

Color Notations

by

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Signature of Author

Visible Language Workshop  
Department of Architecture  
May 14, 1981

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Chairman, Departmental Graduate  
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MAY 28 1981  
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for my family

I extend my gratitude

to Muriel for her support and sharp insights,

to Ron for asking me if my computer dreams were in black and white  
or in color,

to Bill for making sense of my convoluted sentences.

There are no words to express my appreciation of all who helped me.

Thank you,

Sandy, Kathy, Paul, Joel, Francis, Nathan, Sarah, Gregorio, Jeffrey, Joan,  
Gini, Peter, Laura, Tom, Haj, Richard, Paul, Rob, Judy, Doug, Gary, Averill,  
Judy and Eva.

## Color Notations

by  
Nancy Gardner

Submitted to the Department of Architecture on May 14 , 1981, in partial fulfillment of the requirements for the degree of Master of Science in Visual Studies.

### Abstract

This study presents research regarding the language of colors and of computers. The focus was color: translated through personal imagery, transferred and changed through media, and programmed through the computer. The research was a subjective experience within an objective context.

Thesis supervisor: Muriel Cooper

Title: Associate Professor of Visual Design



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Note: All illustrations and journal pages by Nancy Gardner;  
'cn' refers to color notation.

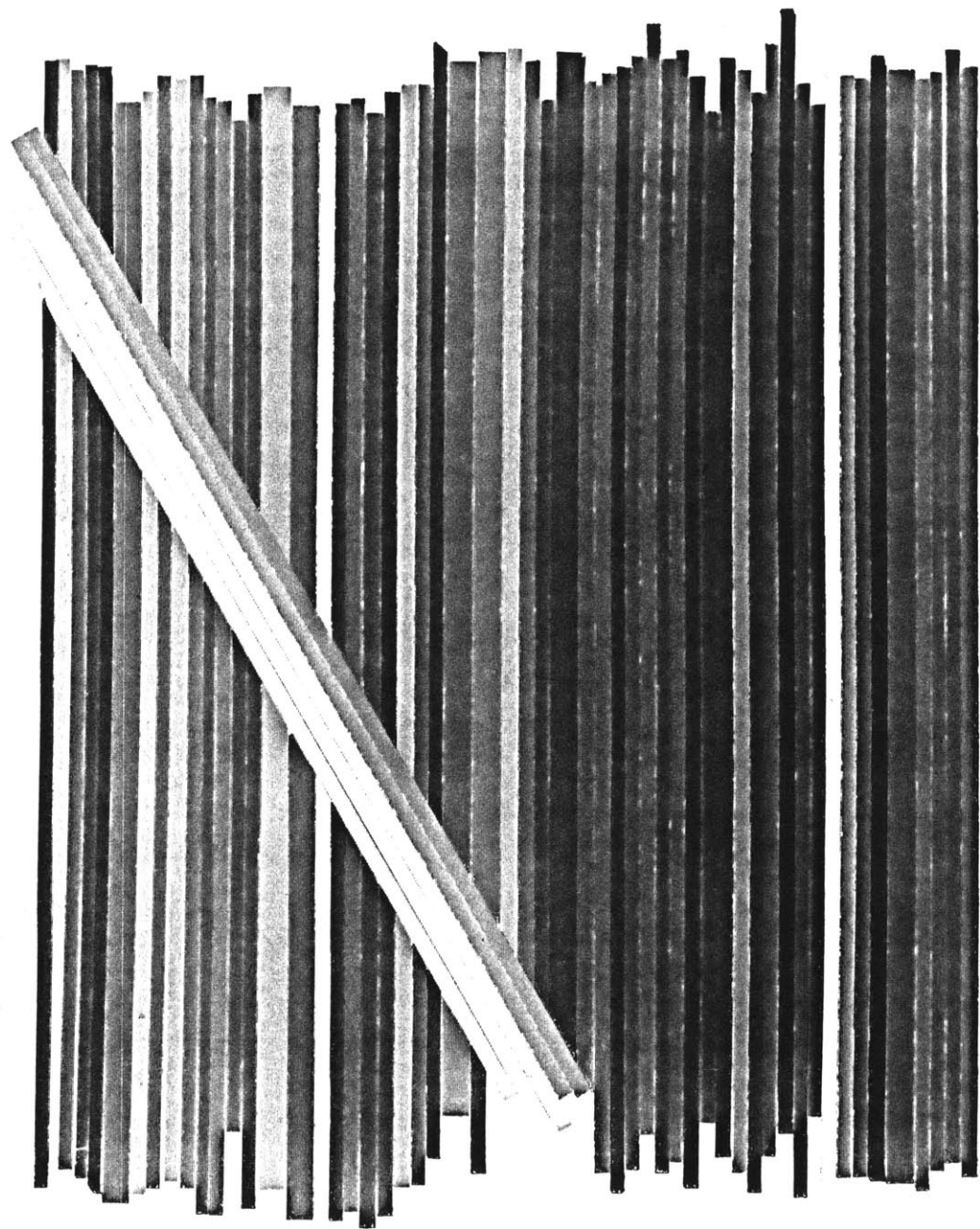
**“By the ‘language of images’, we mean three sorts of things:**

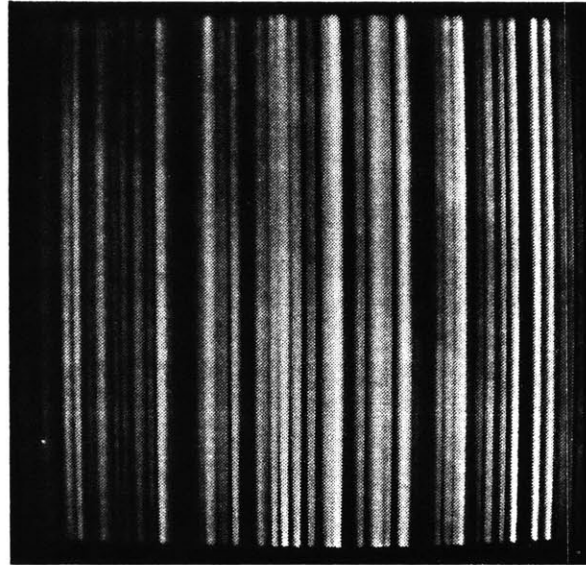
**(1) language about images, the words we use to talk about pictures, sculptures, designs, and abstract spacial patterns in the world, in art and in the mind; the interpretive discourse a culture regards as appropriate to its image systems;**

**(2) images regarded as a language; the semantic, syntactic, communicative power of images to encode messages, tell stories, express ideas and emotions, raise questions, and ‘speak’ to us;**

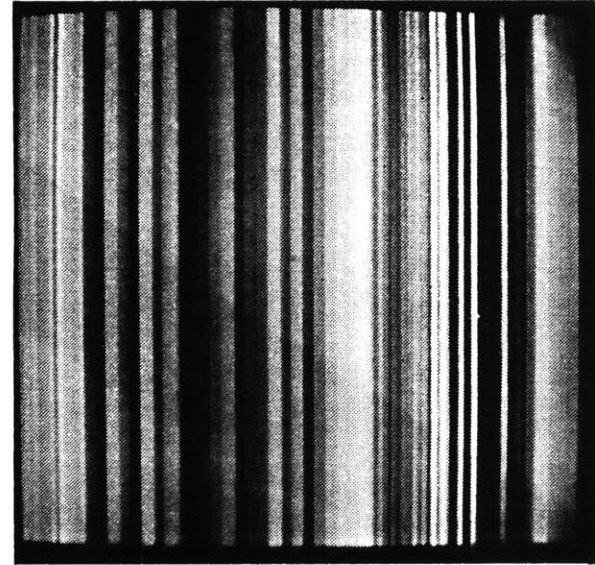
**(3) verbal language as a system informed by images, literally in the graphic character of writing systems or ‘visible language’, figuratively in the penetration of verbal languages by concerns for patterning, presentation and representation.”**

**W.J.T. Mitchell**



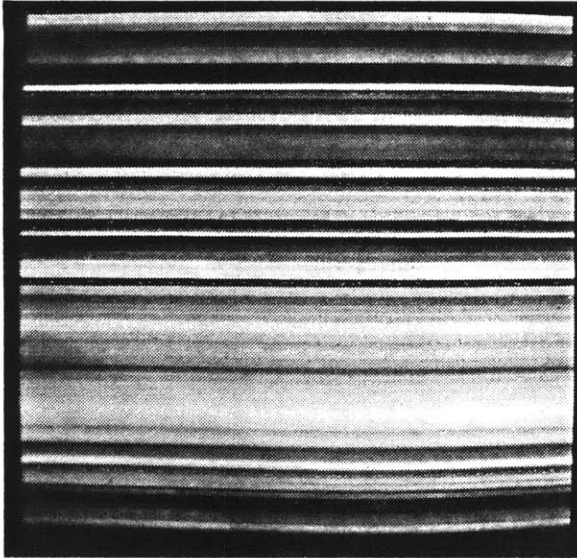


cn 2, computer image.



cn 3, computer image.

Last night, I composed "mean reds" using my square1 program.  
The reds were too luscious to reflect the reds that I felt...  
I have so many questions about the computer....I didn't know  
how to delete my old pictures to store last night's color  
moment.....sars!



cn 4, computer image.

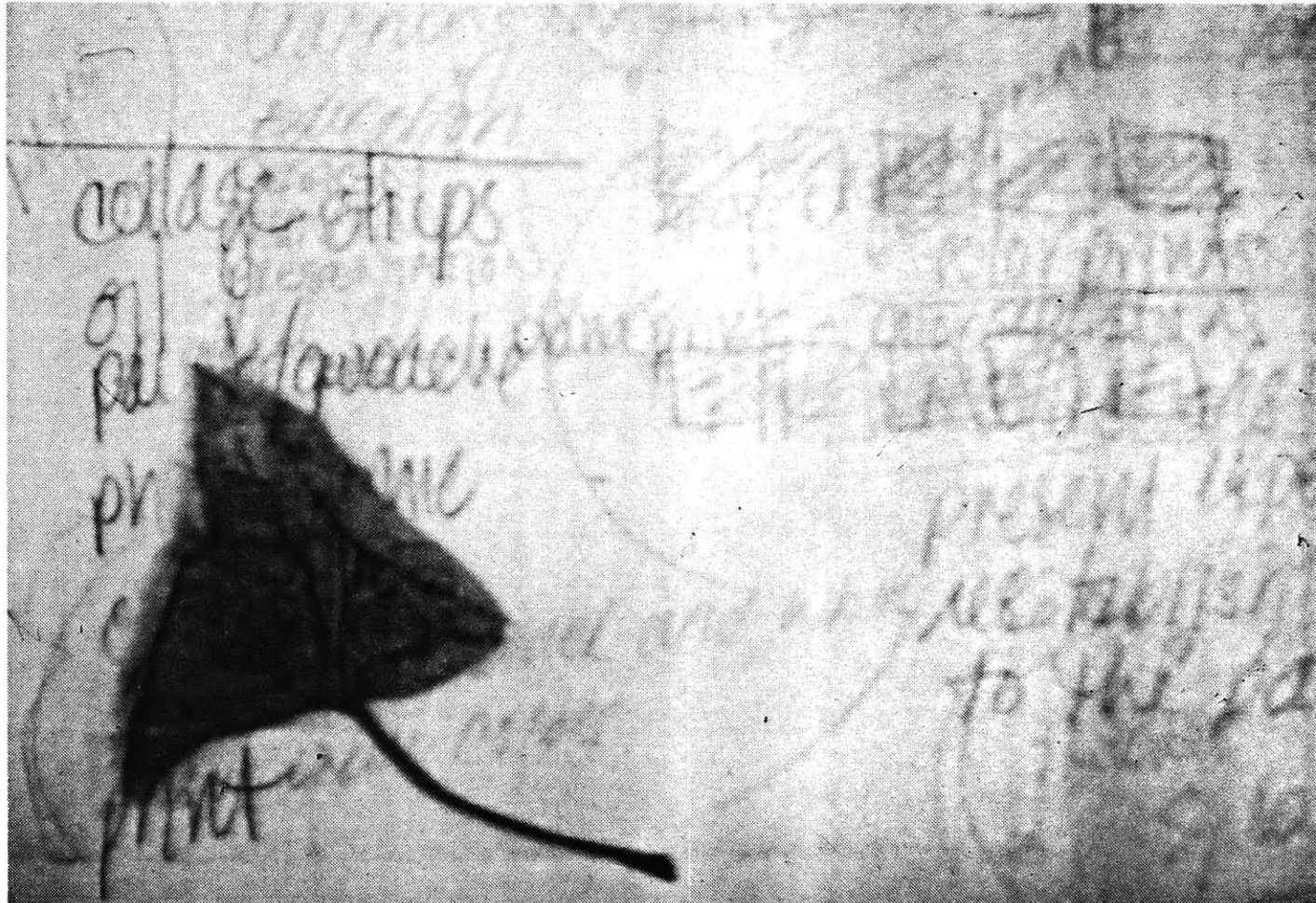
## Introduction

My goal was to use the computer to generate personal color notations. To this end, I constructed a project which combined my exploration of the changing relationships of color with a personal course of study of the computer graphic system at the Visible Language Workshop at the Massachusetts Institute of Technology.

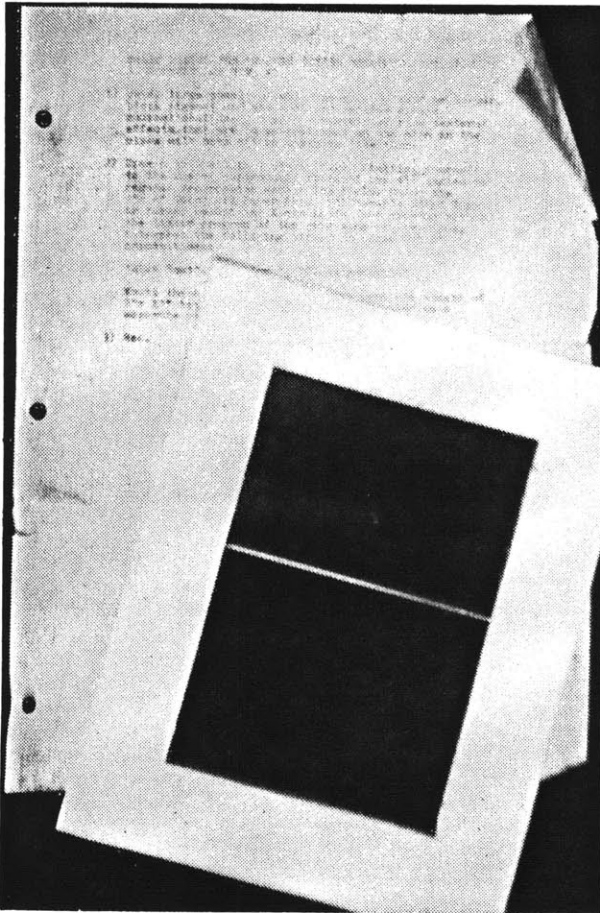
Several issues evolved throughout the project. Briefly, they were an extension of personal color imagery, the translation of that imagery to print, and the generation of my color notations on the computer. The use of 'softcopy' became a means for visualizing my ideas.

A significant aspect of my research is to provide a study for graphic designers and other visual artists who want to learn about computer graphics. My primary manner of research has been 'visual'. Many graphic designers would confront concepts of computer graphics in a similar way.

Moholy-Nagy expresses it this way: "Visual experience is more than the experience of pure sensory qualities. Visual sensations are interwoven with memory overlays and each visual configuration contains meaningful text while evoking associations of things and events, as well as creating emotional and conscious responses."<sup>1</sup> And, in the words of Rudolf Arnheim, "Visual perception is visual thinking."<sup>2</sup>



cn 5, color xerox, journal.



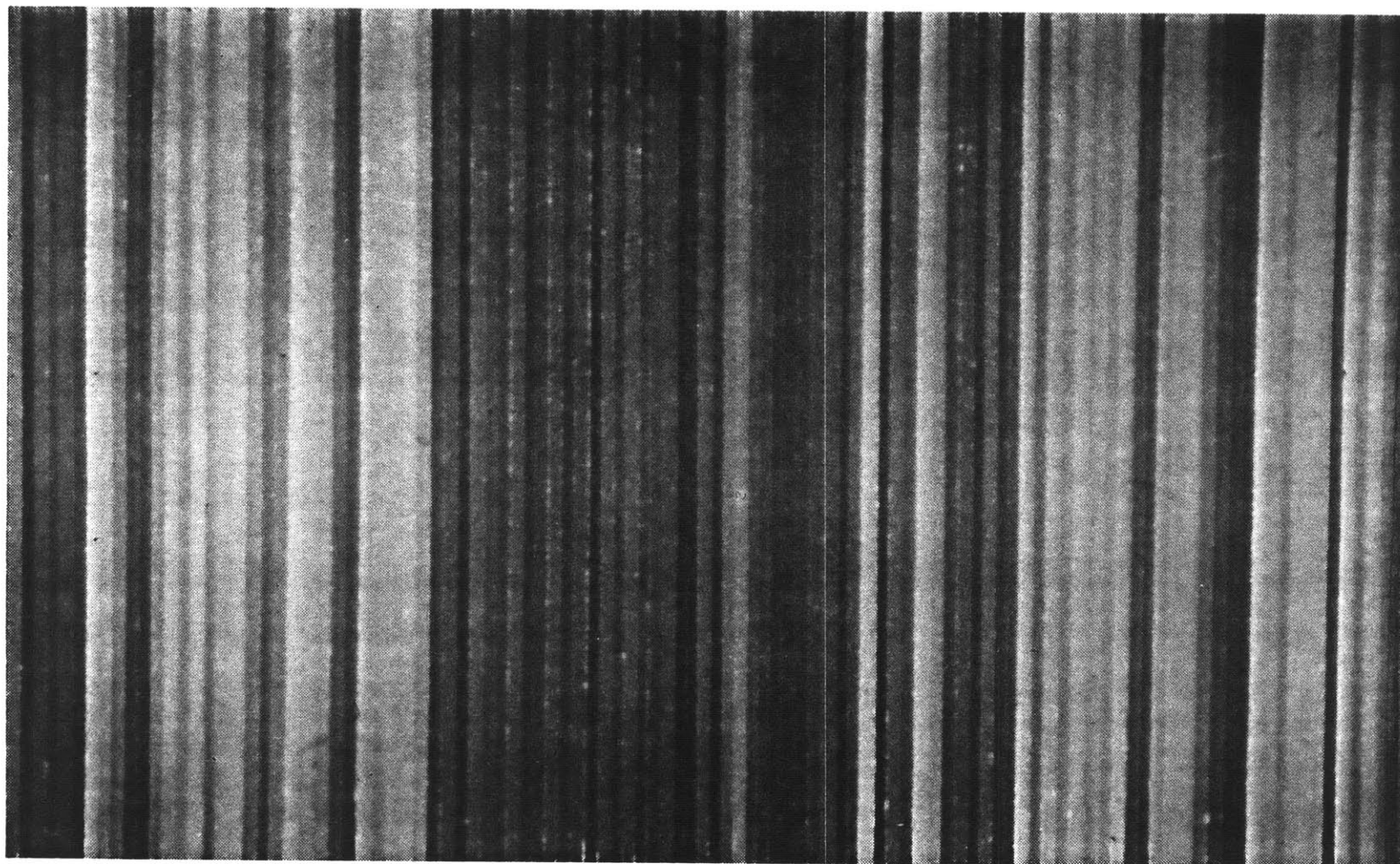
cn 6, basic design exercise.

The project was structured by weekly objectives and 'problem sets'. Each week, I produced various color pieces: Polaroid SX-70s, color slides, or formal studies which were an extension of basic design exercises. In addition, I worked with experienced programmers and started generating and modifying color pieces on the computer.

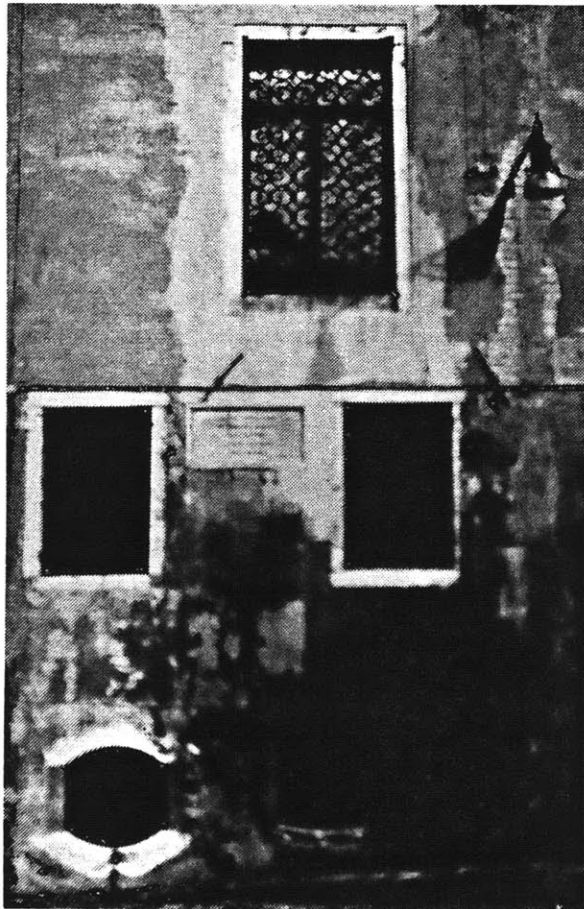
Written documentation was essential to the project. It reinforced the learning process by offering a chronicle for reflection. The journal reflects the idiosyncratic nature of the project. It became a receptacle for color impressions, organizational charts, notes on related reading, and other source material. I included everything from the fantasies and folly of late night musings to f-stops and color separation experiments.

This report presents parts of the journal. For clarity, I have categorized and restructured them. No attempt has been made to report the chronological sequence of my explorations. In some instances, I have foregone the rigors of formal expository writing in order to include excerpts which would otherwise be kept private.

Initially, the computer lexicon was confusing. Learning the terms was part of the project. I have included a glossary to recount my personal definitions. These explanations may help other graphic artists to understand the confusing jargon of computers.



cn 7, Color-aid.



cn 8, photograph.

### Color Notations

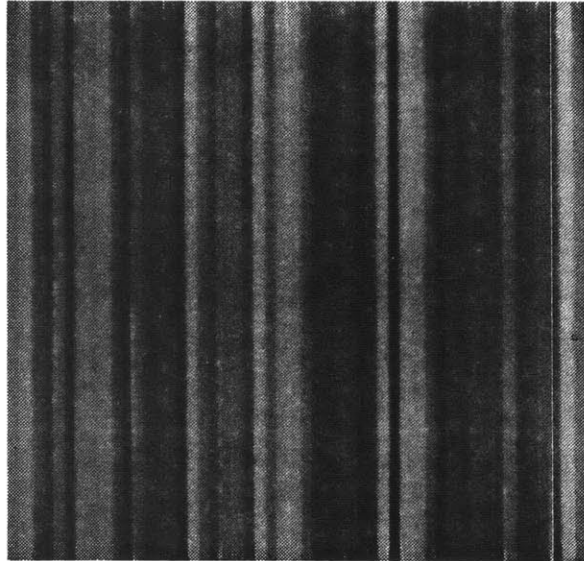
“Long, long weekend of colors . . . Friday was a struggle with water-colors . . . except for a pale Paynes Grey wash down the page, then a brilliant green/red stripe at the bottom . . . I felt the contrast. . . . Arguing; the thio violet, rose madder, and cadmium yellow would not come together . . . I’d close my eyes and the frustration would turn to dissonant colors. . . . Dreams of the painting working with rosy yellows and large gestures . . . the painting was so pure and full of spirit that I awoke so as to save the impression. . . .”<sup>3</sup>

Among all the elements of visual design — line, form, volume, space, texture, etc. — color is the most subjective. Our perception of blue derives not only from its physical properties, but also from the personal and historical allusions one brings to blue.

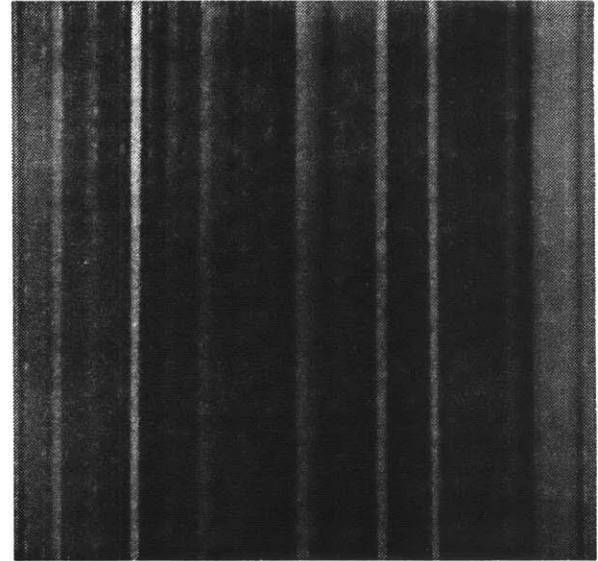
The following is a series of reflections by Joset Albers and Johannes Itten, two prominent color educators. I present their thoughts with these ideas in mind: that perception of color is relative to its medium, that there is a difference between the science of color and the experience of color, and that the way we see and use color reflects our ‘inner self’.

“In visual perception, a color is almost never seen as it really is — as it physically is. This fact makes color the most relative medium in art.”<sup>4</sup>

“In writing, a knowledge of spelling has nothing to do with an understanding of poetry. A factual identification of colors within a given painting has nothing to do with a sensitive seeing nor with an understanding of the color action within the painting.”<sup>5</sup>

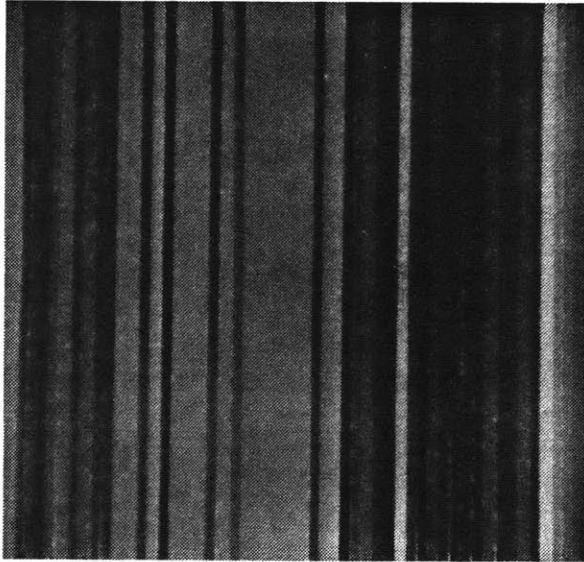


cn 9, Color-aid.



cn 10, Color-aid.

Dot made chocolate chip cookies/EVA AND I PICKED QUARTS OF  
strawberries |



cn 11, Color-aid.

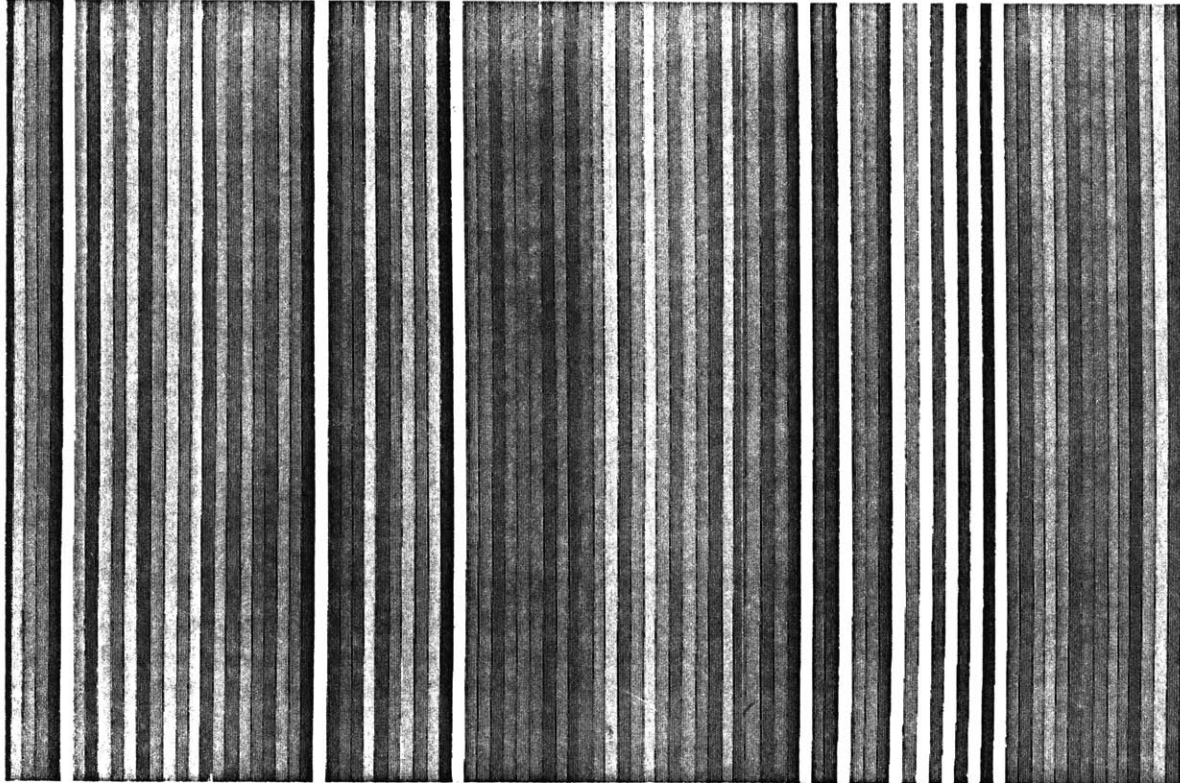
“Just as the knowledge of acoustics does not make one musical — so no color system by itself can develop one’s sensitivity for color. And experience teaches that in visual perception there is a discrepancy between physical fact and psychic effect.

What counts here — is not so-called knowledge of so-called facts, but vision — seeing. Seeing here implies *Schauen* and is coupled with fantasy, with imagination.”<sup>6</sup>

“Between black and white there throbs the universe of chromatic phenomena, so long as colors are bound to the world of objects we can perceive them and recognize their relationships; their inner essence remains concealed from our understanding and must be grasped intuitively, hence rules and formulae can be no more than sign posts on the way to color fulfillment in art.”<sup>7</sup>

“The color combinations constructed as harmonious by each individual here represent individual subjective opinion. This is subjective color. If subjective timbre is significant of a person’s inner being, then much of his mode of thought, feeling and action can be inferred from his color combinations. Intrinsic constitution and structure are reflected in the colors which are generated by dispersion and filtration of the white light of life and by the electromagnetic vibrations in the psychophysiological medium of the individual.”<sup>8</sup>

“He who wants to become a master of color must see, feel and experience each individual color in its many endless combinations with all other colors. Color must have a mystical capacity for spiritual expression without being tied to objects.”<sup>9</sup>



cn 12, Color-aid, Vermont, 1978.



THE AFTERNOON

THE MORNINGS RELEASE TENNIS WITH DOT  
I STARTED LOOSENING UP AND REALLY  
PLAYING TENNIS...  
ALTHOUGH I LOST 6-4, IT WAS A GOOD  
MATCH - PERHAPS TOMORROW I'LL BEAT

HER

THEN A SWIM IN THE WEST RIVER - I  
REMEMBERED THE TIME LAST SUMMER WHEN  
GANNY I GOT REAL CLOSE -  
THE SAND PIT WAS TRANSFORMED INTO  
A WINSLOW HOMER PAINTING -

NOW THAT I'M REMEMBERING IT /  
THE WERE TWO COLOR MOMENTS  
YESTERDAY, ONE, RIGHT BEFORE THE BUS  
GOT TO THE SPRINGFIELD TERMINAL  
THERE WAS A LONG GARAGE FOR TRUCKS



PAINTED GREEN  
WITH A RED "RULE"  
I SUPPOSE IT WAS  
TO MARK SPACES FOR  
SOME TRUCKS.

THE OTHER WAS DRIVING BACK FROM  
DEATLEBORD, IN THE HAZE WHICH  
IS HANGING IN THE VALLEY, AN EARLY  
EVENING TWILIGHT.

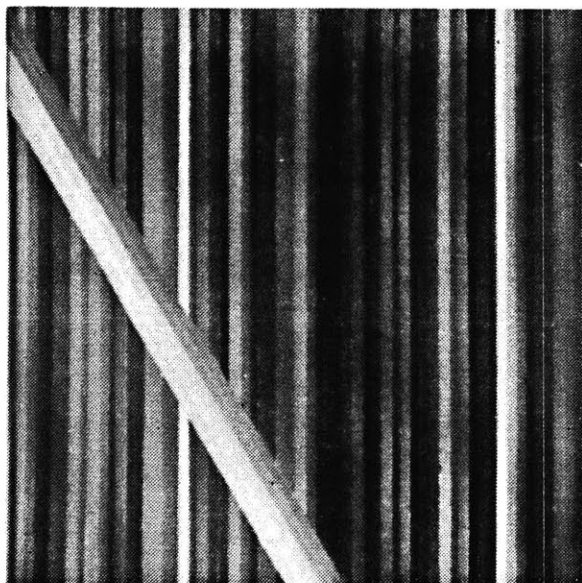
PINK, BLUE, HARDY TUNGSTEN  
MORE FLEETING

AND TODAY - IN THE WEST END  
THE MAJON, SWIMMING COTON OF  
PELICES SHORTS - THE BUSHING RIVER  
A UNIVERSAL SUCCESS!

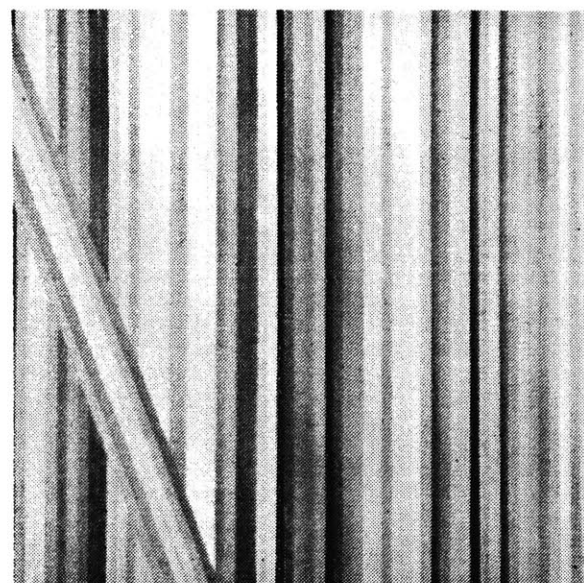
The formal design exercises were about seeing, feeling, and experiencing color. In the summer of 1978, I started a color journal to record the changing light and weather in the West River Valley. I used colored paper from several Color-aid packs cut into one-eighth strips. The color bands were composed within a horizontal or vertical grid. The rectangular frame was in the same proportion as a 35mm camera. To me, the color pieces were photographs of landscapes with a manually constructed time lapse.

These color landscapes were a starting point for my thesis project. I envisioned the initial pieces as 'idea-sketches' about visual memory. My goal was to reconstruct a memory of a specific time period. Previous journals and old photographs helped to trigger my recollection. I used Color-aid and the familiar grid of one-eighth inch strips. The square format corresponded to the image on the computer video display.

In a sketchbook, I found an uncut palette chosen after a weekend spent by the ocean. Each color in the palette began to take on a life of its own. I associated certain feelings with certain combinations of color. Red strawberries, pink beach towels, and the warm feelings associated with family reunions were recalled. Arthur Koestler refers to these recollections as 'vivid fragment-memories'.

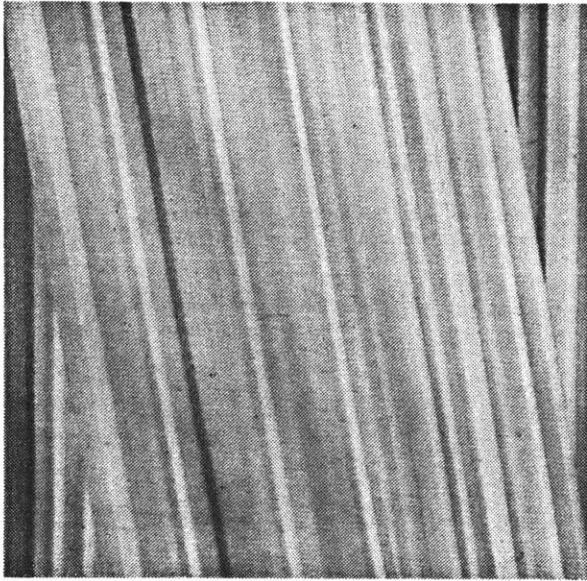


cn 13, Color-aid.



cn 14, Color-aid.

my, images involve blowing up and reducing --enlarging small  
intimate reflection, separating particles - of color overlaying  
layers and reconstructing



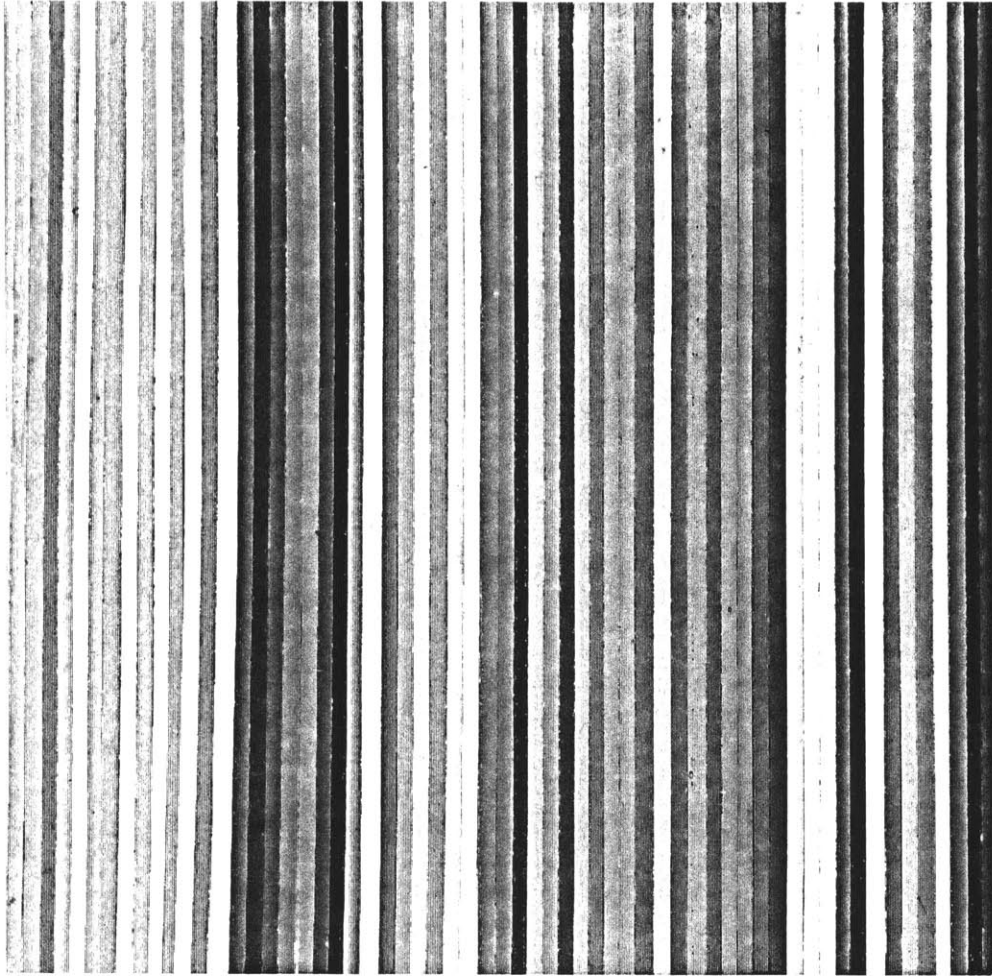
cn 15, Color-aid.

“The vivid detail is usually described as ‘striking’, ‘evocative’, ‘nostalgic’, ‘frightening’, it always has some emotional significance. It is mostly on a pre-verbal level. Only some exceptionally sharp, vivid details are capable of being ‘revived’ or ‘reproduced’, the remainder must be restructured.”<sup>10</sup>

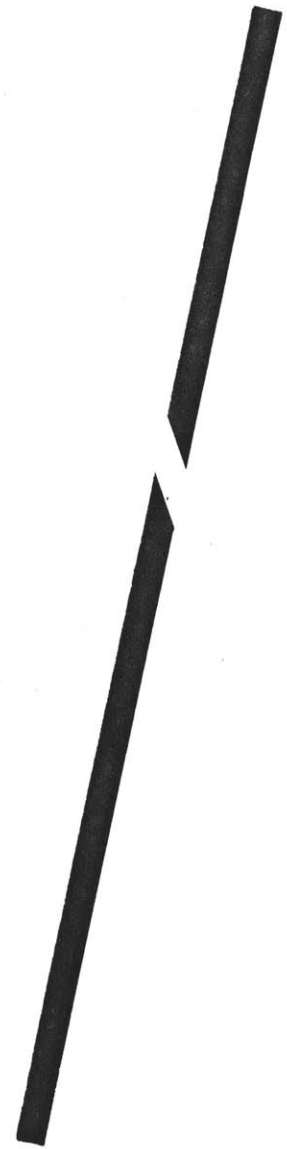
Each successive piece grew from the previous one. The present intruded. I found myself responding as much to the jazz on the radio and the snow falling outside as to recollections from two summers past. The colors became an intimate and direct expression of my inner conversations. They became a metaphor, colors interacting with colors — complex metaphors.

“Metaphor is a matter of imaginative rationality. It permits our understanding of one kind of experience in terms of another. Creating coherences by virtue of imposing gestalts that are structured by natural dimensions of experience. New metaphors are capable of creating new understanding and, therefore, new realities. . . .

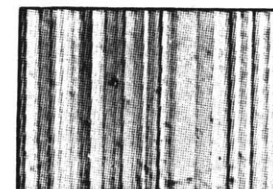
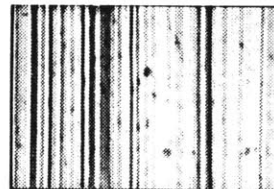
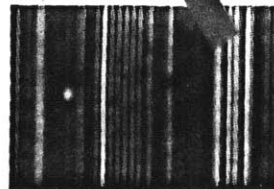
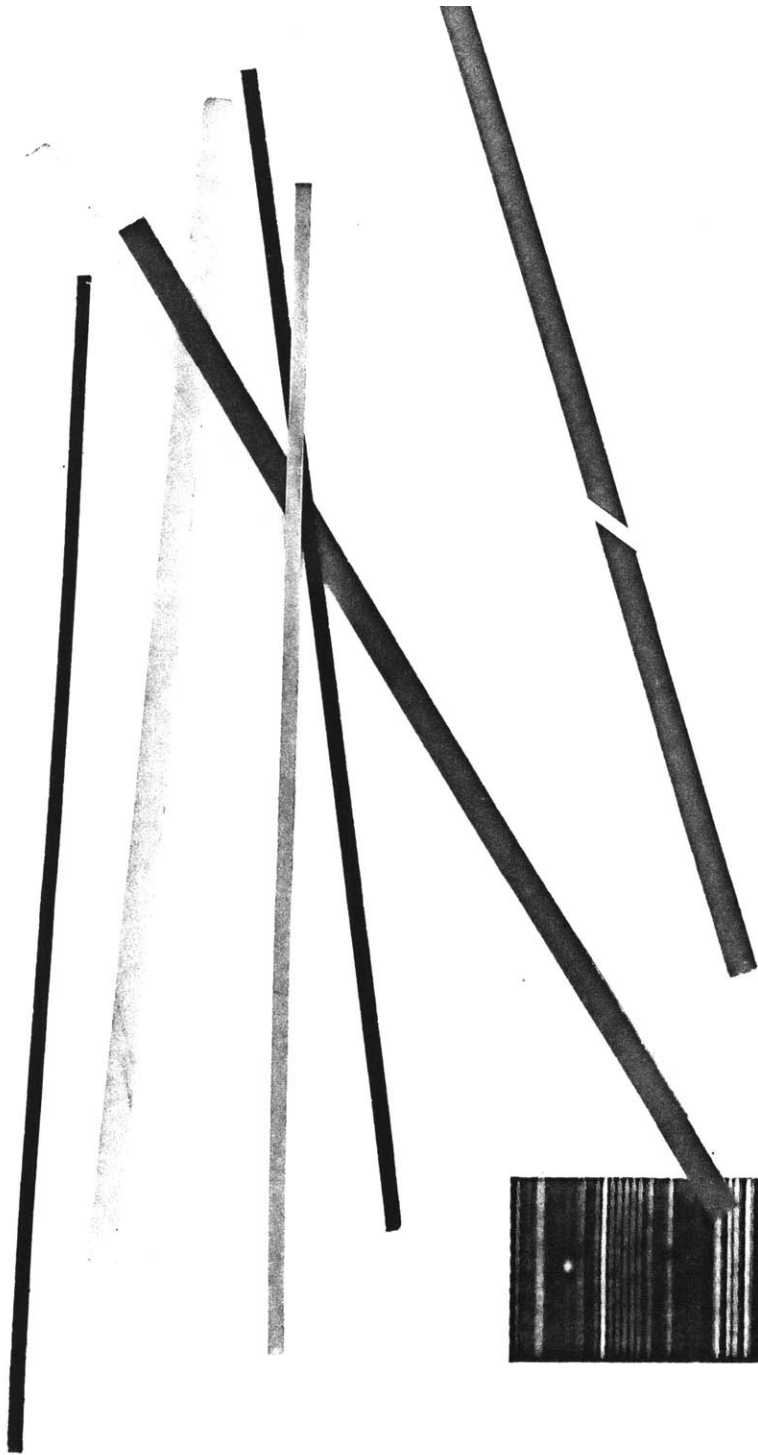
“But metaphor is not merely a matter of language, it is a matter of conceptual structure and conceptual structure is not merely a matter of the intellect. It involves all the natural dimensions of our experience, including aspects of our senses, color, shape, texture, sound, etc., these dimensions structure not only mundane experience but aesthetic experience as well. Each art medium picks out certain ways of structuring experience in terms of the natural dimensions.”<sup>11</sup>

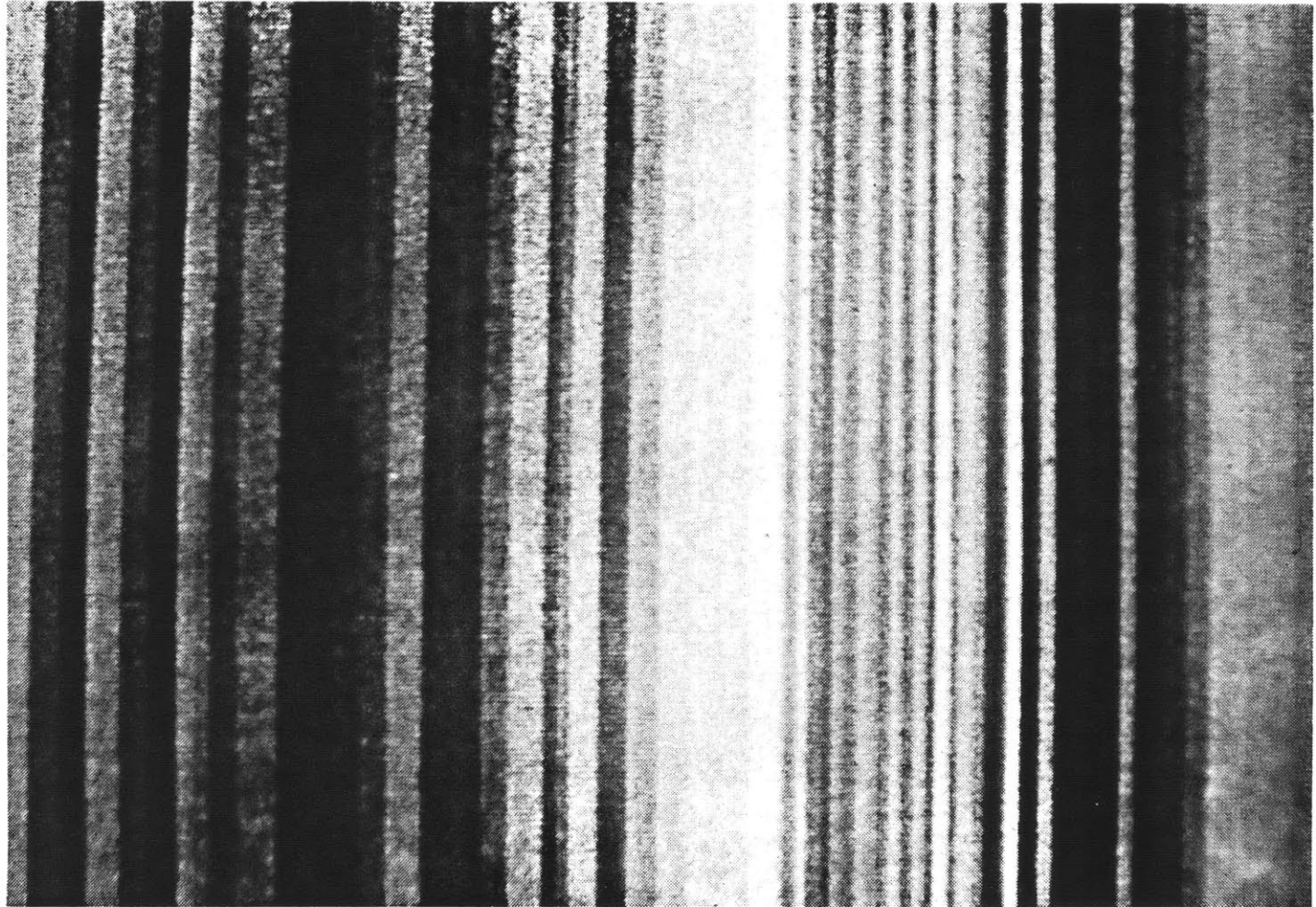


cn 16, Color-aid.

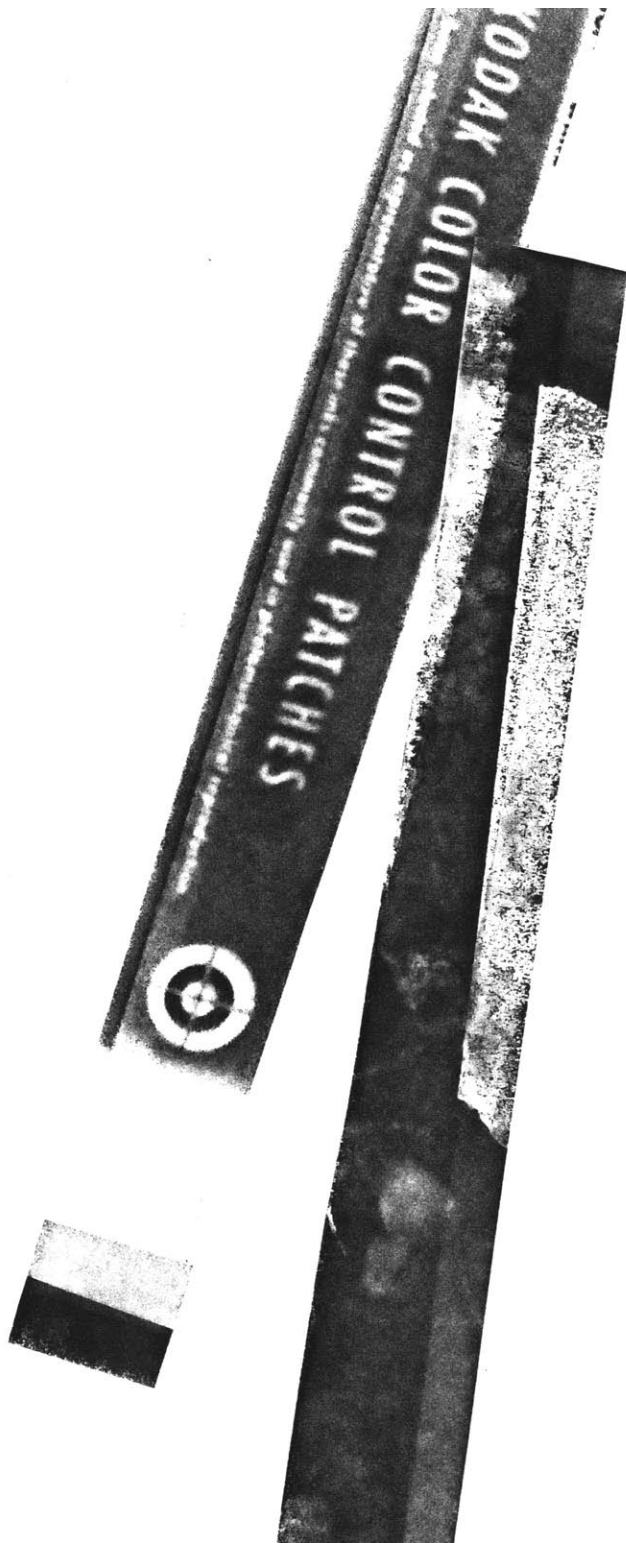


Metaphor helps us grasp those concepts which are abstract and not clearly delineated; i.e., experiences such as emotions, ideas, or times past. It lets us understand these concepts through associational terms and gives us ways to communicate. The color pieces were metaphors in that colors represented a range of complex feelings.





cn 17, 3M Color-key.



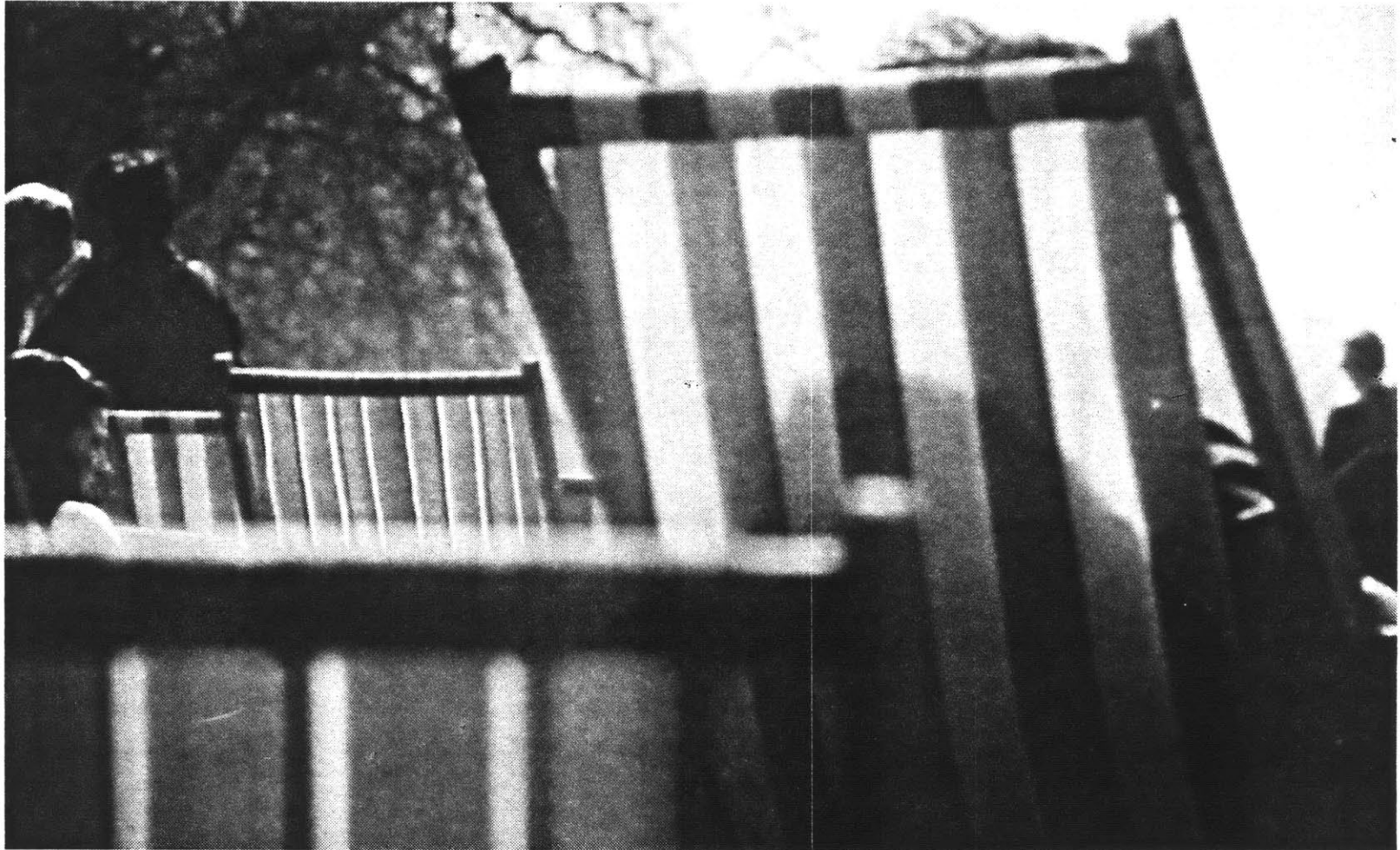
## **Reproduction and Print**

According to William Ivins: "Many of the most characteristic ideas and abilities of our Western civilization have been intimately related to our skill to repeat pictorial statements and communications."<sup>12</sup>

At present, the graphic artist is confronted with rapid advances in graphic technologies. In the area of graphic reproduction, new techniques offer extremely sophisticated electronic scanners and a high degree of color-correction technology. This presents a problem for the graphic artist who is often untrained and unfamiliar with new technology.

The project involved experiments with a range of media. My aim was to understand some of the basic principles in printing and reproduction technology (e.g., additive and subtractive color systems). The translation of personal color pieces from the original to print and the changes inherent in each successive generation were my main interest. "The image itself acquires its own history, and as successive prints unfold additional memories occur to insure new life, new layers of meaning."<sup>13</sup>

When I began, I was open to the possibilities in the various print media. The range included: color prints from 35mm negatives, Polaroid prints of the computer video display, and color xeroxes from slides.



cn 18, photograph.



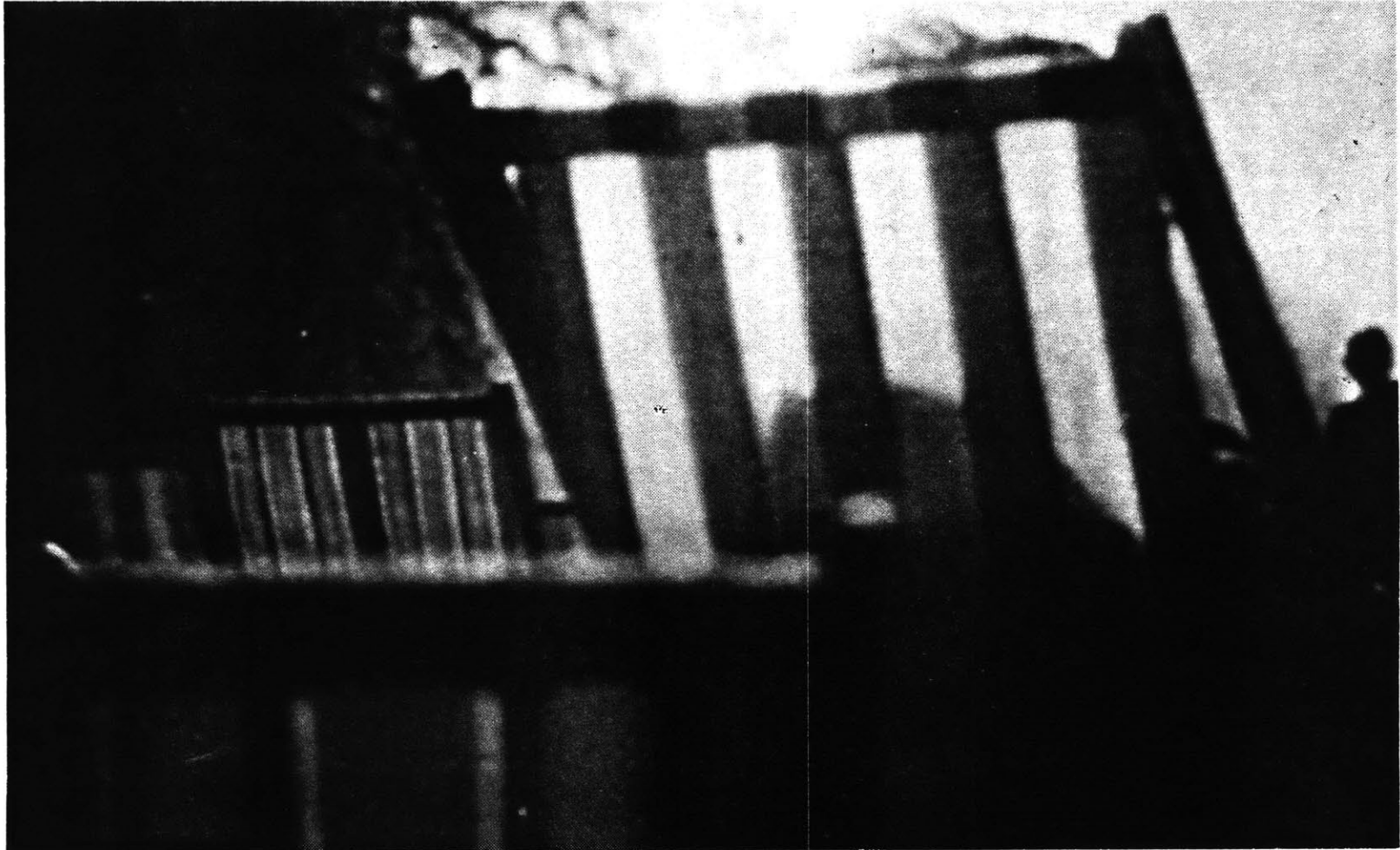
cn 19, photograph.  
cn 20, photograph.

I also experimented with color separation techniques and used 3M Color-Key and Kwik-print material for proofing. As Zimmerman describes in *Options For Color Separation*:

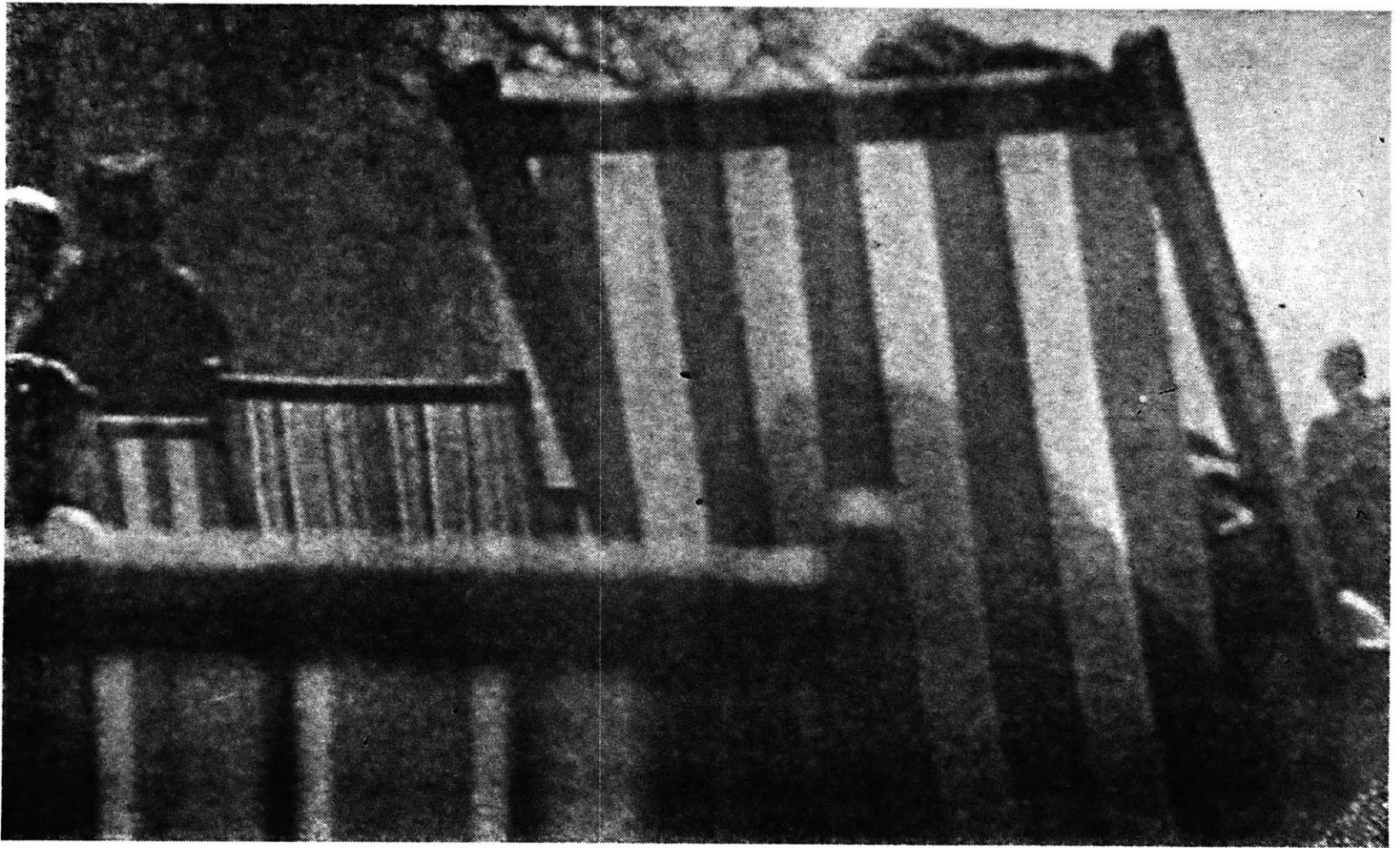
“The techniques are interpretive rather than reproductive. They have a life of their own and their beauty lies in their own specific qualities rather than in the qualities of an original artwork.”<sup>14</sup>

To begin the project, I selected a series of color notations from a contact sheet. I had them enlarged to 8 x 10 inch prints and was surprised by the results. The images were sharp and the colors were luscious, but the subject matter had changed. The content of the photograph now dominated. The pictures were about swimming pools and lawn chairs rather than about “color interaction”.

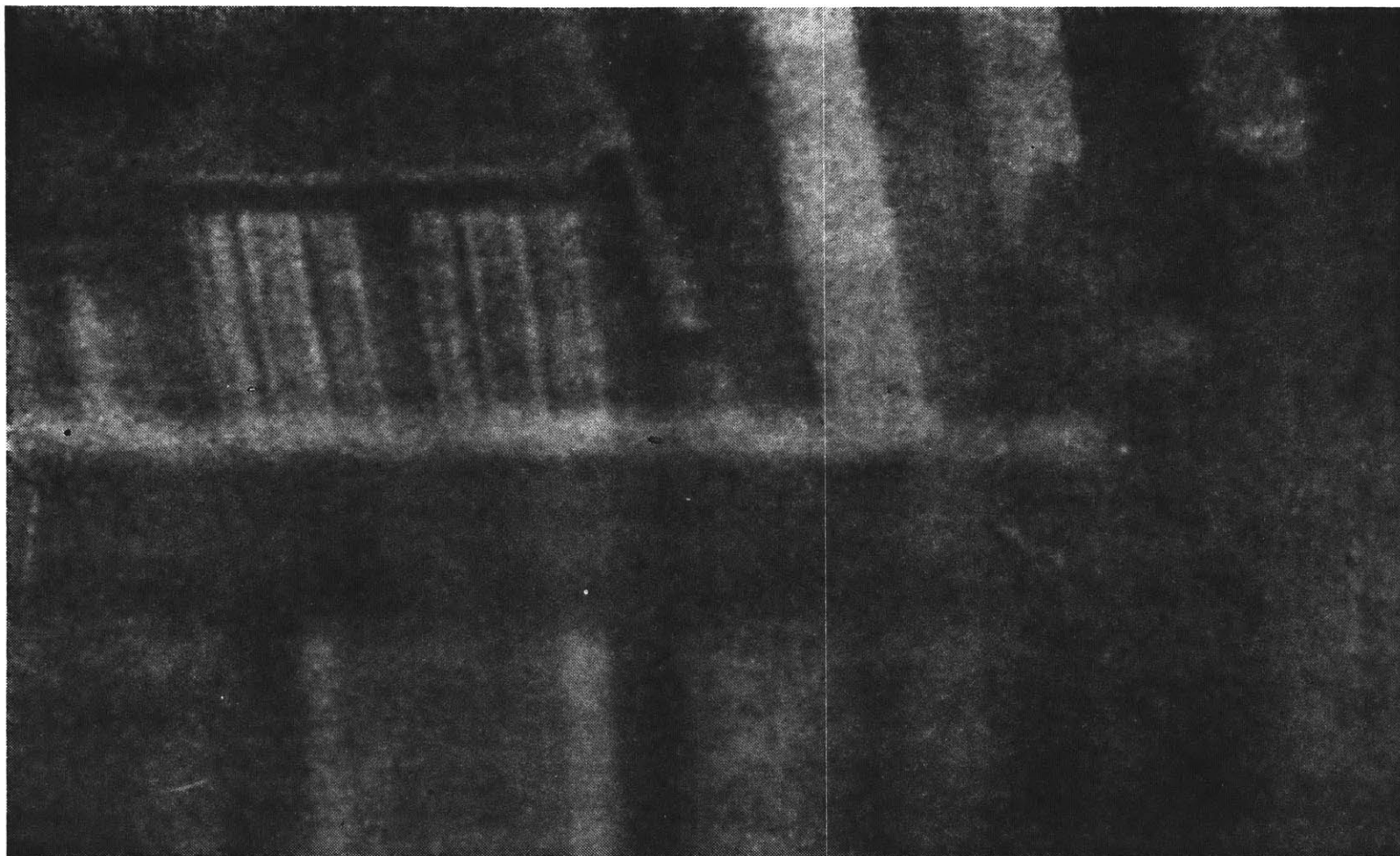
“The eye is prone to deception and the brain to illusion. When our expectations are aroused we are easily deceived and on the scantiest of sense data we will accept an interpretation which matches our inclination. Art and magic rely on both our tolerant senses and on our conditioned reflexes to create their illusion. The reproduction of natural phenomenon by mixing of pigments is essentially based on these fallibilities. These layers of colour can appear to be a multitude of subtle shades in modern colour photography, blue dye, as if by magic, has become an azure sky, it is a most effective illusion.”<sup>15</sup>



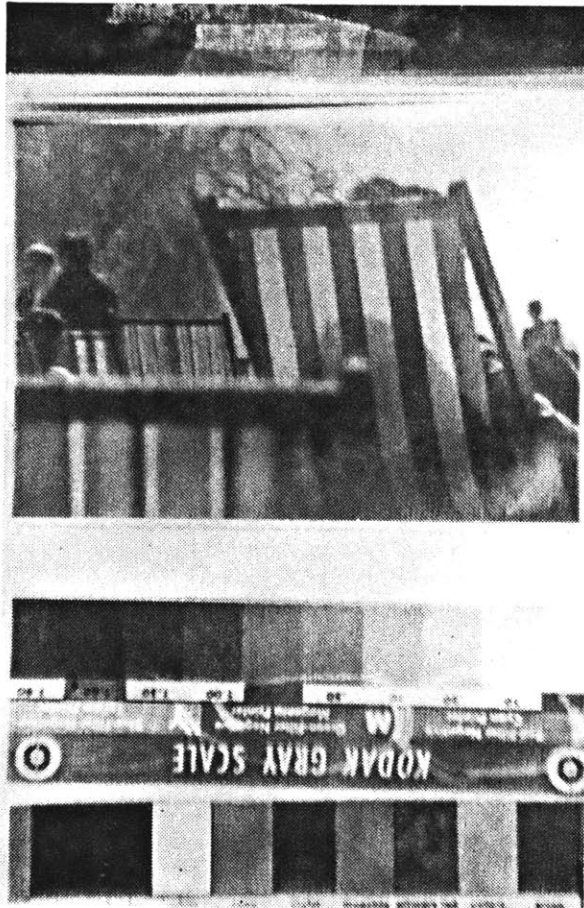
cn 21, digitized computer image.



cn 22, Kwik-print.



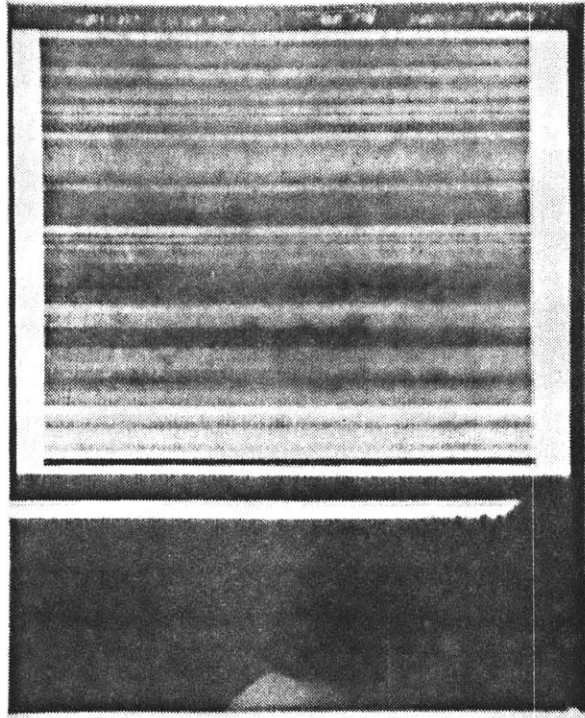
cn 23, Kwik-print.



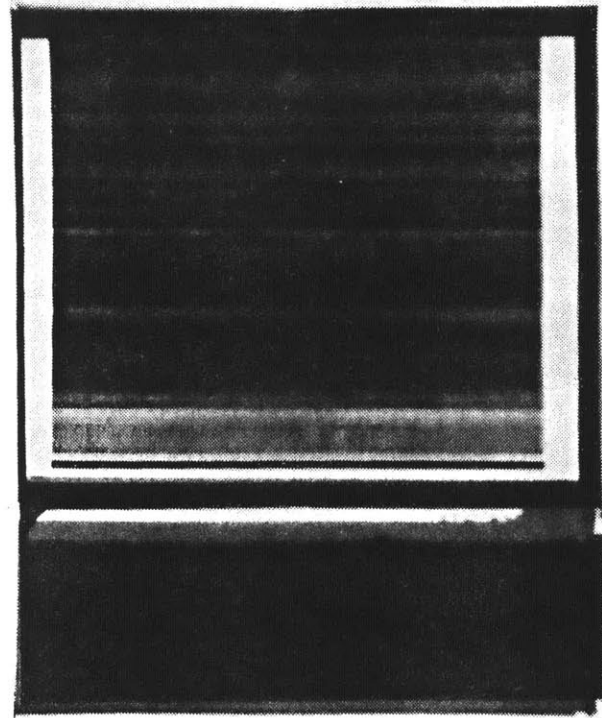
cn 24, Kwik-print.

The next medium I investigated was Polaroid 8 x 10 inch print materials to reproduce images from the computer video display. A camera made by Dunn Instruments takes information from the TV monitor on the frame buffer and relays it to a small TV monitor inside the camera. This information is then transmitted to the Polaroid print material. The results were unpredictable and disappointing. The colors were a poor interpretation of those from the computer video display. The experience of immediate retrieval of the 'original' with its rich and vibrant colors prejudiced my expectations for the Polaroid representation. Duane Palyka articulates this phenomenon when he states it with the following: "A digital picture can be saved, transferred and restored without any loss of information. To make a copy of a digitized image is to make another original, a bit is a bit and is transferred exactly."<sup>16</sup>

The results of the color separation experiments were equally unexpected. There are a number of ways to simulate color separation techniques used by the print industry. A very thorough explanation of these methods is explained in *Options for Color Separation*, edited by Phil Zimmermann. Essentially, "Photographic separations are made through sets of filters which absorb certain wavelengths of light, when the resulting negatives are printed over one another in their complimentary color a full image appears."<sup>17</sup>

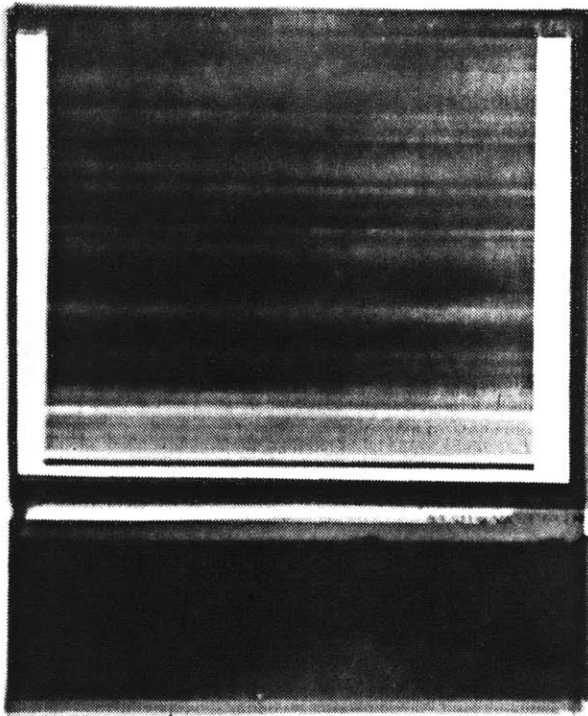


cn 25, 3M Color-key, yellow.



cn 26, 3M Color-key, yellow magenta.





cn 27, 3M Color-key, yellow, magenta and cyan.

The particular 'system' I worked out included: Kodak tri-x film, 25, 58, and 47 Wratten gelatin filters, a mezzotint screen and Agfa copyproof materials. The negatives were combined with Kwik-print.

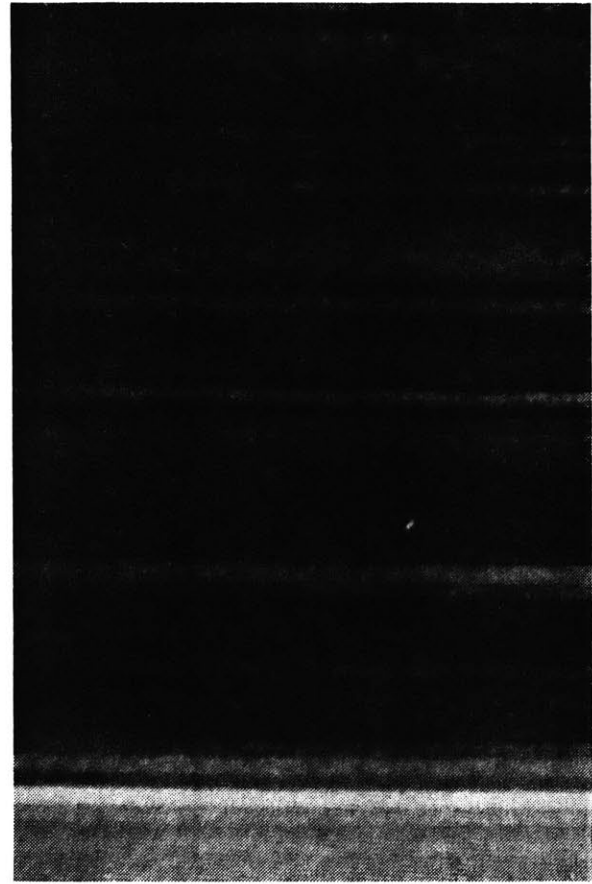
Only in a few prints was I able to achieve the dreamlike, hazy impressions that I was looking for. The proofing process was unreliable. The cyan, yellow, and magenta competed with one another so that the prints looked like a three color mezzotint screen rather than lawn chairs in the park.

Even when I had emotionally and intellectually accepted the prints as pieces in their own right, muddy prints are still muddy prints. The 'original' color pieces by both the Color-aid and the computer were a direct extension of my thoughts. The reproductions often seemed outside of my control. I found the results to be disappointing and frustrating.

I reached several conclusions from my printmaking activity. Through experience, I became familiar with the technical procedures. I further clarified those 'qualities' which give 'life' to a reproduction. I found that color and content vary from medium to medium depending on the translation. "There must be an essence . . . an integrity of an image which extends or transcends the process."



cn 28, photograph.



cn 29, 3M Color-key.

SATURDAY 3.21.81

QUIK-PRINT

# 1 TEST PRINT 1/2, 3 MINUTE CYAN 2 1/2  
 1/2, 3. 30 SECONDS MAGENTA 30 SECS  
 1/2, 3 YELLOW 2 1/2

# 2 FRESH SHEET  
 CYAN 2 1/2 MINUTES  
 MAGENTA 30 SECONDS

# 3 OLD SHEET CYAN 2 MINUTES

OK FOR UVA COLOR

MAGENTA DYE IS NOT WORKING - PROBABLY  
 A DYEING DAY  
 75% OF THE PROCESSOR WORKS

QUIK-PRINT - A REVOLUTIONARY / SIMPLE  
 PROCESS FOR  
 SOPHISTICATED COLOR

A REVOLUTIONARY / SIMPLE  
 PROCESS FOR  
 REVOLUTIONARY COLOR

A SIMPLE PROCESS FOR  
 REVOLUTIONARY COLOR

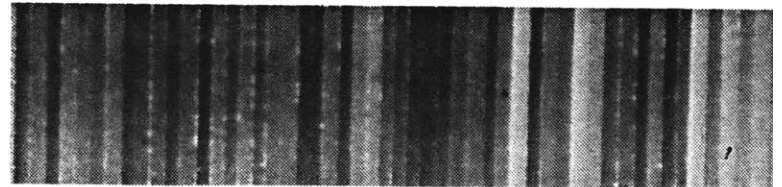
I WANT THE ART CONTROL OVER THE COLORS  
 AND CONTROL OF THE BEAMS AND DATES ON MY FINGERS

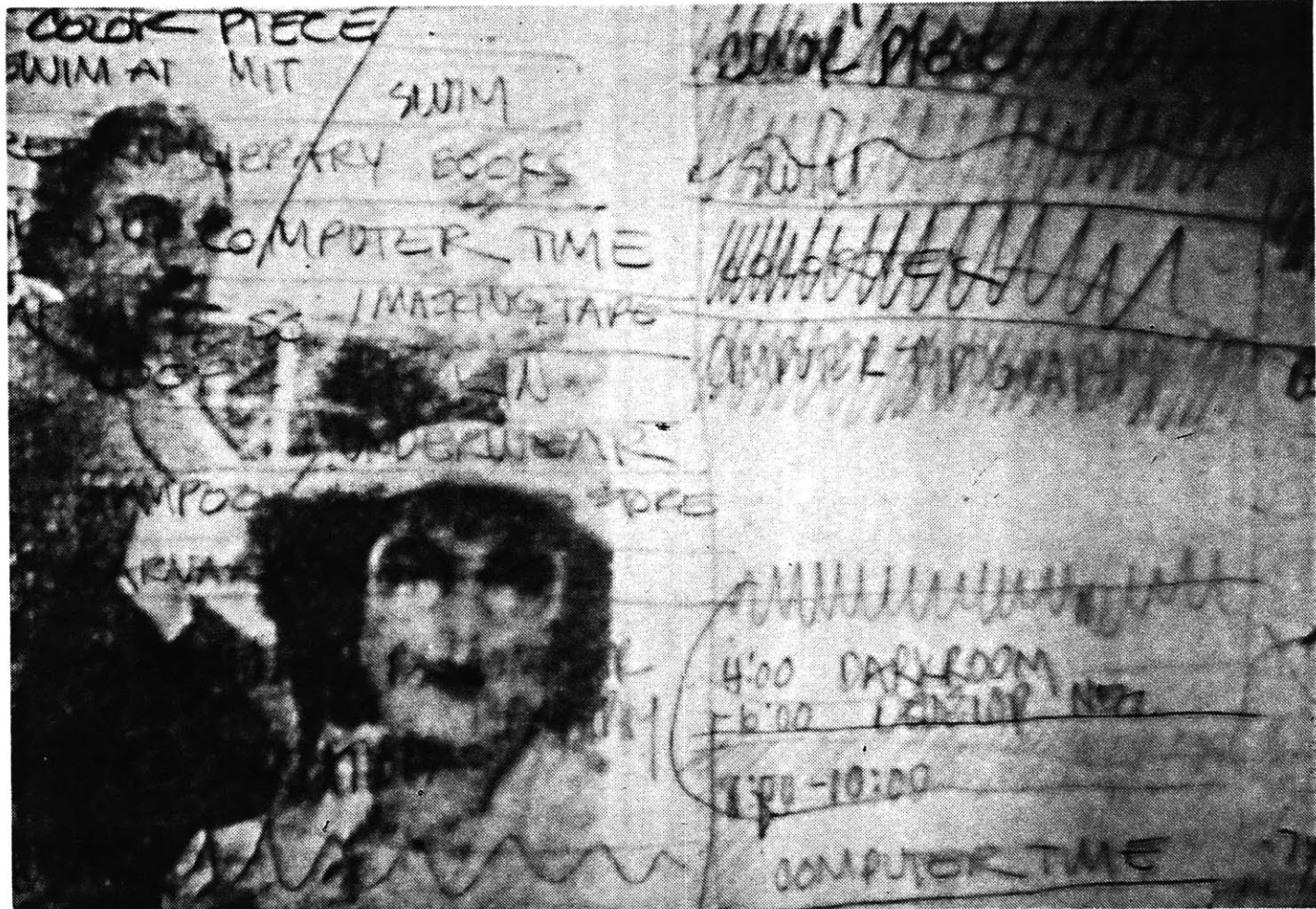
I HAVE A NEW BOOK - I DON'T KNOW HOW TO FORMAT IT

A RIG WITH KEYS  
 GA 1.5

DIFFERENT SIZE (1/4) BEAMS

The aim of my thesis project was not to perfect traditional photographic reproduction techniques; nor was it to solve the age-old issues of transforming an original to print. The experience of color 'in transition' reaffirmed my primary objective to generate personal color notations on the computer.





cn 30, color-xerox, journal.



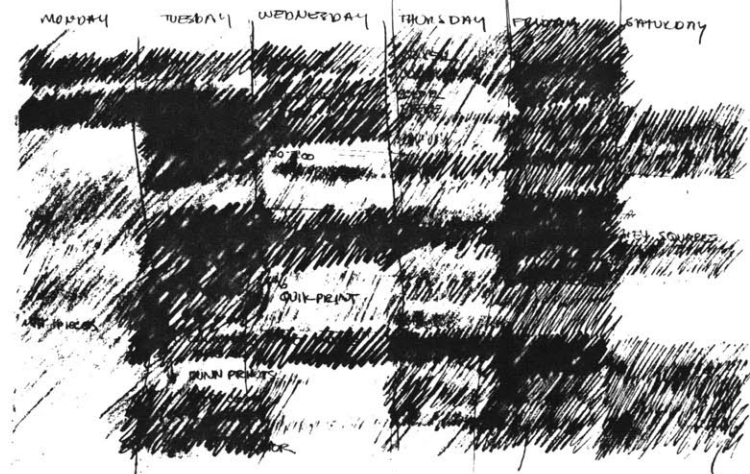
COLLAGE W/ COLOR XEROX  
 MEMORY/  
 GREYS/ COLOR. AID  
 QUICK PRINTS

3-2-81



FROM JOEL' DEVELOPMENT PROCESS  
 TRI-X SO THAT VERY  
 GRAINY

FINISH CLEANING → PLACE  
 OUT THE CLOSET → MEMORY



NEXT WEEK PRINT OFFSET  
 PAPER PAPER  
 WALL

AND AID WHITENESS (LOST) IS SO WHITE AS THE MEMORY EMBODIMENTS OF  
 OF WHITENESS MIND

Walter McCulloch  
 STRUCTURES

NOT QUITE THERE YET

FORMAT / PRESENTATION

A DISCIPLINE OF SPACE

3-22-81



NOTES

KARL GEESAYER  
DESIGNING PROGRAMMES  
HASTINGS HOUSE, NEW YORK, 1964

THE SUBJECT IS: CREATIVE ARRANGEMENT  
WHAT IS ESSENTIAL LIES IN BETWEEN

INVENTING RULES OF ARRANGEMENT  
THE FORMULA CREATES THE FORM

HOUSEWIFELY OCCUPATIONS: MAKING SOMETHING LINEAR INTO SOMETHING TWO-DIMENSIONAL  
I.E. KNITTING

THE TYPOGRAPHIC GRID IS A PROPORTIONAL REGULATOR FOR COMPOSITION.  
TABLES, PICTURES ETC. IT IS A FORMAL PROGRAMME TO ACCOMMODATE  
X UNKNOWN ITEMS TO FIND THE BALANCE, THE MAXIMUM OF CONFORMITY  
TO A RULE WITH A MAXIMUM OF FREEDOM.

THE BASIC UNIT - IS SIZE OF TYPEFACE INCLUDING THE LEAD.

DESIGNING PROGRAMMES MEANS FINDING A GENERALLY VALID  
PRINCIPLE OF INTEGRATED ARRANGEMENT.

THE FACT THAT THE ELEMENTS OF THE VISUAL ARE PERIODIC, AND THAT  
THE PERIODIC IS AN ESSENTIAL PART OF PROGRAMMING FINDS ITS  
CONFIRMATION HERE: A PHOTO GRAPH PUT TOGETHER FROM PHOTO GRAPHS.

FRIEDER NAKE "VISUAL OBJECTS GENERATED BY COMPUTERS AND DRAWN BY  
AUTOMATIC DRAWING MACHINES ARE SOLUTIONS OF  
AESTHETIC PROGRAMMES WHICH ARE WRITTEN BY HUMAN  
BEINGS AND IMPLEMENTED BY MACHINES."

"ALL ELEMENTS OF THE VISUAL ARE PERIODIC, I.E. CAPABLE OF BEING  
PROGRAMMED AT WILL"

REPLACING "PERIODIC" WITH "CONTINUOUS"

"COLOURS ARE OF THEIR NATURE CONTINUOUS."

THOUGHTS AND COMMENTS RELATED TO MY PERSONAL ACTIVITY, AN INTERIOR  
AND EXTERIOR MONOLOGUE. NO PROGRAMME. AN ACCOUNT FOR ME, PAGE 10  
AND MAYBE (I HOPE) A KEY FOR THE READER.

PICTURE-MAKING IS ONE VARIETY AMONG MANY OF DESIGN, OF  
INVENTION. THE WORKING-AREA IS DEFINED: THE VISUAL FIELD,  
OR MORE PRECISELY, VISUAL SENSATION. THE ELEMENTS ARE  
DEFINED: COLOURS. THE MEANS ARE GIVEN: PROPORTIONS.  
THUS THE CRAFT IS: TO COMBINE COLOURS, TO FIX  
PROPORTIONS AND TO LINK THE TWO TOGETHER, TO INTEGRATE.

THE POINT OF PROGRAMMING: CONSISTS IN FINDING SOLUTIONS TO  
INDIVIDUAL PROBLEMS ... TO REVEAL THE INNUMERABLE  
VARIATIONS THAT CAN BE OBTAINED FROM A SIMPLE STRUCTURE  
BY CONTROLLED MOVEMENT. THE ADVANCE FROM THE MATERIAL  
TO THE DESIGN.

MONDAY - APRIL 11

FRANCOIS STEUBER'S THE TRANSPARENT MODEL BY NATHAN  
LENS - WIDE OPEN AT A BOTH AND A GOTH  
A GOOD MESSAGE

INTERACTION OF COLOR.

I. COLOR RECOLLECTION - VISUAL MEMORY

IT IS HARD, IF NOT IMPOSSIBLE TO REMEMBER DISTINCT COLORS.  
THE NOMENCLATURE OF COLOR IS MOST INADEQUATE  
THOUGH THERE ARE INNUMERABLE COLORS - SHADES AND TONES  
IN DAILY VOCABULARY - THERE ARE ONLY ABOUT 80 COLOR NAMES

IN MUSICAL COMPOSITIONS,  
SO LONG AS WE HEAR MERELY SINGLE TONES, WE DO NOT HEAR MUSIC.  
HEARING MUSIC DEPENDS ON THE RECOGNITION OF THE IN-BETWEEN OF  
THE TONES, OF THEIR PLACING AND OF THEIR SPACING.

IN WRITING, A KNOWLEDGE OF SPELLING HAS NOTHING TO DO WITH AN  
UNDERSTANDING OF POETRY.

A FACTUAL IDENTIFICATION OF COLORS WITHIN A GIVEN PAINTING  
HAS NOTHING TO DO WITH A SENSITIVE SEEING,  
WORK WITH AN UNDERSTANDING OF THE COLOR ACTION WITHIN THE  
PAINTING.

SEEING WHAT HAPPENS BETWEEN COLORS.

WE ARE ABLE TO HEAR A SINGLE TONE,  
BUT WE ALMOST NEVER (WITHOUT SPECIAL DEVICES) SEE A SINGLE  
COLOR UNCONNECTED AND UNRELATED TO OTHER COLORS.  
COLORS PRESENT THEMSELVES IN A CONTINUOUS FLUX,  
CONSTANTLY RELATED TO CHANGING NEIGHBORS AND  
CHANGING CONDITIONS.

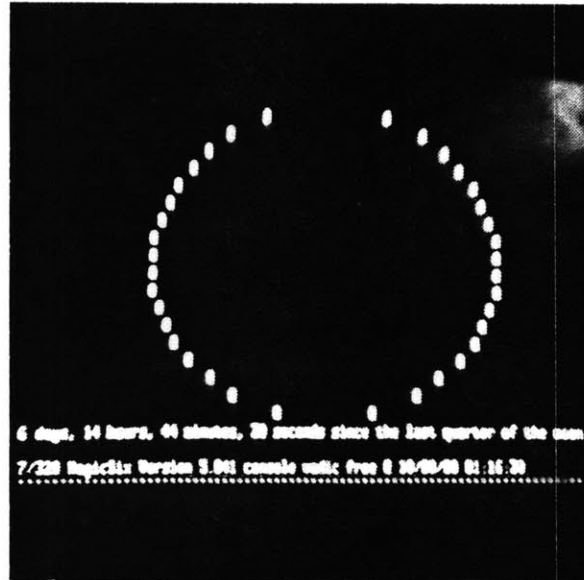
"COLOR IS THE MOST RELATIVE MEDIUM IN ART"

A. RELATIVITY OF COLOR

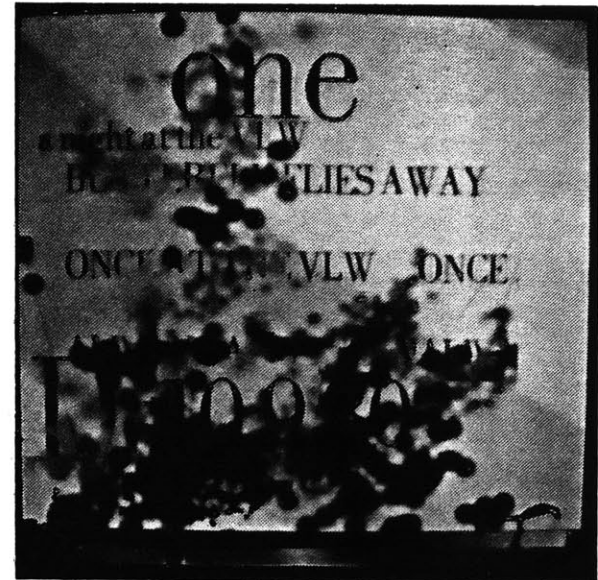
B. LIGHT INTENSITY - HOW AREABLE TO DISTINGUISH HIGHER AND LOWER  
LIGHT INTENSITY (USUALLY CALLED HIGHER AND LOWER  
VALUE) BETWEEN DIFFERENT RUES.  
THE DARKER ONE IS VISUALLY THE HEAVIER ONE, OR ONE CONTAINING  
MORE BLACK OR LESS WHITE.

COLOR PHOTOGRAPHY DEVIATES STILL MORE FROM EYE VISION  
THAN BLACK AND WHITE PHOTOGRAPHY. BLUE AND RED ARE  
OVER EMPHASIZED TO SUCH AN EXTENT THAT THEIR BRIGHTNESSES  
IS EXAGGERATED ... THE RESULT IS A LOSS IN FINER  
NUANCES AND IN DELICATE RELATIONSHIPS. WHITE RARELY APPEARS  
WHITE BUT USUALLY LOOKS GREENISH.

"EVERYONE HAS PREFERENCES FOR CERTAIN COLORS AND  
PREJUDICES AGAINST OTHERS. THIS APPLIES TO COLOR  
COMBINATIONS AS WELL."



first computer image.

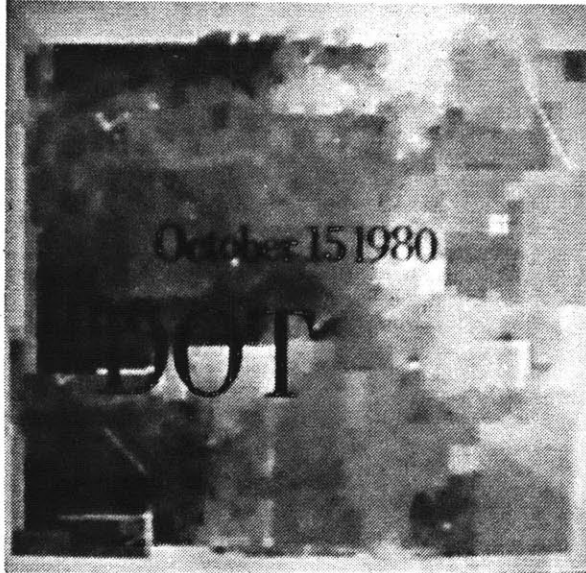


second computer image.

MagicSix not in operation at 00:00:00 Tuesday January 1, 0.

MagicSix in operation at 18:26:53 Sunday February 15, 1981.  
The Architecture Machine, 7/32Q MagicSix Version 5.041

Login Please



third computer image.

### **Computing Processes & Computing Machines**

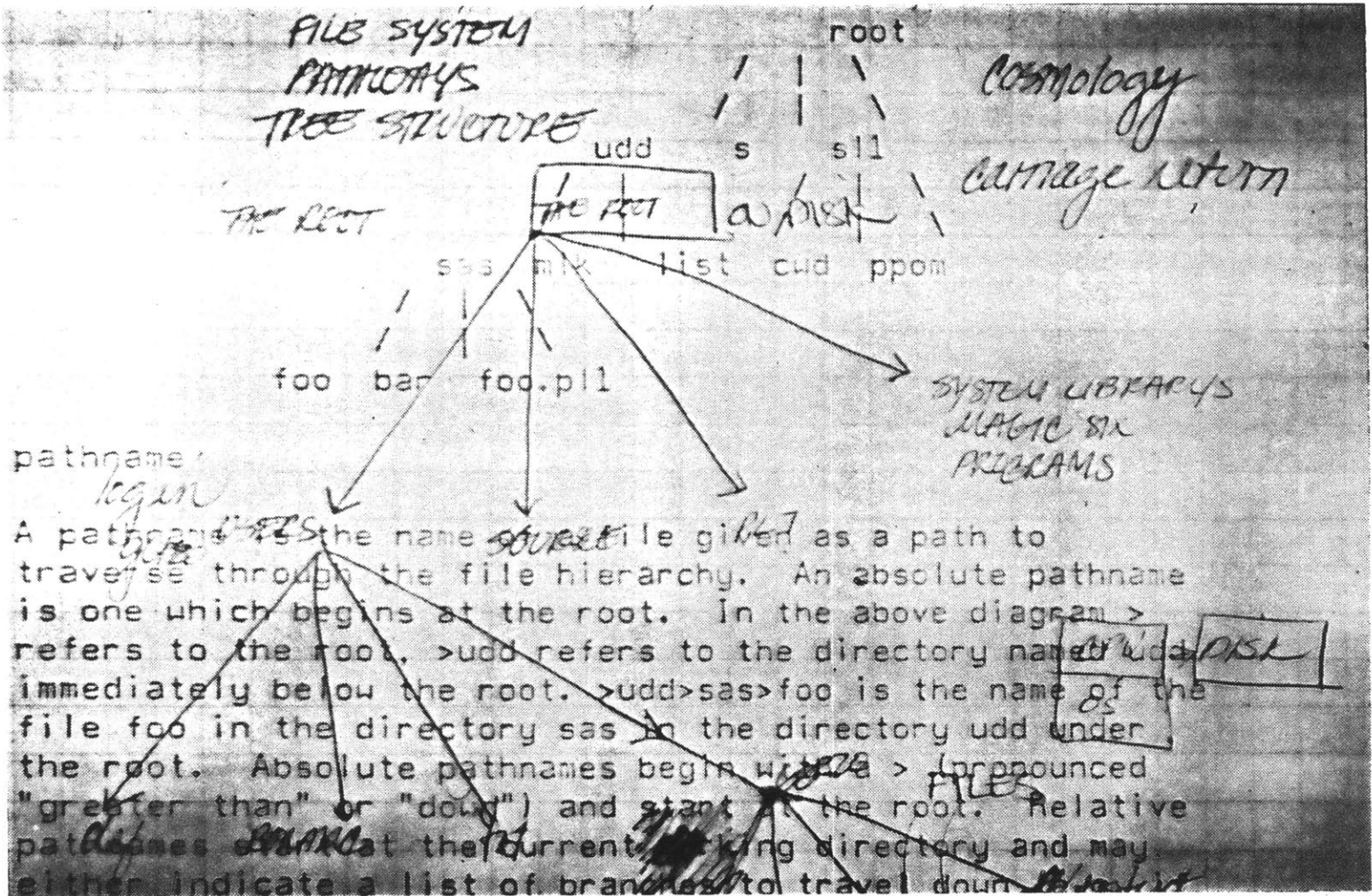
“Rarely have two disciplines joined forces seemingly to bring out the worst in each other as have computers and art.”<sup>18</sup>

“The relationship between artist and computer is important to people in the arts and science and to society as a whole.”<sup>19</sup>

Conflicting views of computer art force the graphic artist to question its potential. At present, the graphic arts industry is using sophisticated computer technology primarily in the area of typesetting and printing. More recent developments include page layout systems.

Over the past three years, the Visible Language Workshop has been developing a computer graphics system. It is an ‘interactive,’ full-color imaging system with the additional capability to photographically input images. Research has been focused on the “interaction of computer typography, layout, pagination, and color separation systems.” The workshop also projects advances in ‘hard copy’ output.

The following is an introduction to the computer graphics system at the Visible Language Workshop. I will recount, in a personal narrative, those experiences which are most vivid in my memory. After wading through the piles of notes, code, and diagrams, I arrived at a few key topics. They are: “getting on” the machine (getting past the initial machine intimidation), ideas about learning to program, and an account of my computer color notations.



cn 31, color xerox, computer notes.

TEXT  
 To: ...  
 From: ...  
 Subject: ...  
 When you come to the computer terminal you will see a screen  
 with the computer is called. It says "ready". The  
 computer should respond to typing some letters and the  
 answer is "login please".  
 At this point it is worth mentioning that you must follow  
 EVERYTHING you type with a "RETURN". This is the signal to the  
 computer that you have finished typing a command and wish the  
 computer to execute it.  
 So you should now type "login" followed by your login name. If  
 you don't have one, type anything. The computer will finally  
 give you the "ready" line which looks something like this:  
 ready (.....) Sur...

**Magic Six Commands**

- MACHINE PAM TV  
 P11

pl  
 9/1

```
LOGGING IN
On a terminal connected to Q, hit ^Z (control-Z). Wait. Then type ^M (control-M) when you
see the ready message:
ready 23:14:07 (4/20/1) >users>sam

STATUS COMMANDS

pr/l <filename> - prints the file on your box. eg 'pr >u>su>sam.startup.ec'

ls/l <starname> - lists all disk objects (files/segments, dirs, or links) matching the starname. The
starname can be relative or absolute. eg 'l *pl*' would list all pl files in your working dir.

psw/cwd <dir> - changes your working dir.

p or l - lists current users.

newproc/mp - what you do when things don't work. Starts a new process.

logout - log out

help <topic> - online documentation. eg 'help tv' or 'help ram*'

psr - print search rules.

asr <dir> - adds the directory to your search rules.

stly <options> - psychotherapy for your terminal. Try 'stly fox' if your typing disappears. Try 'help stly' to
learn about all the options.

SEGMENTS, DIRECTORIES, and LINKS:

copy/cp <old file name> <new file name> - copies a file.

delete/dl <starname> - deletes all segments matching the starname. eg '(for sadists) dl <sdms>*pl!'.

rename/rn <old name> <new name> - rename any object (segment, dir, or link).

link/lk <your name> <target pathname> - makes a link to a segment or dir.

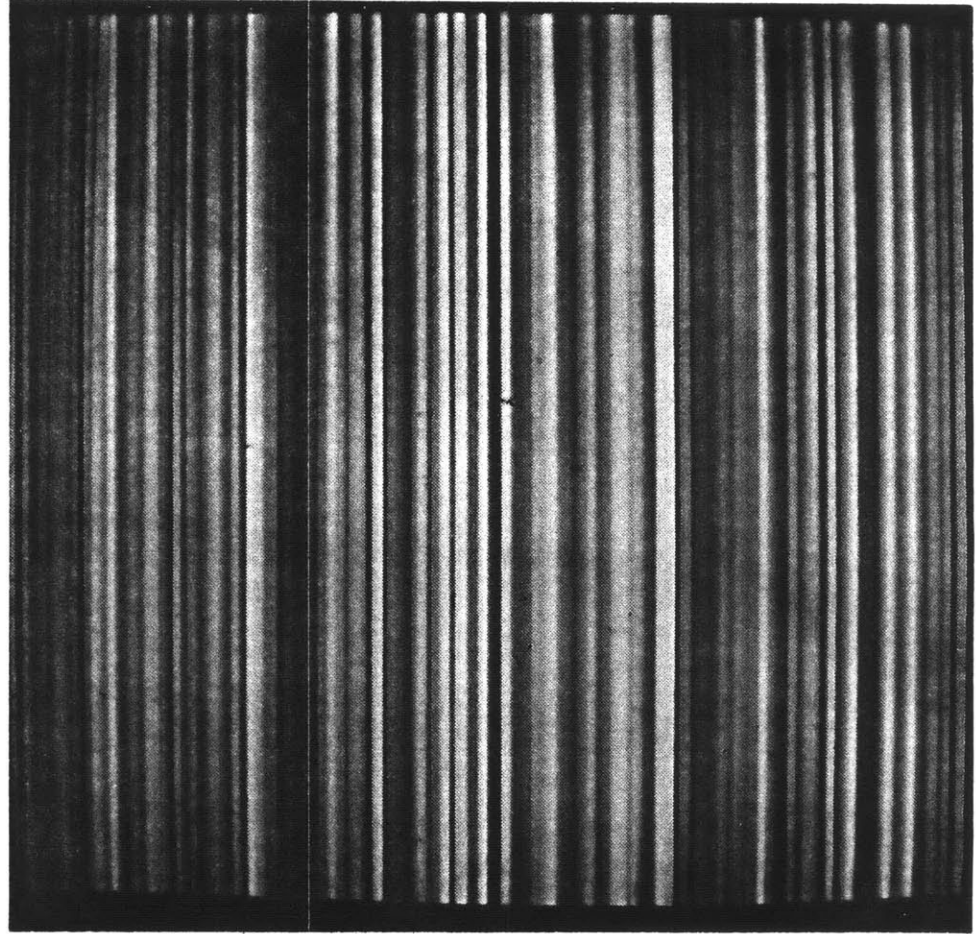
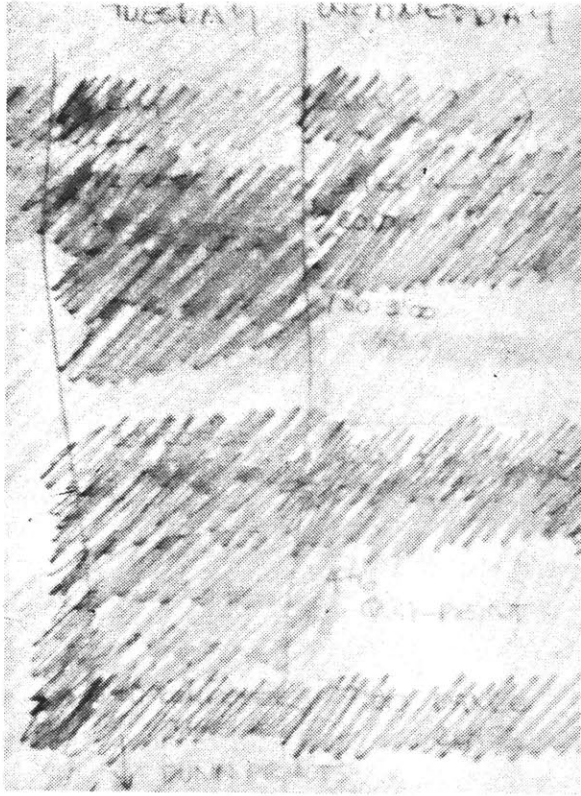
sanders <pathname> <font#> - prints a file on the sanders printer if you're lucky.

MAJOR SUBSYSTEMS:
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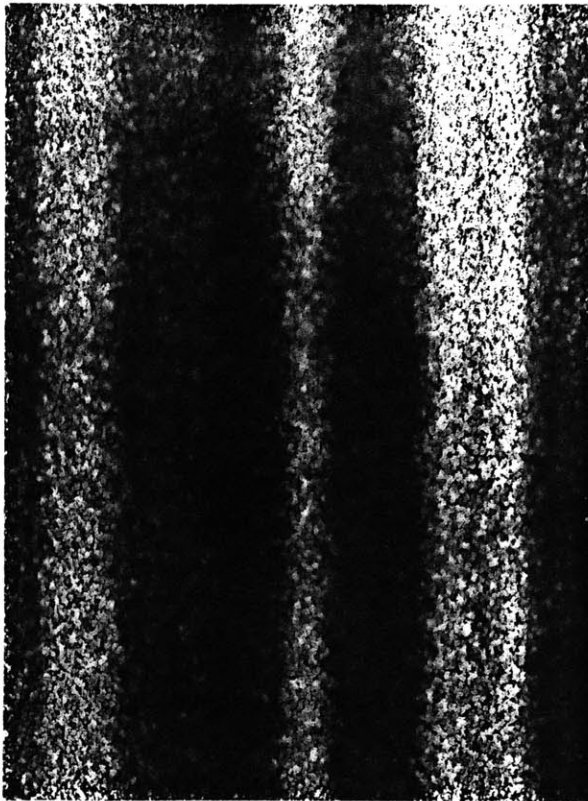
I started with a persistent desire to learn about and use the computer. I felt an intense 'machine phobia' and an emotional block toward mathematical expressions. I found the logic of the computing process easier to conceptualize than the computer jargon used to describe it. I was unfamiliar with the 'language'. A newcomer in a foreign country can communicate through gestures and other nonverbal cues. Machines, however, do not respond to a friendly smile. "They deflate the ego and show no respect for who you are and what you represent."

Personal associations I brought to words like 'memory' and 'word' served to distort my understanding of their use in the computer field. In addition "Conflicts between mathematical language and common language may account for the mistrust of intuition if there are several meanings floating around in someone's head."<sup>20</sup>

Direct confrontation with the machine proved futile. Once I managed to 'login' after reading fairly simple printed instructions, I would stare at the terminal and wonder . . . what next? . . . then type 'help'. Information would appear on the terminal screen with terms like 'trees' and 'roots'. I could not imagine how these correlated to the wires and machine parts that I could see inside the computer. In frustration, I would 'logout'.



cn 32, computer image.



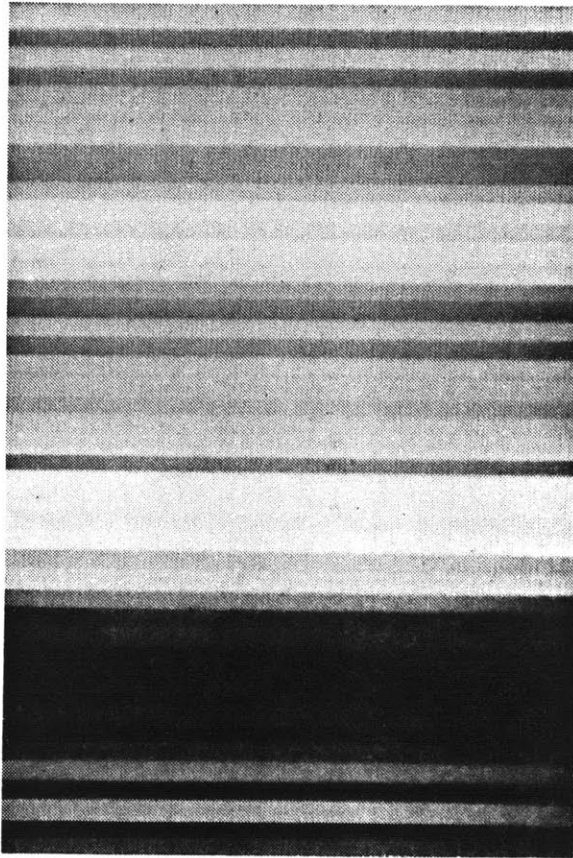
Initially, it was hard for me to sit at the machine for even fifteen minutes without feeling a tremendous sense of panic.

“Paranoia comes quickly on the heels of an anxiety attack. ‘Everyone knows,’ the victim believes, ‘that I don’t understand this. The teacher knows. Friends know. I’d better not make it worse by asking questions then everyone will find out how dumb I really am.’ This paranoid reaction is particularly disabling because fear of exposure keeps us from constructive action. We feel guilty and ashamed because we believe that our failure to comprehend this one new idea is proof that we have been ‘faking it’ for years.”<sup>21</sup>

I realized that if I wanted to ‘get anywhere’ I would have to start asking questions. But how could I ask the ‘right’ questions without exposing myself? In reply to my queries, programmers would reply: “eight bits are a byte; find help files in directories; down u down search rules; commonly defined a computer is an electronic machine that accurately and rapidly calculates by storing instructions and information or data, simple or complex math formulae — it has the capacity to compile, correlate, and select data. . . .” Needless to say, I was overwhelmed.

It was time to rethink the situation. I wanted to be an ‘intelligent user’ and felt that an understanding of programming was essential in the creative and speculative use of computer graphic systems.





cn 33, Polaroid computer image.

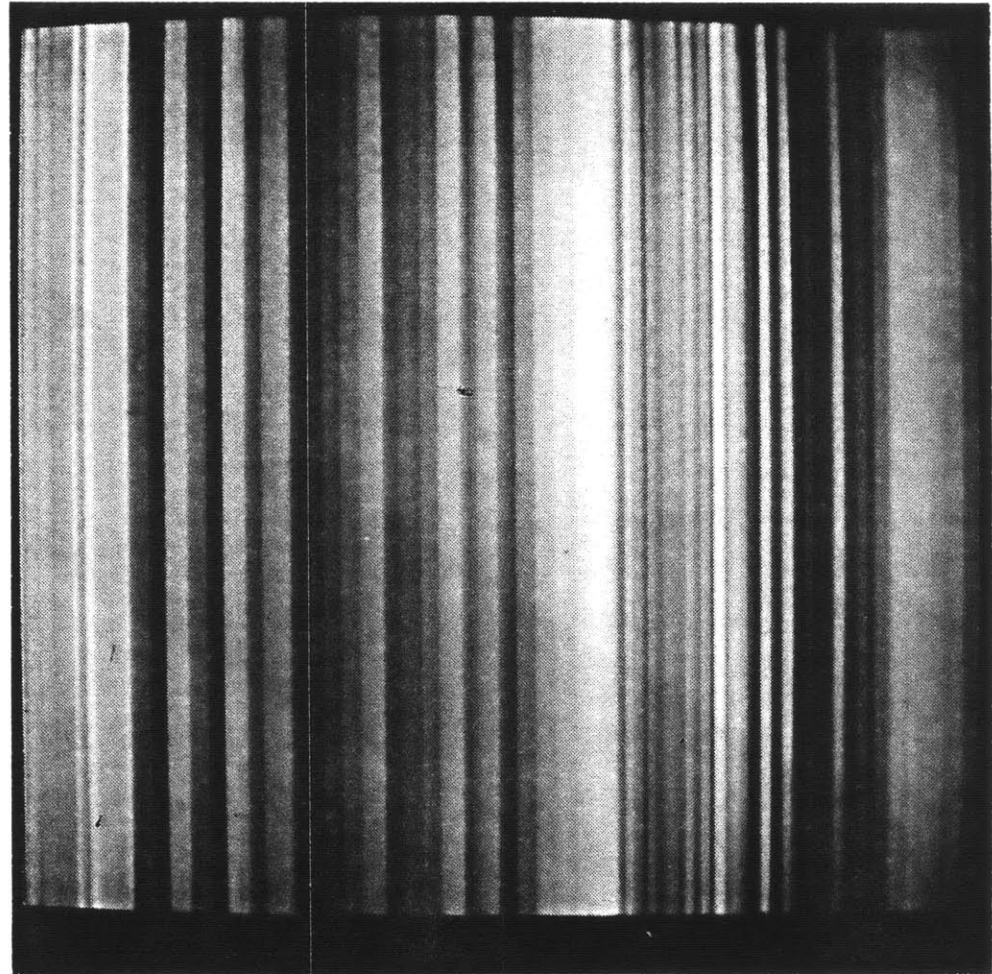
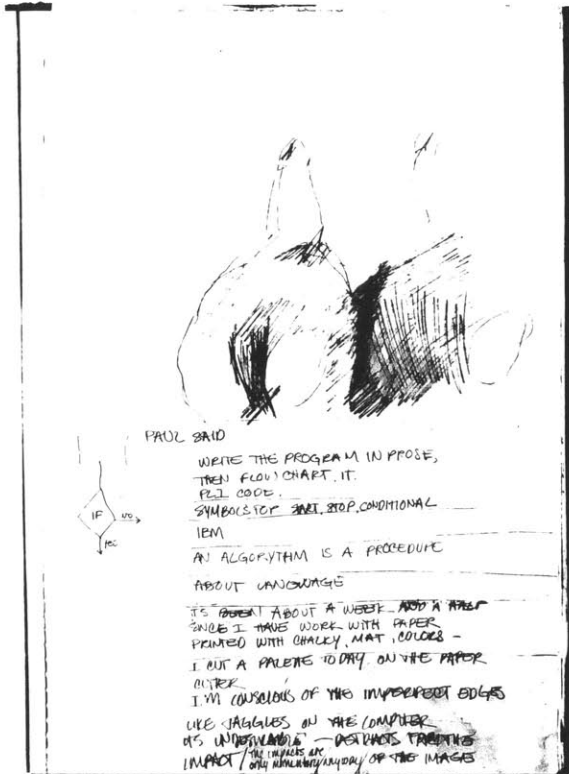
Professor Ron MacNeil gave me a helpful suggestion to begin with 'lines'. Lines, part of the basic vocabulary of every visual artist, were a familiar place to start.

The first program I wrote was called 'five-lines1'. I had to mentally transfer my image of drawing lines on paper to the computer screen. I thought of the programs as pencil on paper design exercises. The immediacy of the visual results was tremendously gratifying. They invited further exploration.

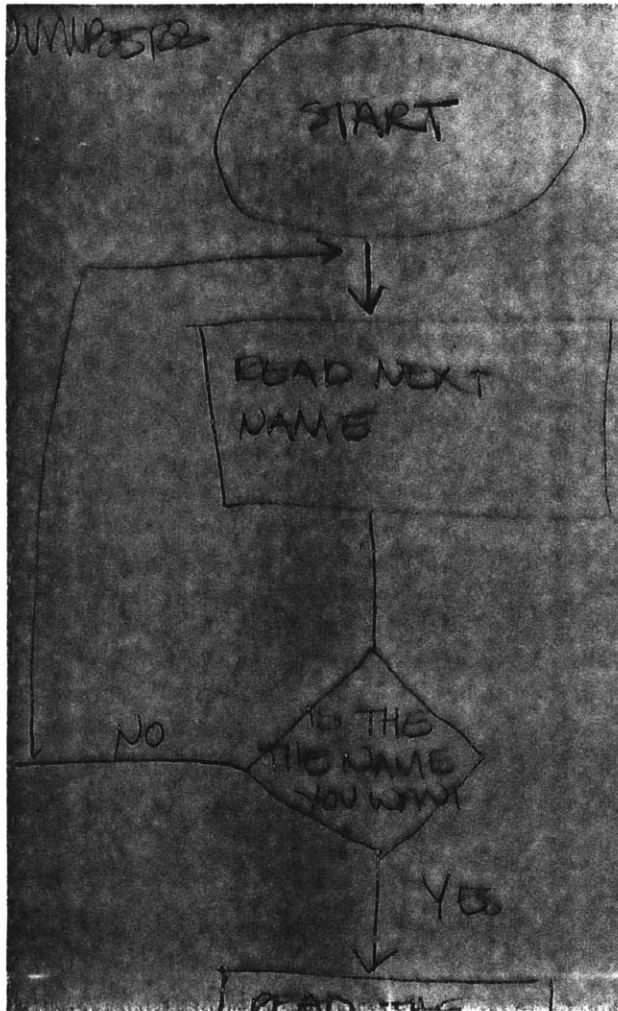
Duane Palyka, in his essay in *Artist and Computer*, provided a helpful way of thinking about programming.

"Both the creation of paintings and the creations of computer programs are creations of objects — objects constructed out of ideas, concepts, and craftsmanship. The aim is a finished work with strong structure, patterns, imagery, and textures. Good structure in a program can bring as much esthetic satisfaction as good structure in a painting. The code and structure of a program reflects the personality of the person generating it. Both programming and painting are problem solving processes to which each person has his own approach."<sup>22</sup>

However, the scientific process and the artistic process differ on one basic point: the artist allows feedback from the process to dictate changes in his goals, whereas the scientist interprets the results as defining a state of his progress toward his predefined goals.



cn 34, computer image.



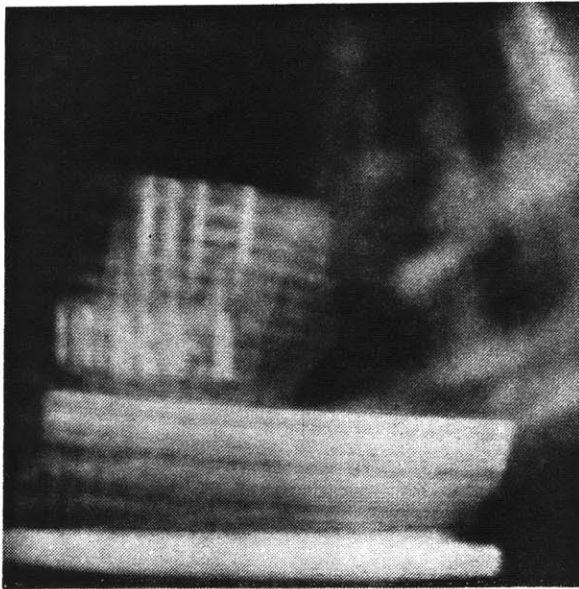
The field of graphic design presents a bridge between the artistic approach, often intuitive and emotion-based, and the logical analytic approach. “Design is the process of inventing physical things which display new physical order and organization. It is form in response to function.”<sup>23</sup> The process of design is based on methodical problem solving.

Christopher Alexander and Karl Gerstner offer two views:

“The ideas of diagrams are the key of creating form. It is an abstract pattern of physical relationships which resolves a small system of interacting and conflicting forces, and is independent of all other forces, and all other possible diagrams. It is the idea that it is possible to create such abstract relationships one at a time — and to create designs which are whole by fusing these relationships . . . Because the diagrams are independent of one another, you can study them and improve them one at a time, so that their evolution can be gradual and cumulative. More important still, because they are abstract and independent, you can use them to create not just one design, but an infinite variety of designs, all of them free combinations of the same set of patterns.”<sup>24</sup>

“Instead of solutions for problems, programmes for solutions. . . . To describe the problem is part of the solution. This implies: not to make creative decisions as prompted by feeling but by intellectual criteria. The more exact and complete these criteria are, the more creative the work becomes. The creative process is to be reduced to an act of selection. Designing means: to pick out determining elements and combine them.”<sup>25</sup>





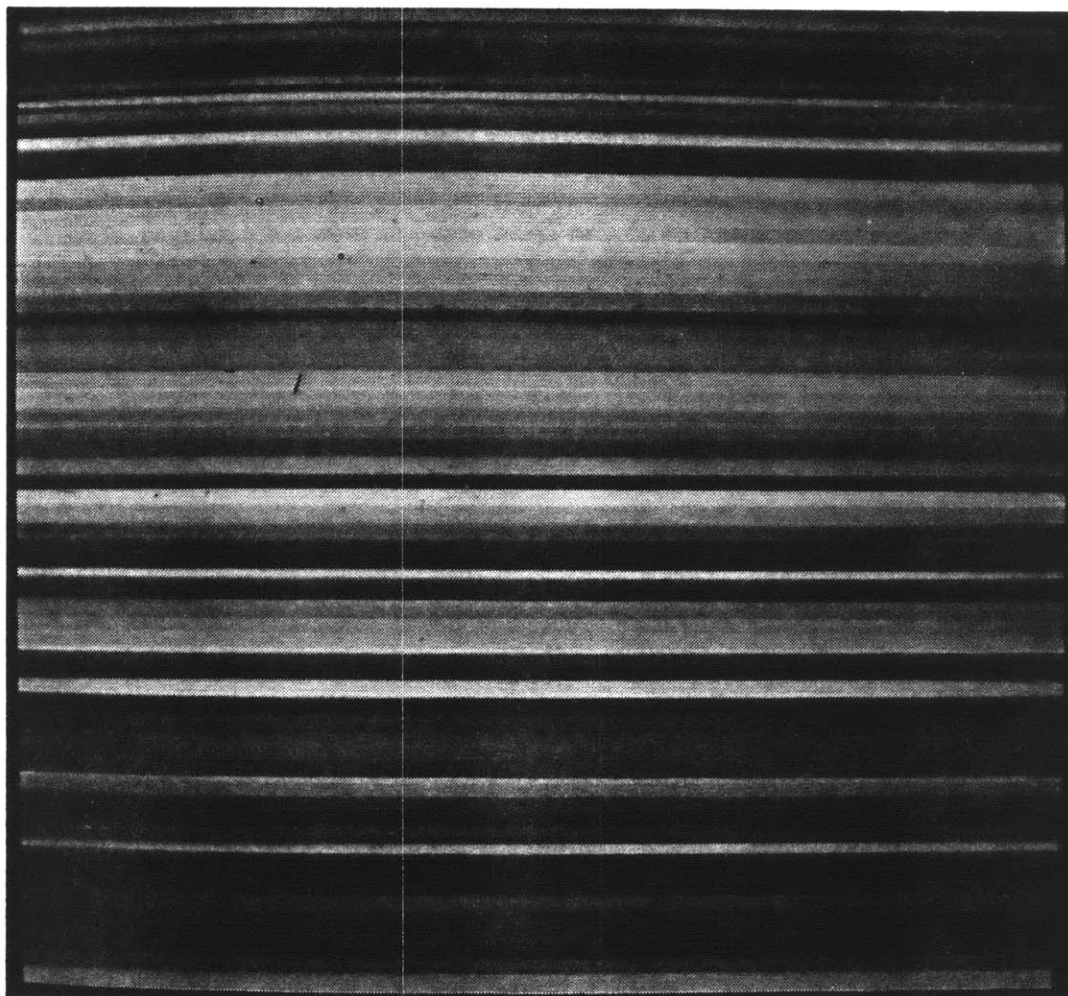
The same process is evident in computer programming. A computer program is a procedure which, when compiled and run by the computer, performs a certain function. Programming involves a step-by-step process which must be as explicit and unambiguous as possible. These are similar choices a designer must determine when faced with a new job. Elegant programming and elegant design have a similar aesthetic.

A second factor which helped me overcome my initial problems with the machine was the patient help from the programmers at the VLW. Consequently, I was able to spend more time working at the computer.

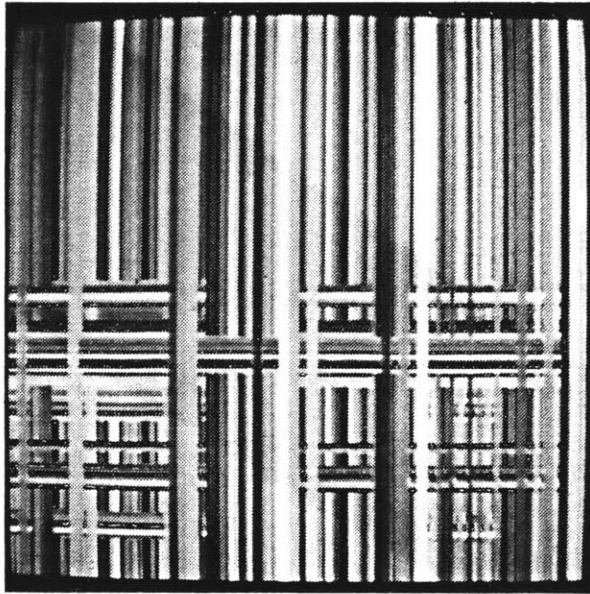
I had to remind myself to take small steps. I began with the idea of filling a square with rectangular bands of color. After I programmed 'square1', which generated vertical bands of random colors, I began to modify it. First, I changed the width and directions of the bands. Then, I was ready to 'load' a specific palette.

The TV colors began to 'speak' . . . each morning I composed a new color piece which was an extension of my thoughts. I began to see the color pieces as conversations.

A conversation is defined by its participants and the way they interact. It consists chiefly of a certain kind of activity — namely talking. Each



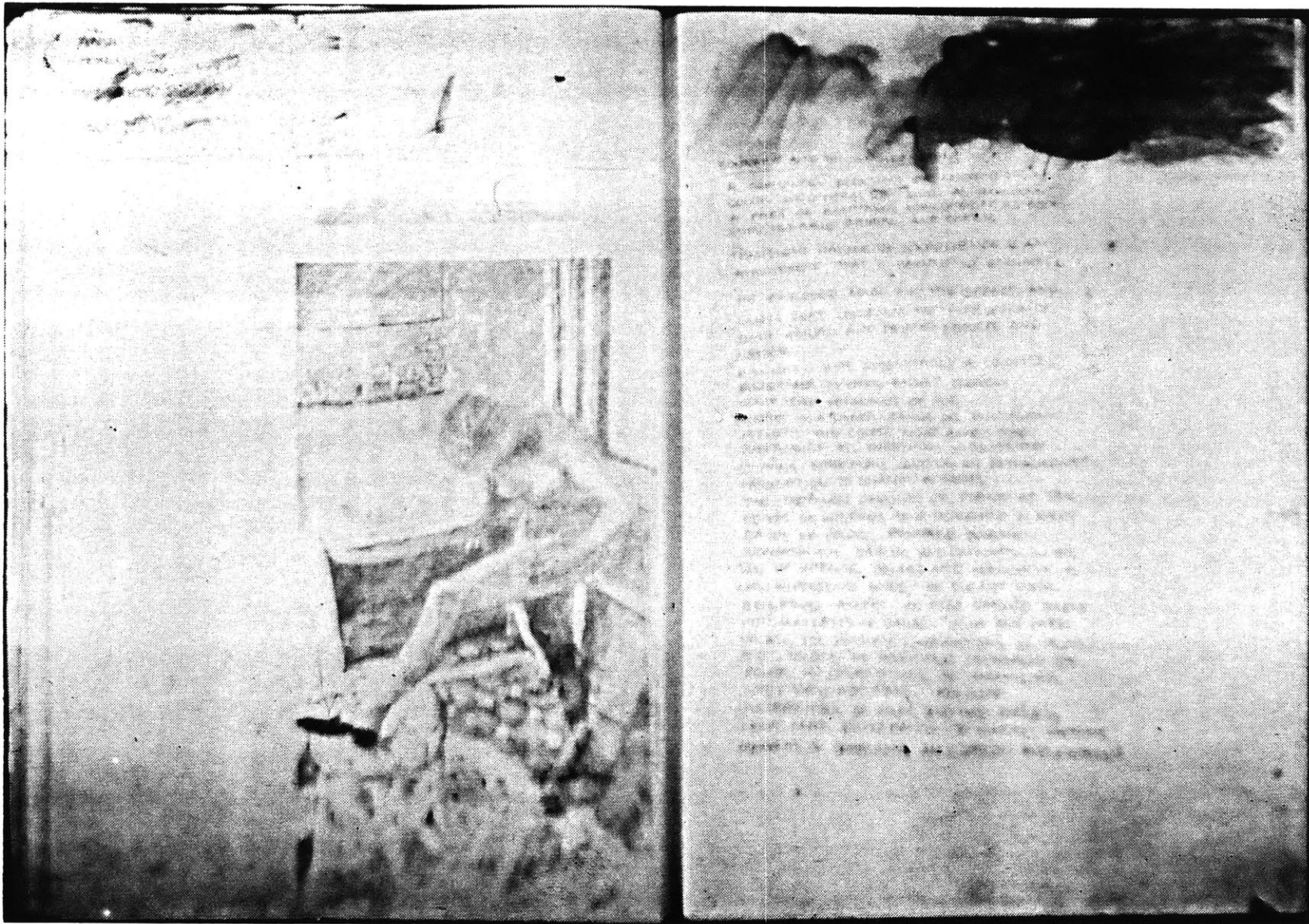
cn 36, computer image.



cn 37, computer image.

turn at talking forms part of what ultimately becomes a coherent message. There is a general pattern for all conversations. Typically, they have a set of initial conditions and then pass through various stages, including at least a beginning, a central body, and an end. The red, green, and blue signals of the computer video display are the speakers.

Conversations follow a linear sequence with the general constraint that they alternate. Some overlapping is permitted and there are lapses where one speaker doesn't take her or his turn and the other speaker continues — a monologue is the result. The color pieces follow these general patterns and sequences as well.<sup>26</sup>



## **Conclusion**

“You go places, getting from place to place, you have to get to places on time, you find new places in the course of moving. . . .”<sup>30</sup>

Throughout the course of my thesis project, I discovered many possible directions. Often, when I thought that I was actively pursuing one direction, another one of equal importance would surface. There are many possible future detours and directions.

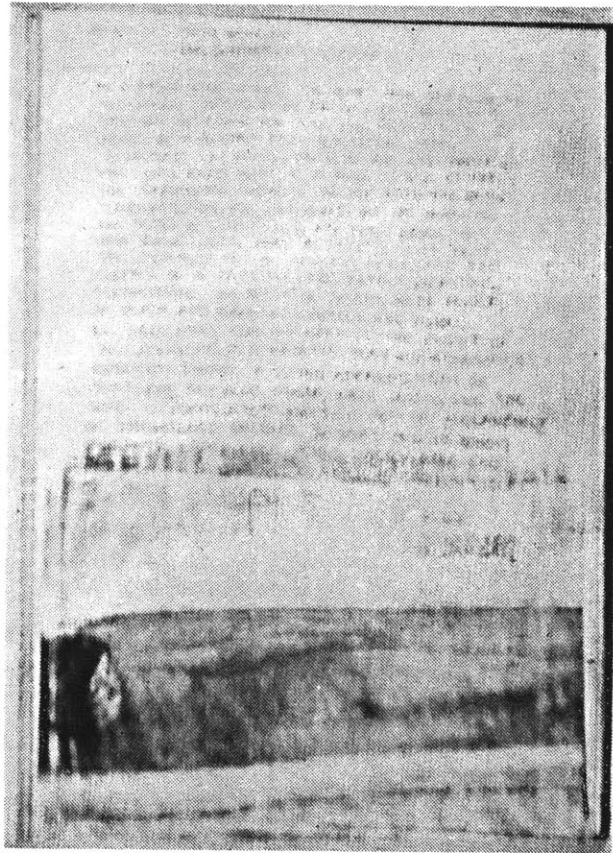
The key issue which I explored was the use of ‘soft copy’ for personal ‘idea sketching’. I took to the computer a familiar and personal element which were my color notations. This provided a starting point toward learning, using, and understanding ‘computer aided design’.

To end, I would like to include thoughts by William Gass, Northrop Frye, and Jacob Bronowski. These thoughts might guide and inspire the graphic artist/designer who faces the challenge of using computer technology.

On color:

“As I should like to spell the theory now, the musician, for example, counting on the auditory laws, creates a structure he knows the mind will materialize in sounds of a certain kind. The musical score represents the music’s form in ink and paper. The disc represents it in wiggles and rounds. The performance troubles the air with the same structures. And our mind hears. But the qualities we taste in wine, touch and feel along the thigh while loving, hear as singing,





sniff from the steaming pot, or observe articulate the surface of a painting, are, in fact, relations. Furthermore, the sense of passion or of power, of depth and vibrancy, feeling and vision, we take away from any work is the result of the intermingling, balance, play and antagonism between these: it is the arrangement of blues, not any blue itself, which lets us see the mood it formulates, whether pensive melancholy or thoughtless delight, so that one to whom aesthetic experience comes easily will see, Schopenhauer suggests, sadness in things as readily as smoky violet or moist verdigris."<sup>28</sup>

On art and science:

"If we split the world in subject and object, we tend to assume that the objective is real, the world of waking consciousness that we can agree we are seeing and that the subjective world is one of dreams and resentment and wishes and desires and similar products of illusion. But this distinction between reality and illusion arises only when we stare at the world passively. . . . But when we think of reality in terms of a world to be remade, we find that we need a model or imaginative vision of what we are trying to achieve. The world of dream and fantasy can be a source of models as well as illusions, and models are the first products of the chaos of hunch and intuition and guesswork and free association out of which the realities of art and science are made. This is the starting point of all creative work in any area, however different the products may be."<sup>28</sup>

"All created works, in science and in art, are extensions of our experience into new realms . . . The work of science or of art moves us profoundly, in mind and in emotion, when it matches our experience and at the same time points beyond it."<sup>30</sup>



## **Glossary**

basic design exercises: Simple, visual problems to study the basic vocabulary of design; i.e., composition, balance, texture, line, and color.

bit: [bi(nary)(digi)t]

The smallest unit of information in a computer; it has only two possible values — a one or a zero.

Color-aid: Mat silkscreened paper, 202 colors in a pack, 24 hues, 4 tints of each hue, 3 shades of each hue, 8 greys, plus black and white.

data organization:

- bit - a one or a zero in computer memory
- byte - a group of bits; normally eight
- word - one or more bytes of data
- field - a group of words containing related data
- record - a group of related fields of data
- file - a group of related data records
- volume - all the data on one disk or tape
- database - all the data in a computer system

frame buffer: The frame buffer at the VLW is made by Grinnell systems. It is a piece of memory which takes bits converted to video signals fed to a color video monitor to form the image. The frame buffer memory is continuously scanned and displayed on the monitor. The way the bits are set affects the way the three color guns excite the phosphors on the tube surface.

hard copy: Print on paper.

interactive: Describes the use of a computer in which the computer responds immediately to the input from a person.

memory: Method of storing information. It is made up of thousands of individual cells, each of which contains a "bit."

soft copy: What you see on the video display.

## Footnotes

1. Lazlo Moholy-Nagy, *Vision in Motion* (Chicago: Paul Theobald, Publishers, 1961), p. 200.
2. Rudolf Arnheim, *Visual Thinking* (Cambridge: Harvard University Press, 1964), p. 14.
3. Nancy Gardner, personal journal, 1978.
4. Josef Albers, *Interaction of Color* (New London: Yale University Press, 1963), p. 1.
5. Ibid., p. 5.
6. Ibid., p. 1.
7. Johannes Itten, *The Elements of Color* (New York: Van Nostrand Reinhold Company, 1970), p. 10.
8. Ibid., p. 26.
9. Ibid., p. 94.
10. Arthur Koestler, *The Act of Creation* (New York: MacMillan Company, 1964), p. 525.
11. George Lakoff and Mark Johnson, *Metaphors We Live By* (Chicago: University of Chicago Press, 1980), p. 235.
12. William M. Ivins, Jr., *Prints and Visual Communication* (Cambridge: MIT Press, 1973), p. 1.

13. Jasper Johns, notes.
14. Philip Zimmermann, ed., *Options for Color Separation* (Rochester: The Visual Studies Workshop Press, 1980), p. 1.
15. Jorge Lewinski and Bob Clark, *Colour in Focus* (Suffolk: Fountain Press, 1976), p. 70.
16. Duane Palyka, *Artist and Computer*, Ruth Leavitt, ed. (New York: Harmony Books, 1976), p. 61.
17. Philip Zimmermann, ed., *Options for Color Separation*, p. 1.
18. Nicholas Negroponete, ed., *Reflections on Computer Aids to Design and Architecture* (New York: Petrocelli/Charter Publishing, Inc., 1975), introduction.
19. Duane Palyka, *Artist and Computer*, Ruth Leavitt, ed., p. vii.
20. Sheila Tobias, *Math Anxiety* (Boston: Houghton Mifflin Company, 1978), p. 45.
21. Ibid., p. 56.
22. Duane Palyka, *Artist and Computer*, Ruth Leavitt, ed., p. 62.
23. Christopher Alexander, *Notes on the Synthesis of Form* (Cambridge: Harvard University Press, 1964), p. 1.
24. Ibid., p. 5.

25. Karl Gerstner, *Designing Programmes* (New York: Hastings House, Publisher, Inc., 1968), p. 9.9.
26. George Lakoff and Mark Johnson, *Metaphors We Live By*, p. 78.
27. William Gass, *On Being Blue* (Boston: David R. Godine, Publisher, 1978), p. 67.
28. Northop Frye, "The Bridge of Language," *Science* (April 10, 1981: Volume 212, Number 4491), p. 131.
29. Jacob Bronowski, *The Visionary Eye* (Cambridge: MIT Press, 1978), p. 32.
30. Nancy Gardner, personal journal, 1981.

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