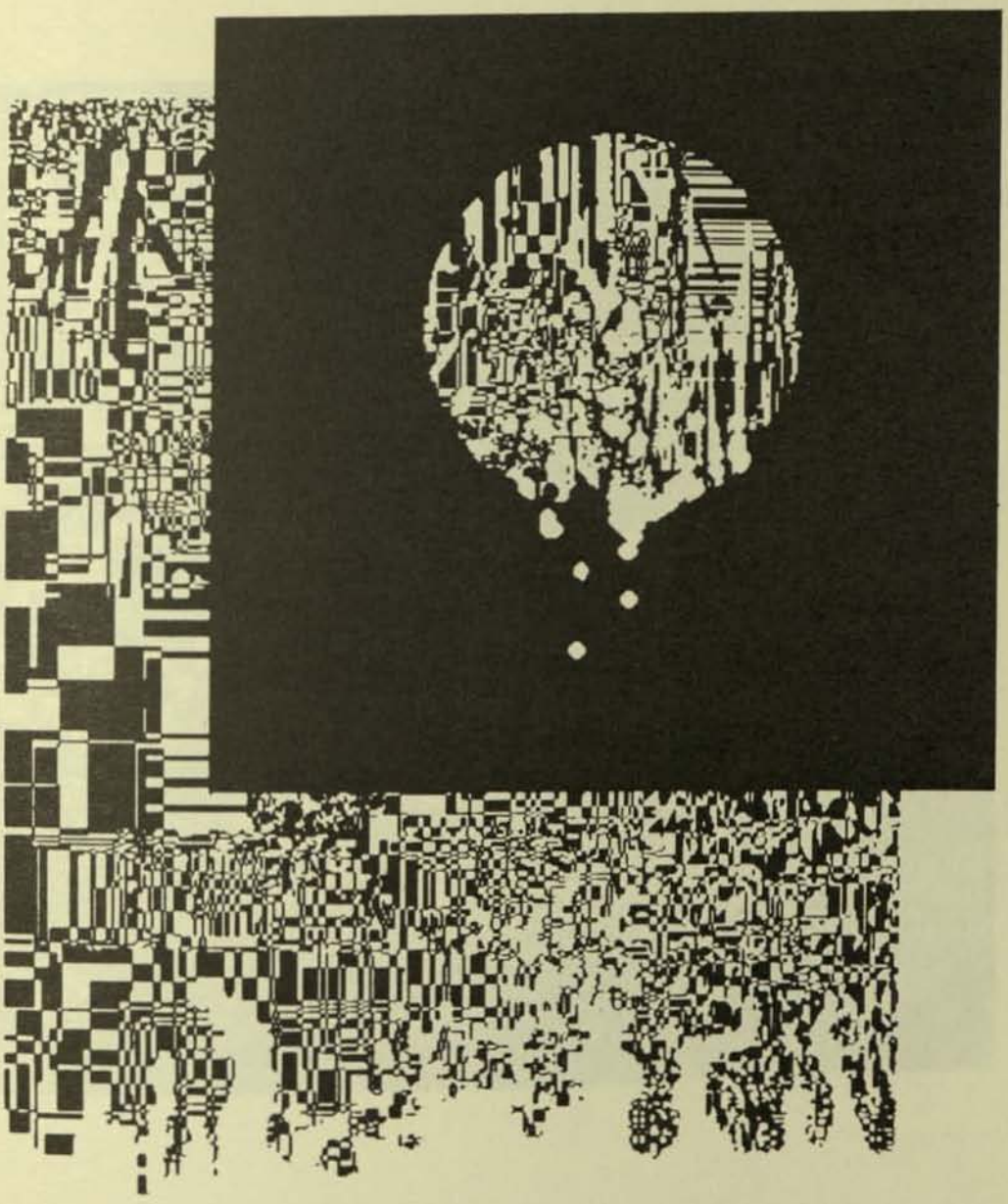


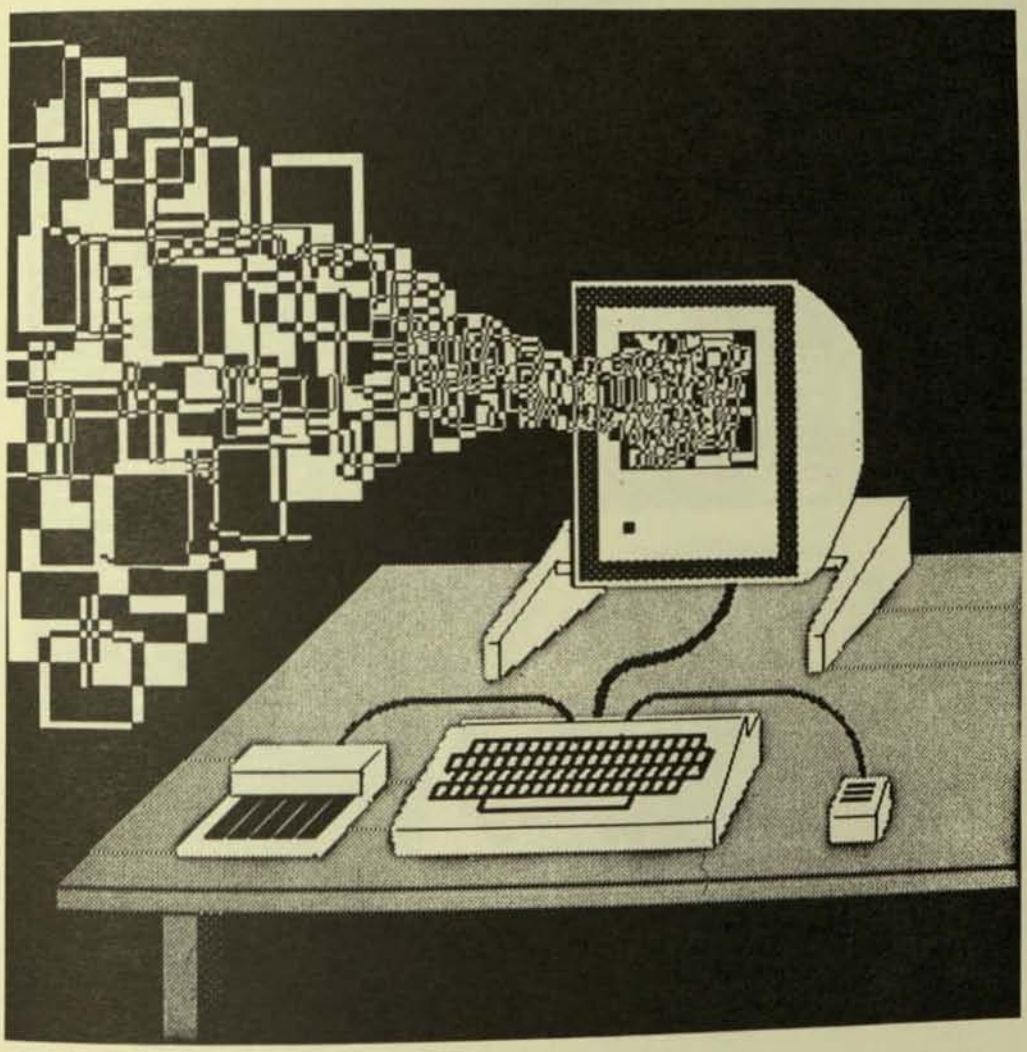


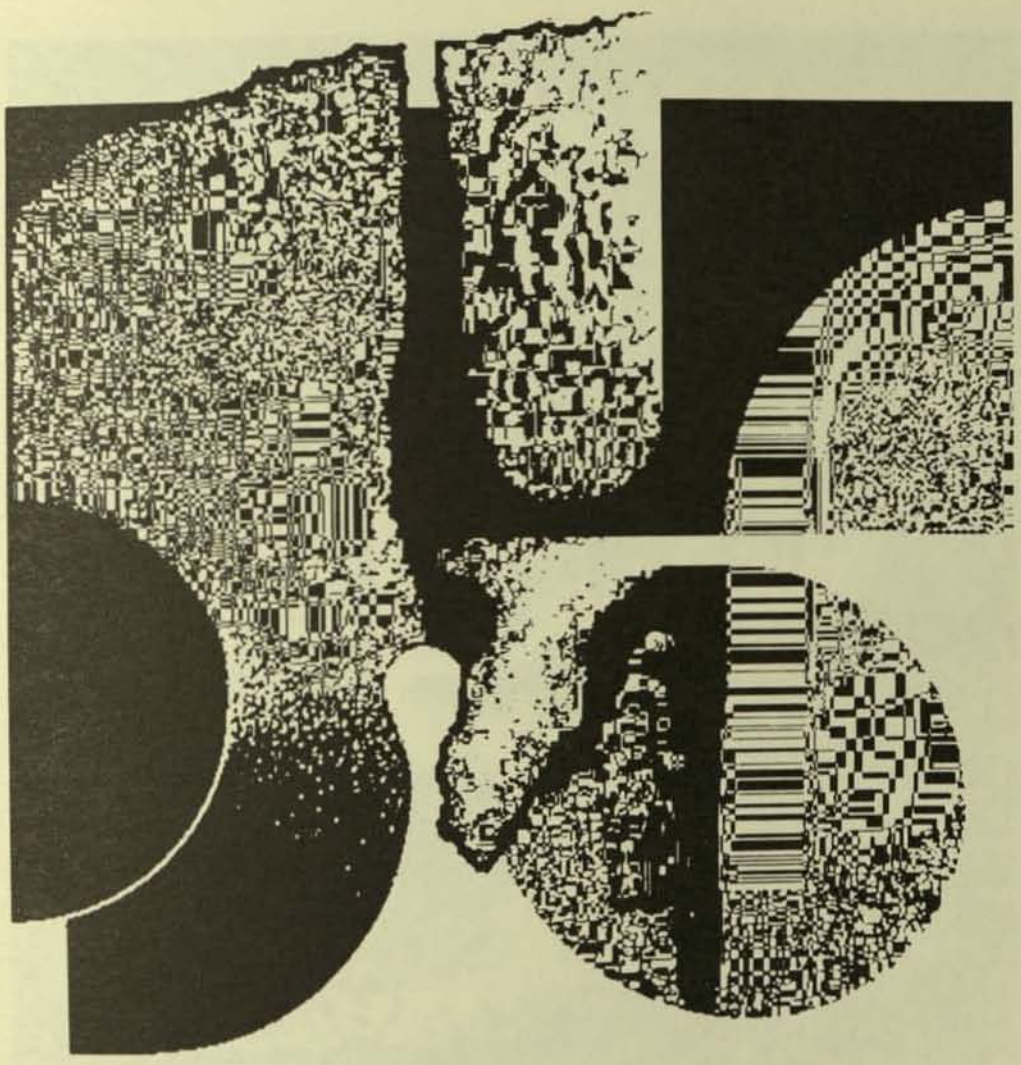


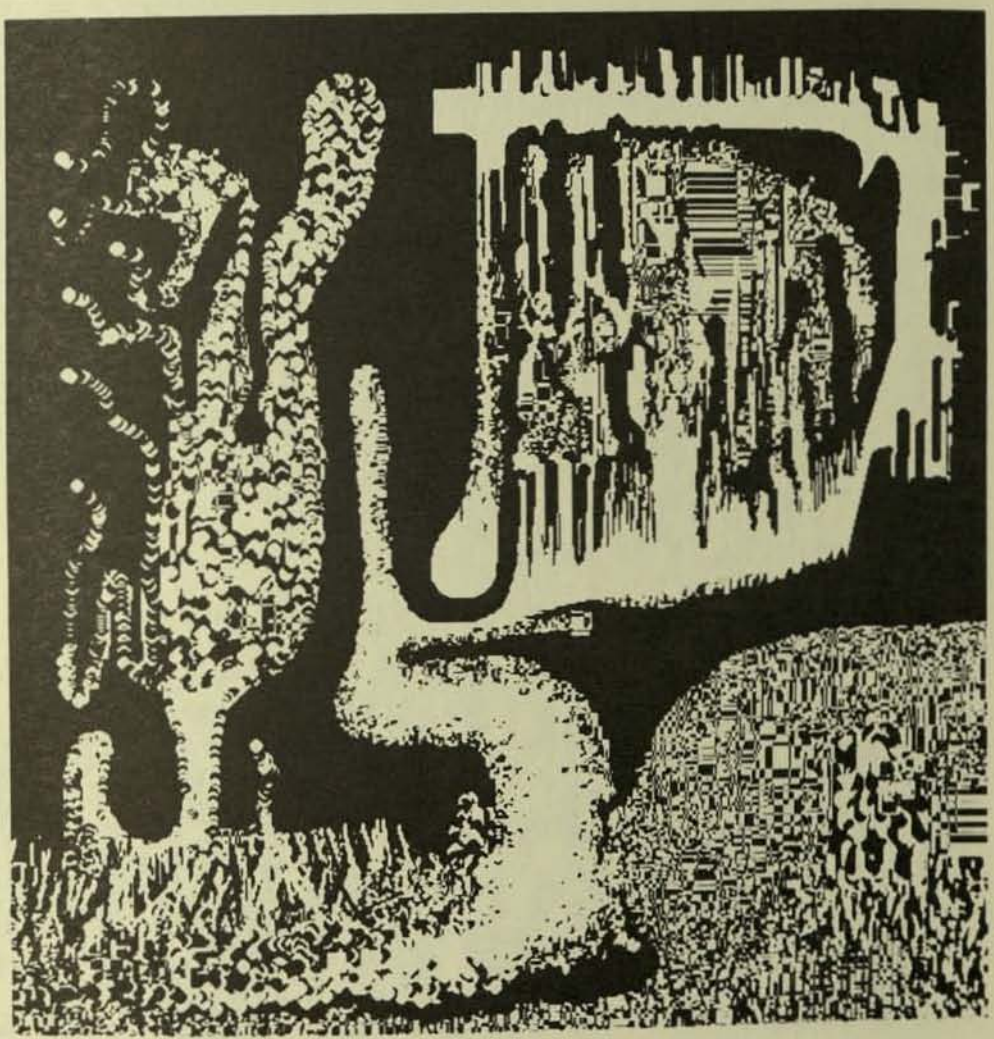


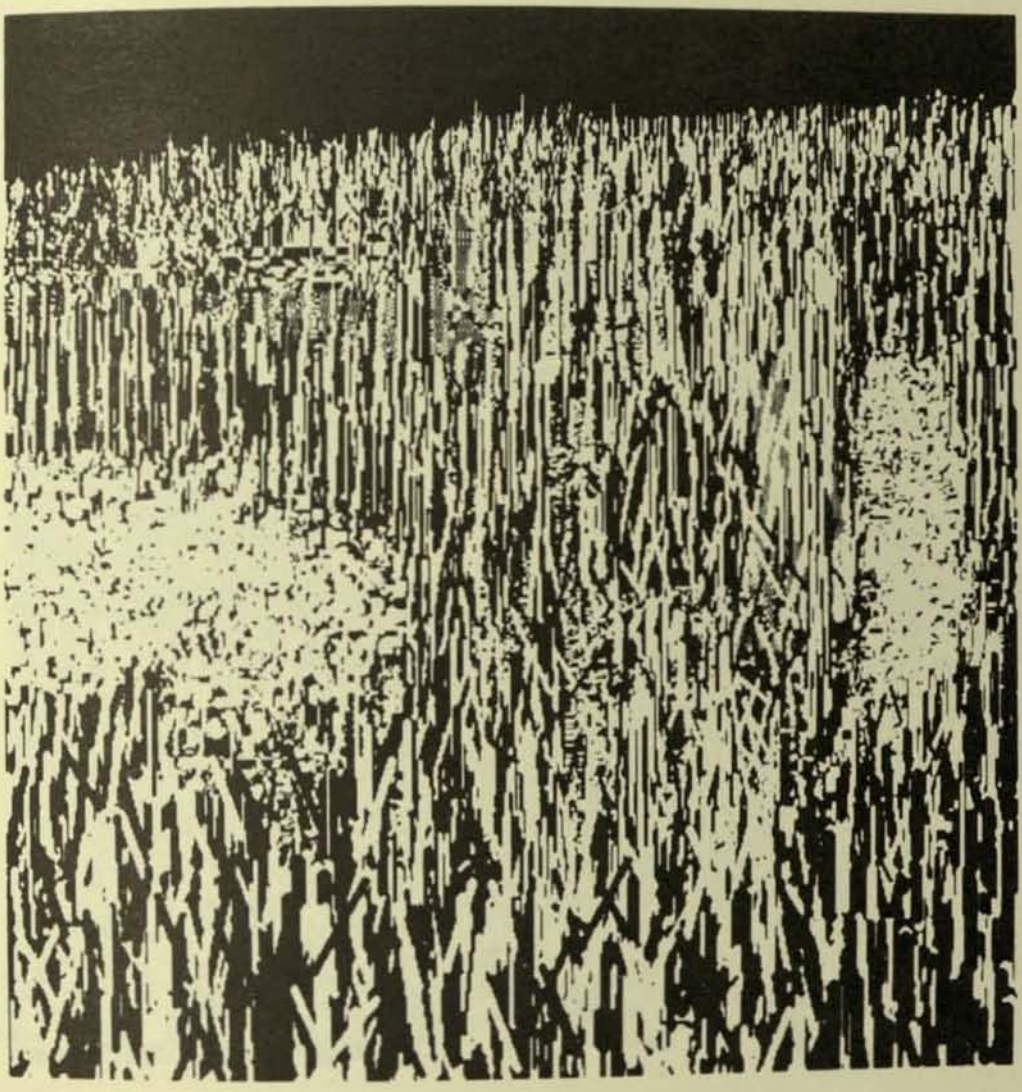


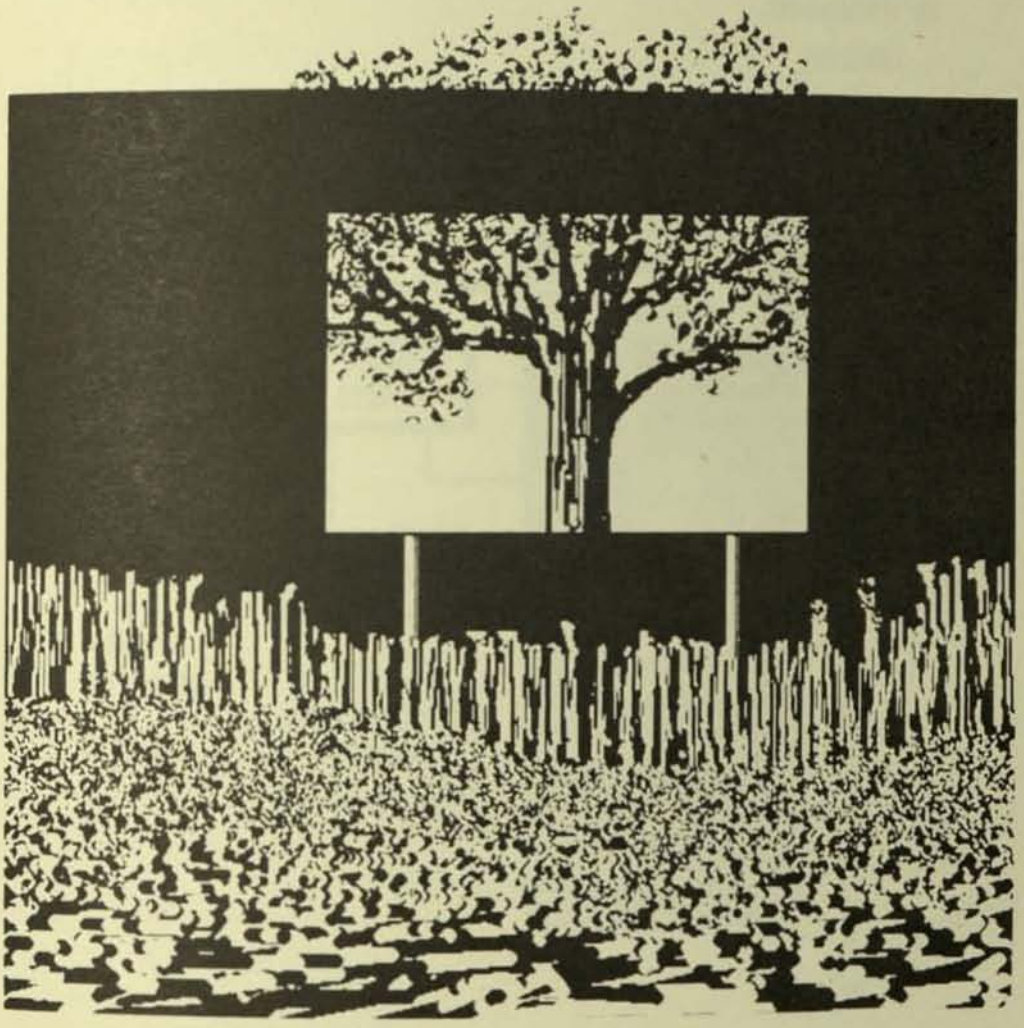


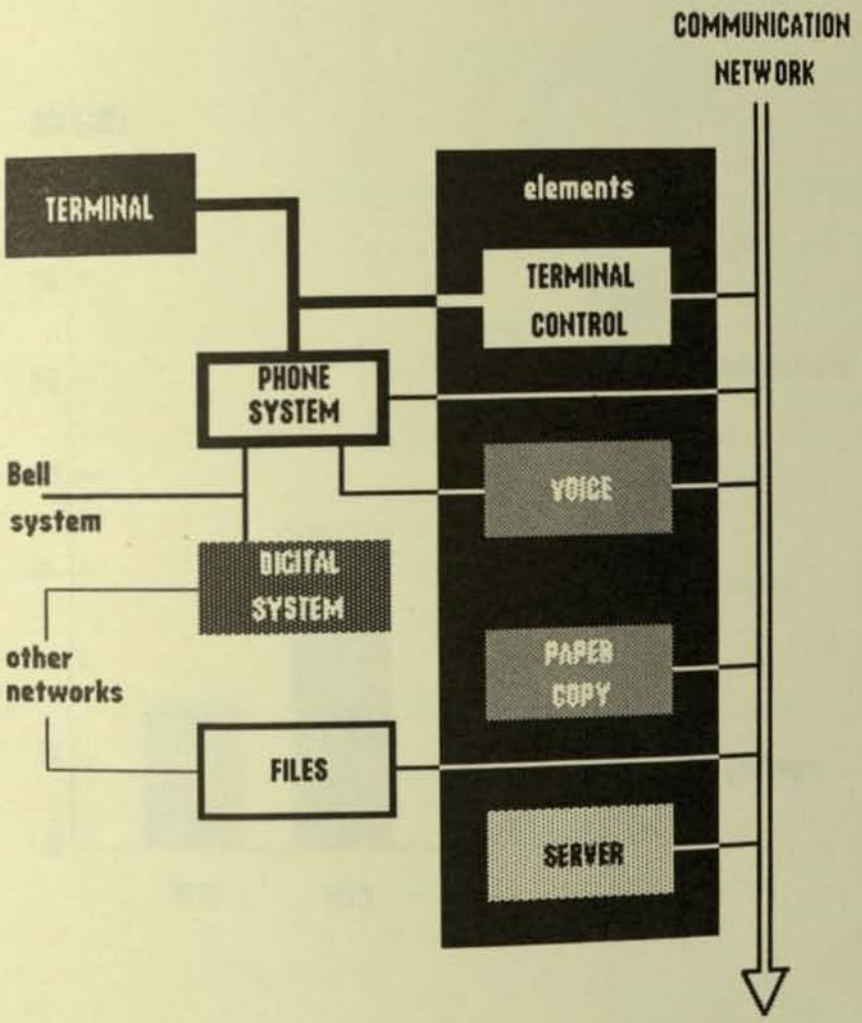








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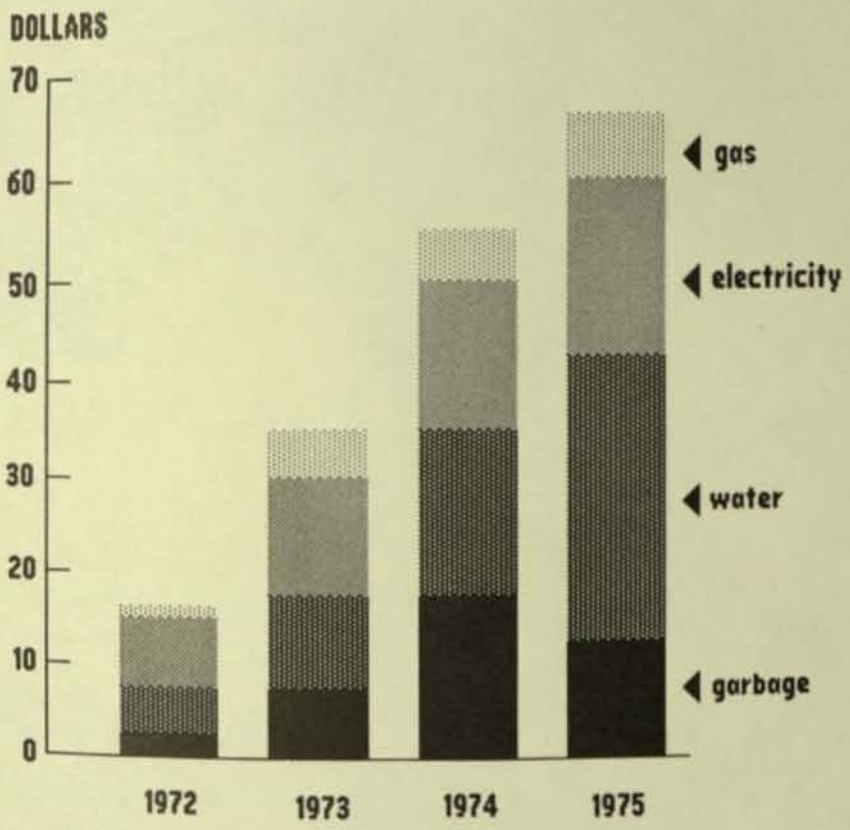
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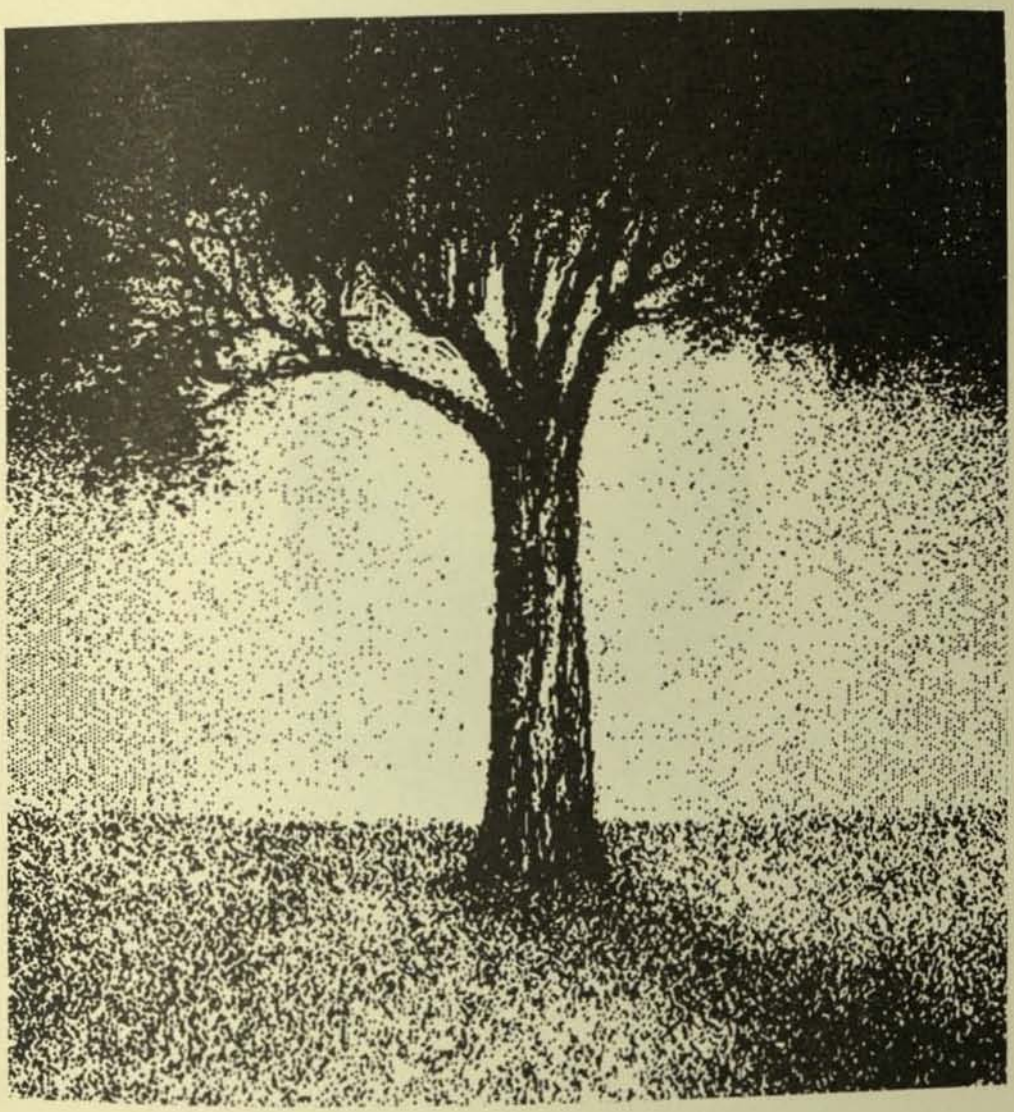

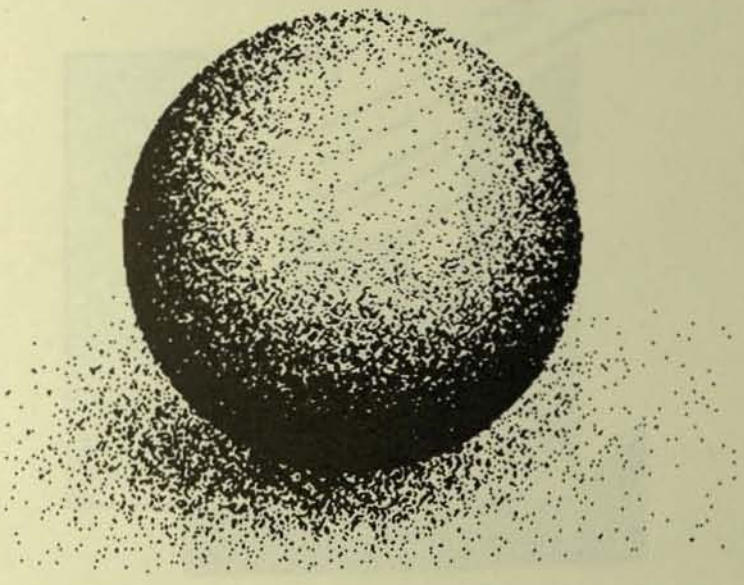

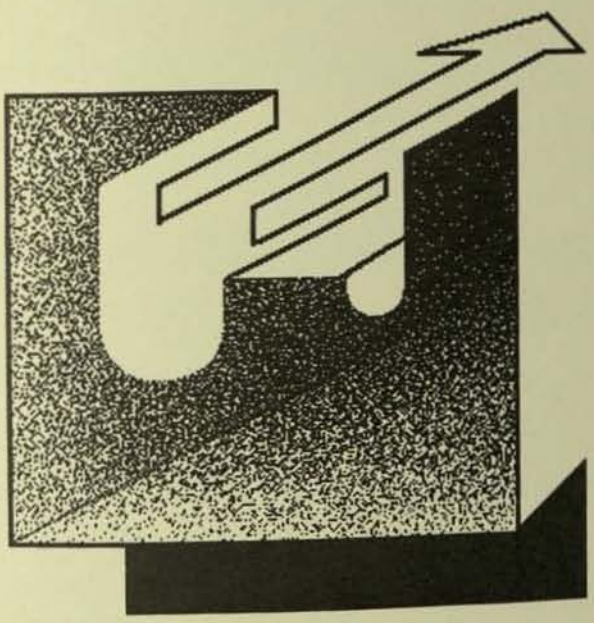

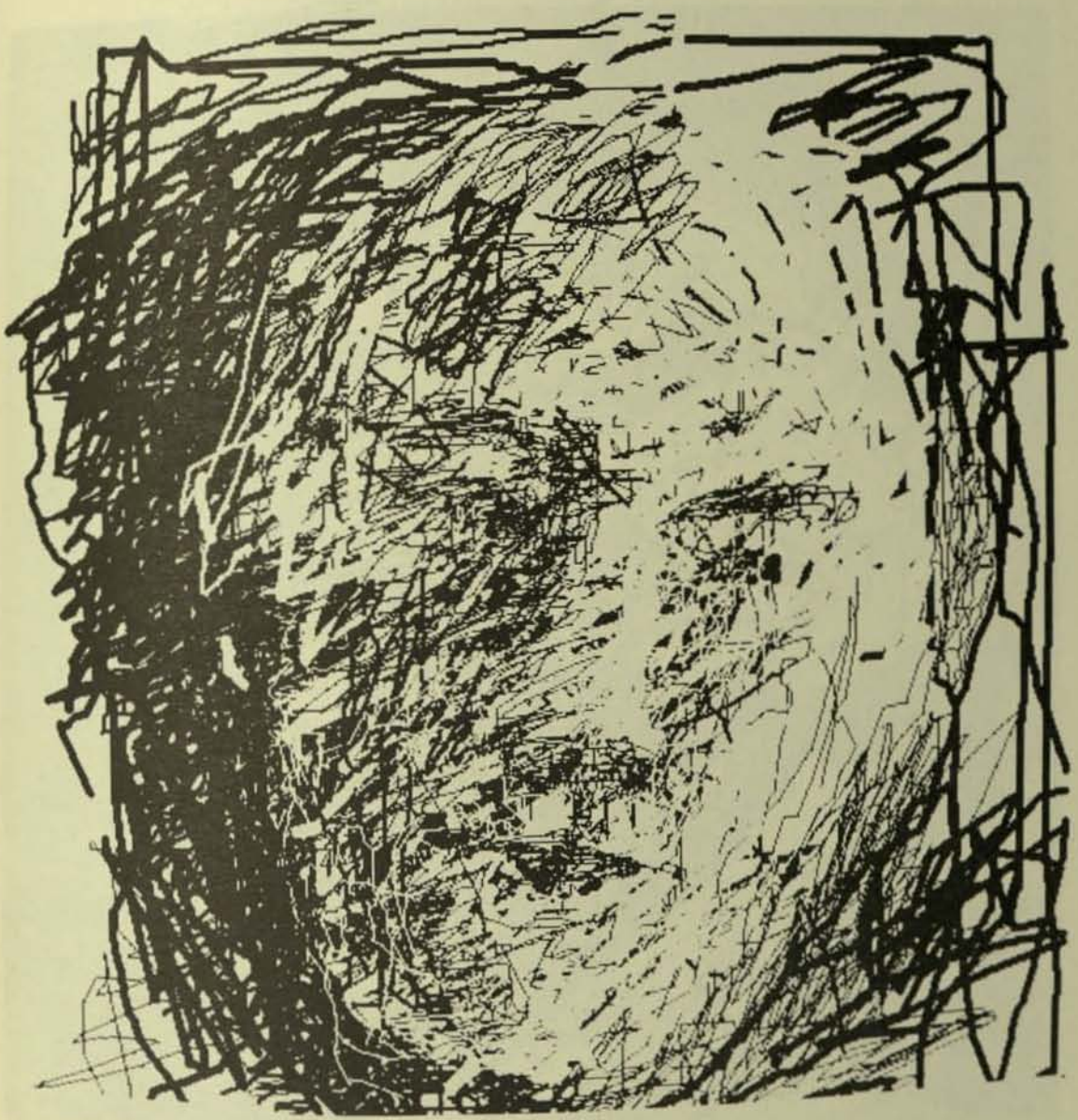

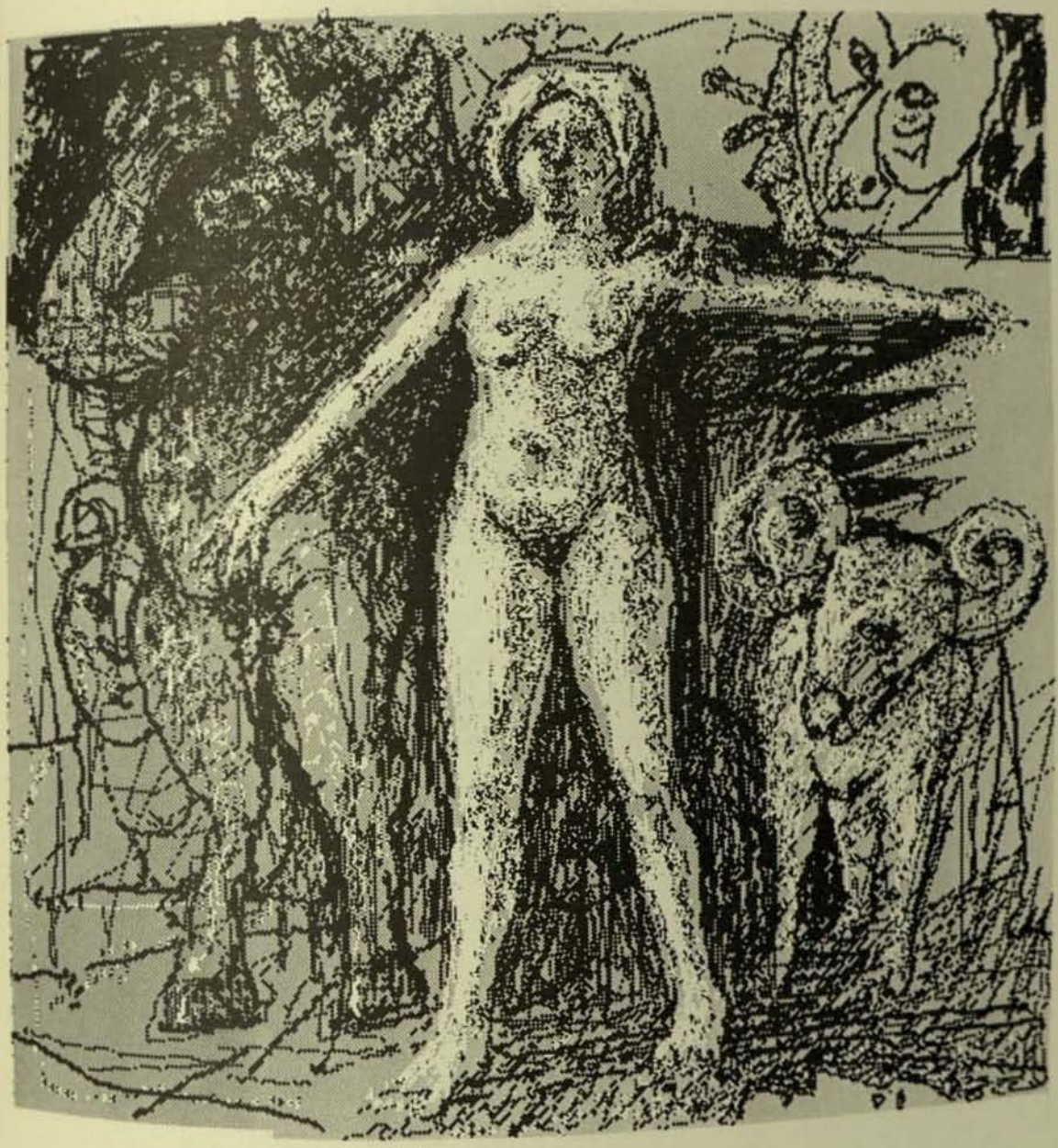

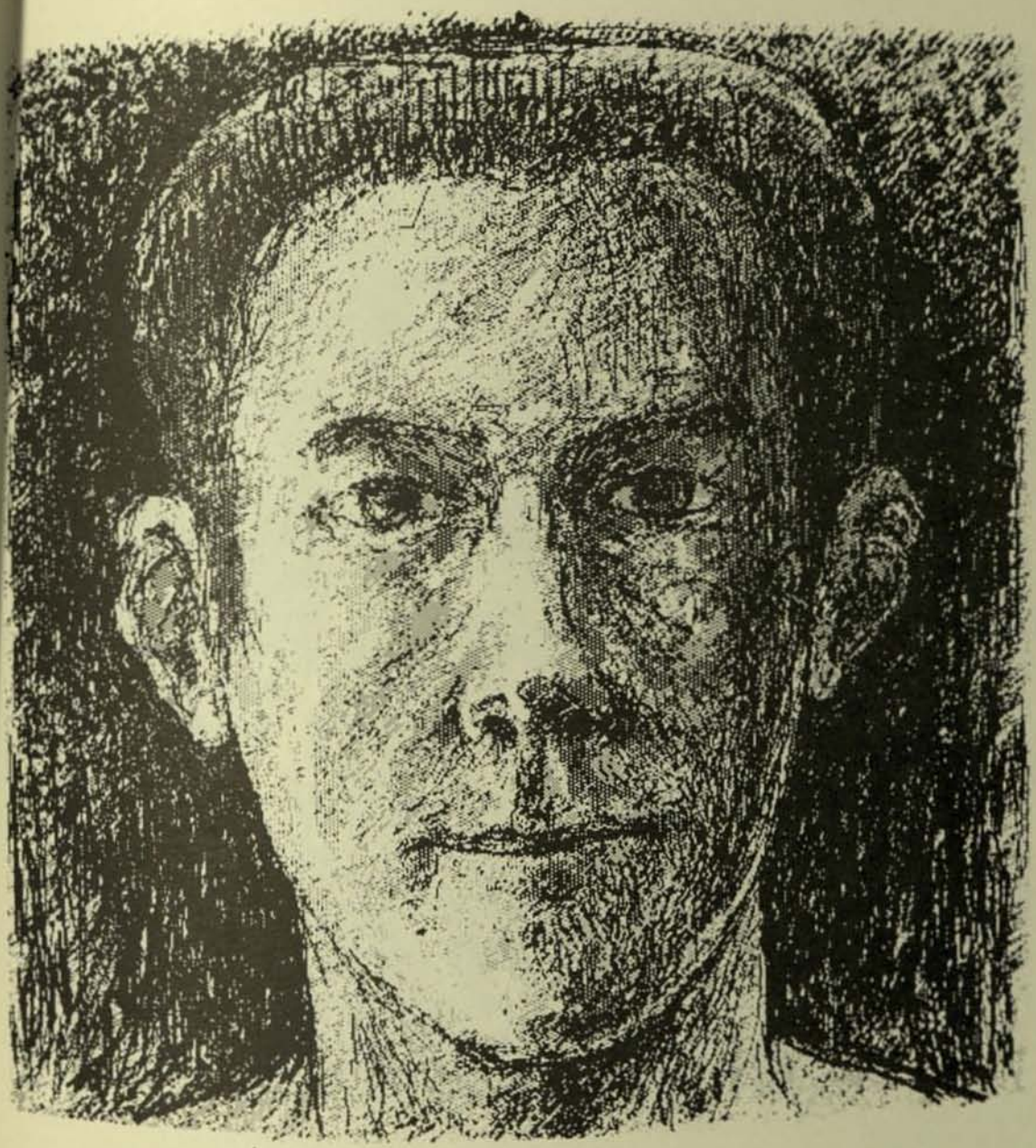

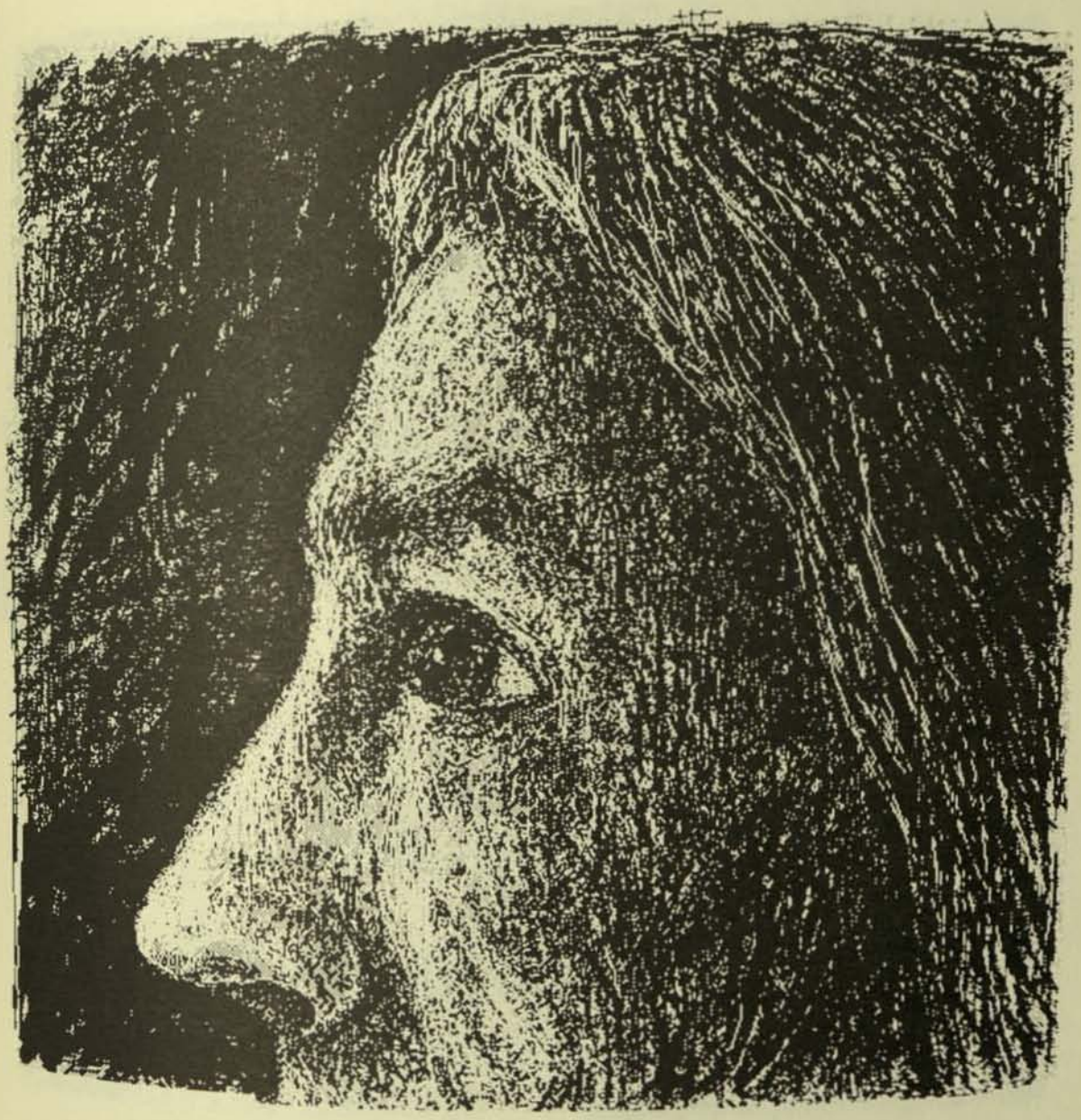

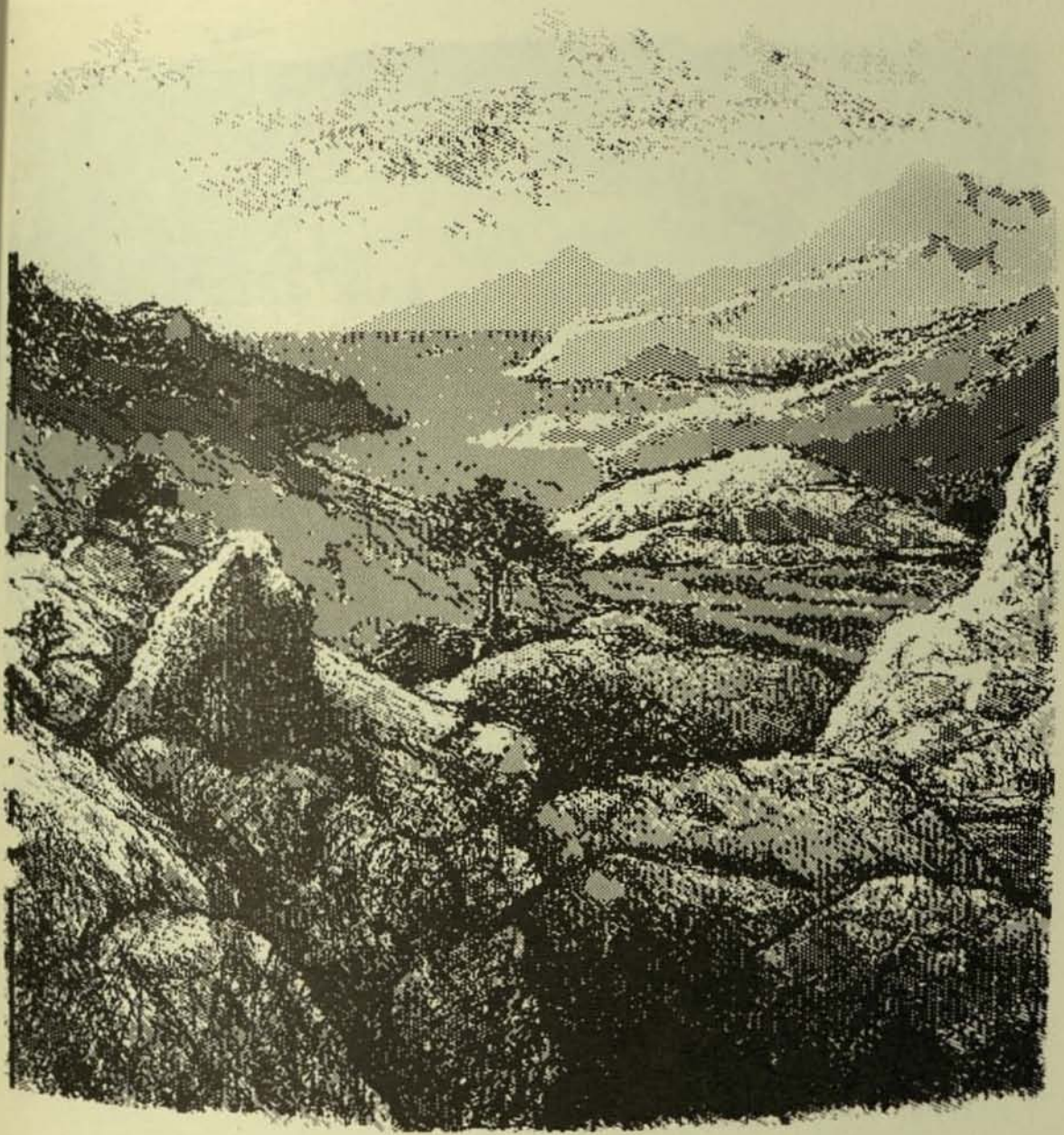

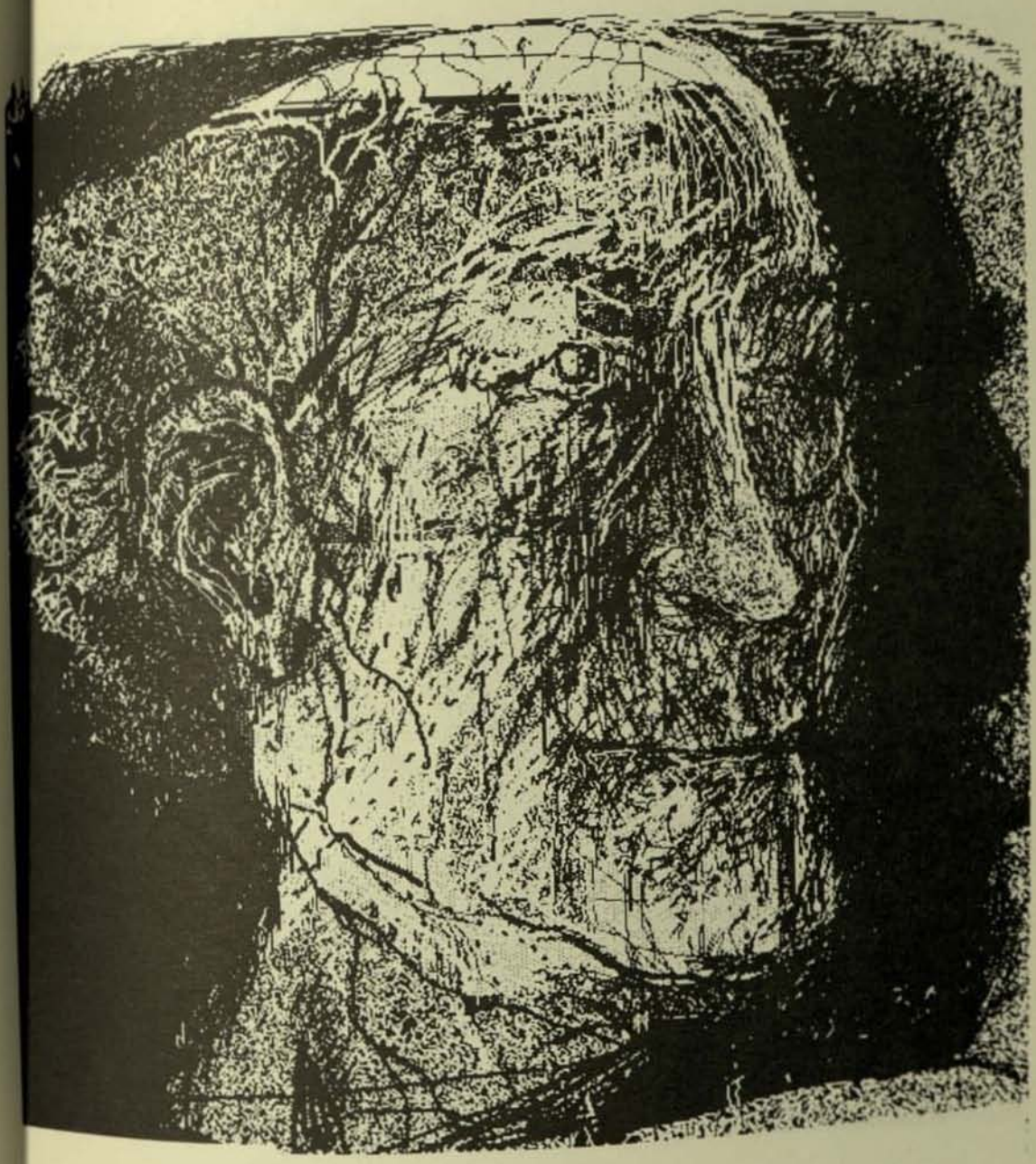

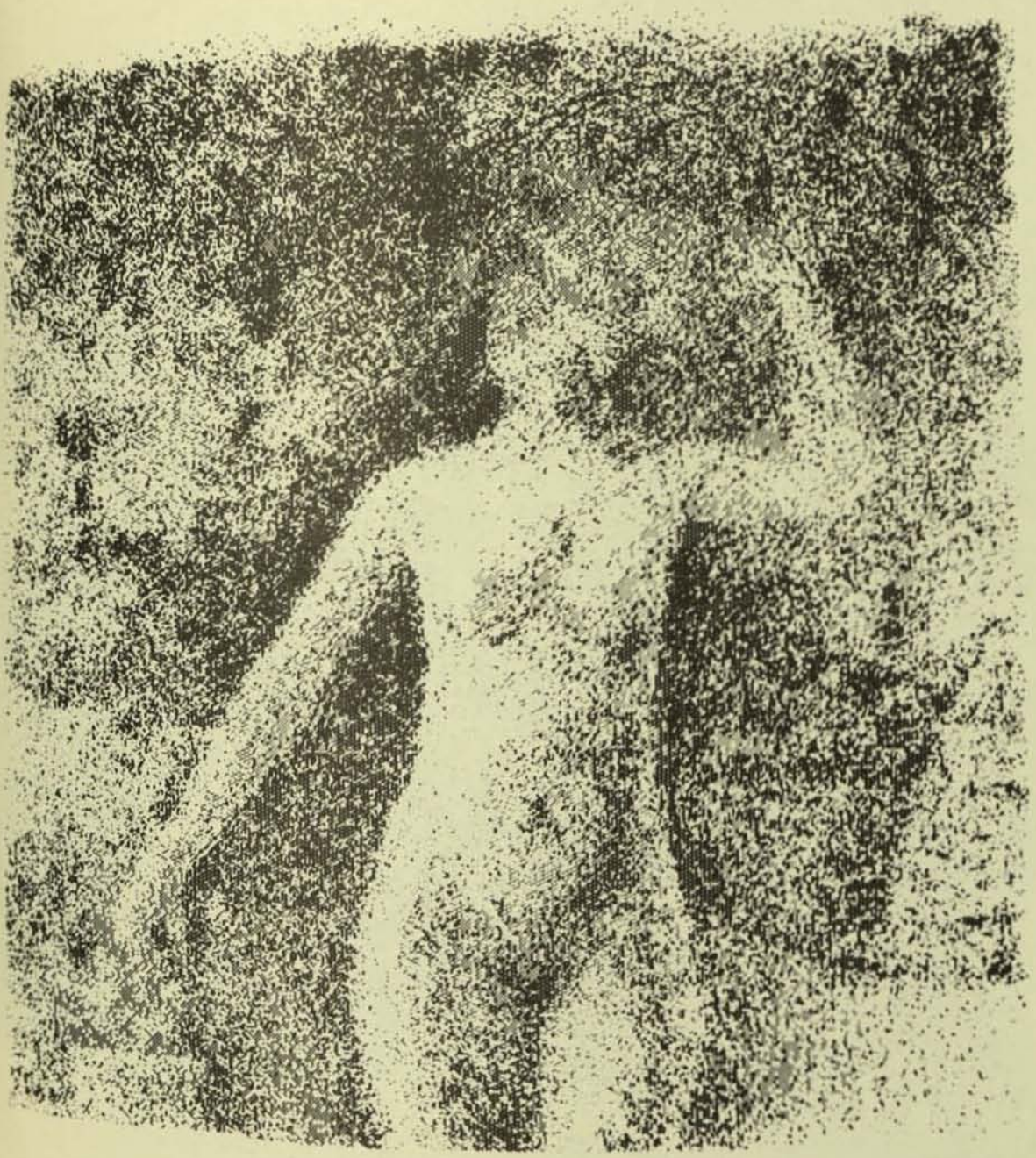

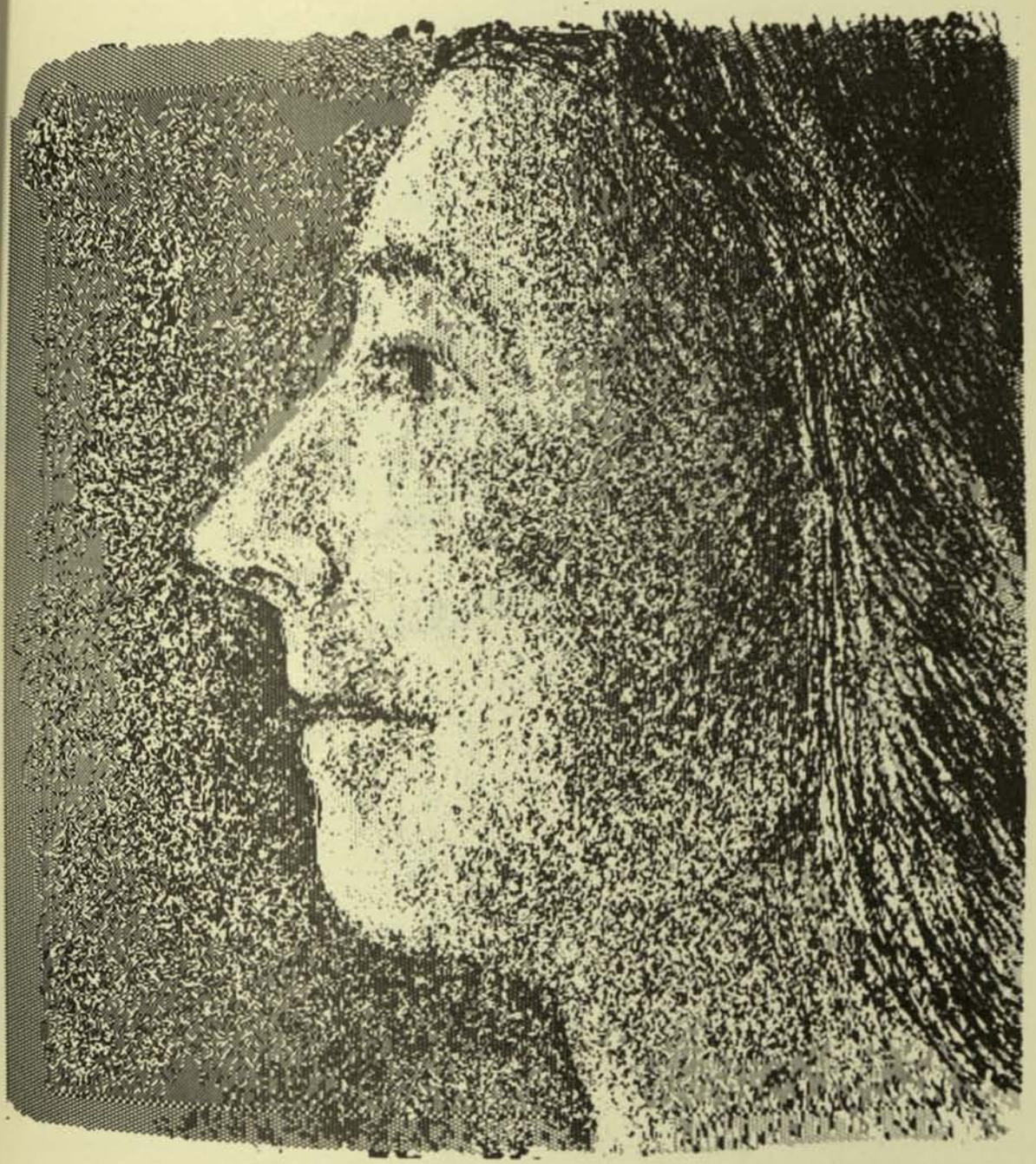

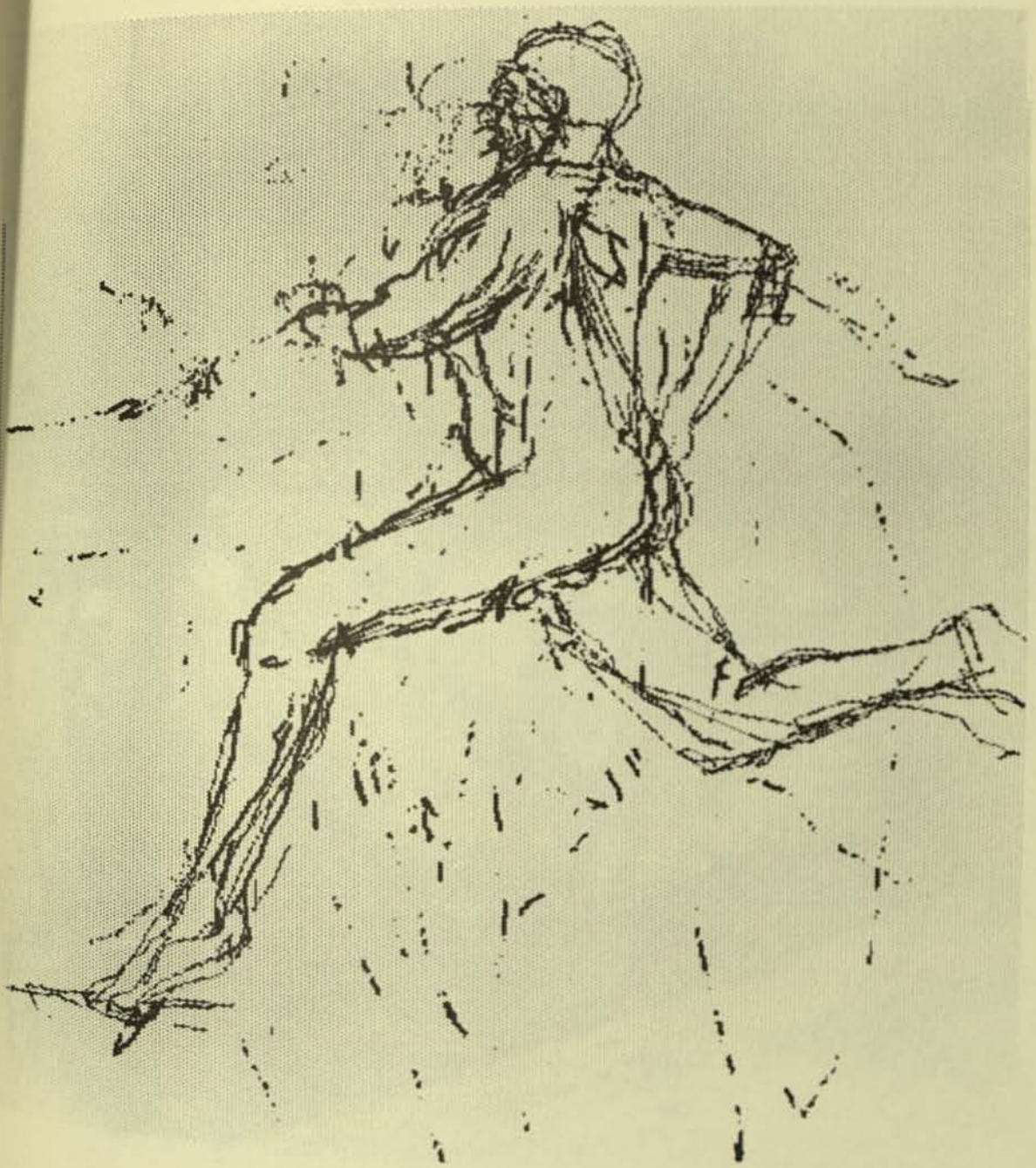

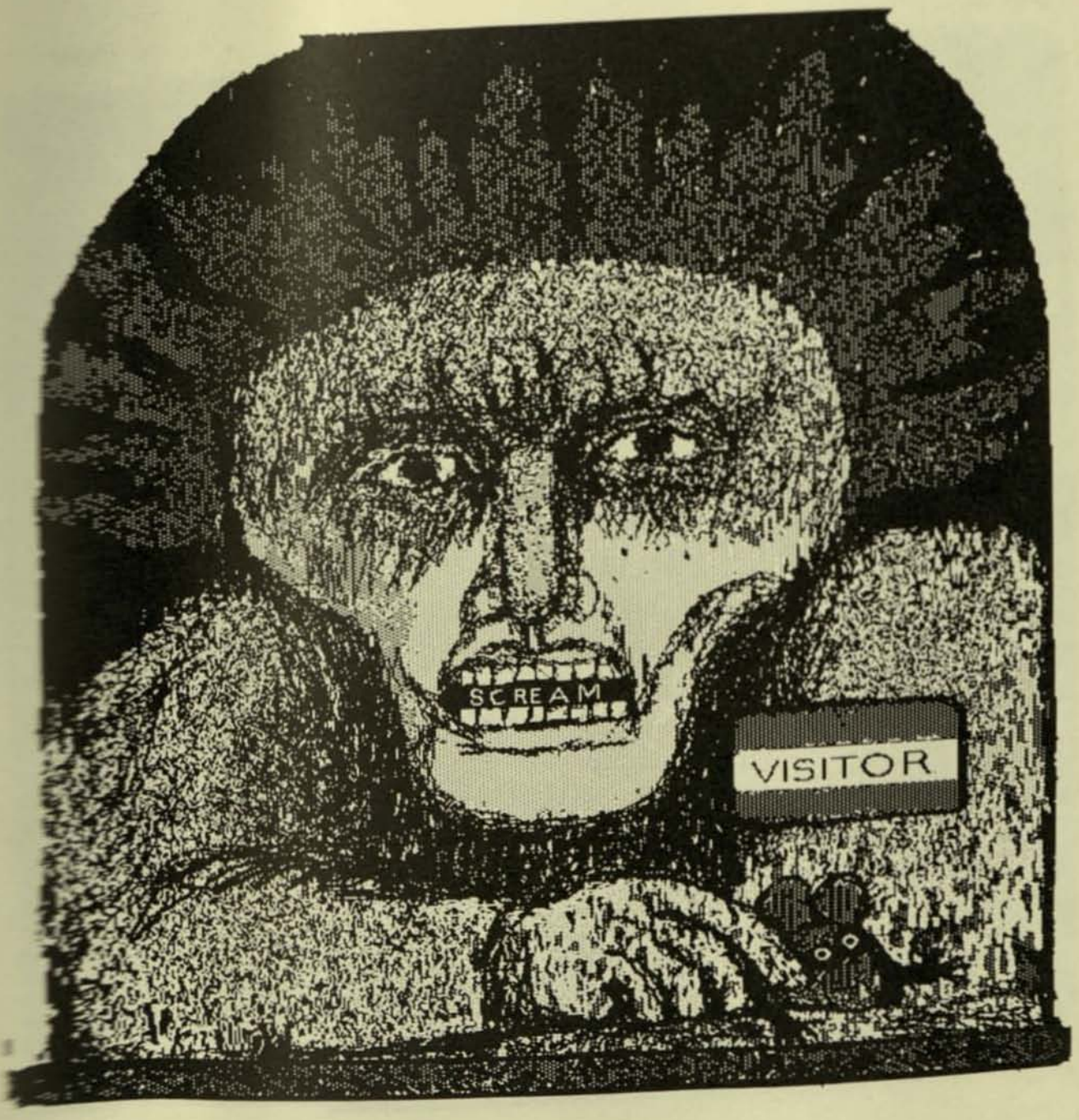
SCREAM
VISITOR