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An image study--visual expression in communication

by

Robert Burgess Boyd

A Thesis Submitted to the
Graduate Faculty in Partial Fulfillment of
The Requirements for the Degree of
MASTER OF SCIENCE

Major: Journalism and Mass Communication

Signatures have been redacted for privacy

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I. INTRODUCTION

The photographic image is a primary force in the
communications activities of today's society. Whether it be
the still photograph, the television image or motion picture,
today's citizen finds himself surrounded, indeed bombarded
with image communication.

Whether one picks up a newspaper or a magazine,
turns on a television set, or travels the nation's streets
and highways, he encounters one or more of the many forms
of image communications.

The communicator operating, as he does, in a
visually oriented society, cannot be fully effective if he
is ignorant or casual concerning the potential impact of
visual communications.

Image communication is a complex phenomenon. It is
therefore necessary for the image to be understandable
to the audience for which it was intended.

For the communicator to create an understandable
image, it is imperative that he understand the nature of
forces operating to give the image its apparent position of
importance in today's world of communication.

He must have knowledge of how man has used the

image in the past, and how the practice of image communication has evolved.

He must be fully aware of exactly how it is that the image can be made to perform its function of communication. There are many facets involved in this complex problem, just as there are many functions in the process of communication which the image can be called upon to perform.

It is the intention of the author to concentrate upon the role and the potential of the still photograph, to the apparent exclusion of the television and motion picture media. Let this in no way be construed to suggest either that the principles or assertions contained in this study apply only to the still photographic medium or that the still photographic medium is somehow isolated from, or more important than, the other media. Indeed, the case is just the opposite. All are inextricably intertwined, and many of the principles herein discussed apply to all visual media.

Additionally, it will be apparent to the reader that much of the discussion concerning the history, the theory, and the use of the still photograph is drawn from references primarily concerned with the fine arts.

This was no accident, for photography is more than communication alone. The photograph can be, and often is

an artistic work in the truest meaning of the term.

The author will present a portfolio of still photographs in which it is intended that the qualities of communication and art will be combined. It is hoped that while the reader is observing the images, he will be the receiver of both a factual visual communication and an expression of a point of view.

II. A HISTORY OF MAN'S USE
OF THE IMAGE

The history of man's use of imagery is indeed
long, pre-dating the dawn of written history by more
than seven thousand years.

The first evidence of man's effort to create pic-
tures can be found in the caves of southern France and
northern Spain, and are generally conceded to date from
10,000 B.C. or earlier. These efforts, however, were
probably not directed by a need to communicate, nor is it
likely they were made for decoration or amusement. To the
Stone Age man, the environment was a frightening unknown, and
experts agree that the images of bison, horses, cattle and
other animals "were produced as part of a magic ritual to
ensure a successful hunt...to bring the animal itself
within their grasp."[1]

As man gradually learned to bring more and more
of his environment into his grasp, he learned to domesticate
his food supply, a revolutionary discovery. This step,
gradual as it was, signalled a new era that has been termed
by the historian as the Neolithic Age. Not only did man
herd his animals, but he learned to till the soil. He

became less dependent upon the hunt for food and the environment thereby became less threatening. He learned to make crude tools, and with those tools fashioned primitive shelters that freed him from the cave.

His imagery continued, however, to be ritualistic in its creation and expression. It included drawings and statues used in ancestor worship, fertility rituals and battle. Man was still seeking to control the unknown by creating what he thought to be its likeness.

The era to which we often refer as the "dawn of recorded history" began in Egypt around 3000 B.C. Early imagery was primitive in nature--bas relief on flat stone or wall. The endeavors of Egyptian artists were tightly controlled and their works began to take on a certain standardization, as if on the verge of turning into hieroglyphics.

As the society progressed, so did the imagery, though it was still tightly controlled by the Pharoahs. Eventually, the symbols did in fact turn into picture writing, and in the absence of an alphabet, the ancient Egyptian adopted these symbols as writing for use in recording events.

The Egyptians created many images and objects of art which contained beauty in their own right, but these creations were still religious in nature and were not

meant for decoration or pleasure.

For the creation of art for its own sake, we must look to the West. "...art in the West began with the Cretan civilization, in which art was created for art's sake, without any religious connotation."[2]

Relatively little is certain about the Cretan civilization. It is known that the development of the culture roughly paralleled that of the Egyptian civilization in terms of historical date. Indeed, the Cretans developed an alphabet and a form of writing, known as Linear B, possibly as early as 2000 B.C. The problem contributing to our lack of knowledge about the culture is the fact that not all of the Cretan writing is in Linear B and much has not yet been translated.

It is known, from archeological discovery, that much of the art in the later period of the civilization was purely decorative; intricately designed vases in abstract patterns, gaily painted walls, and sculpture of a delicate beauty that is almost modern.

"Although we usually trace our ancestry to classic Greece, painting, as we understand the term, was never as great in Greece as sculpture and architecture."[3]

Prior to 800 B.C. Greek art was characterized by the Geometric style, concentric circles, triangles, etc. At about 800 B.C. the use of figures began to

emerge. Much of the work was ornamental, although there was often a mythological basis for the message in the scene.

The sculpture was more refined than that of Egypt, although it showed Egyptian influence. The Greek work was truly free standing and far more lifelike, more attentive to proportion and anatomy. Indeed, towards the end of Greek development, the physical characteristics of the images and the statuary began to reflect even ethnic origins of their subjects.

Greek influence in art was to live far beyond the influence of the Greeks themselves, for the Roman Empire, which was to dominate the world for so many centuries, never really developed its own distinct method of artistic expression.

> The Roman genius, so clearly recognizable in every other sphere of human activity, becomes oddly elusive when we ask whether there was a characteristic Roman style in the fine arts. Why is this so? The most obvious reason is the great admiration the Romans had for Greek art of every period and variety.[4]

This seems to be true to greater or lesser extent in architecture, sculpture and painting. All were used by the Romans, as by the Greeks, mainly to portray religion and mythology, but also to a lesser extent for pure ornamentation.

With the fall of the Roman Empire and the rise of the Christian church, the western world went into a period that historians refer to as the Dark Ages. No

longer would the artist portray worldly scenes. Art for the
sake of ornamentation ground to a halt. "The early Christians"
...sole aim was to make the supranatural visible to
illiterate pagans and Christians alike."[5]

If it can be said that religious art is art for
education, then the images created during the one thousand
years of the Middle Ages were truly only for communication,
for the education of the masses. The church kept an iron
grip on all art media and the only art produced was for
the glory of God.

> It was not until the fourteenth century that
> artists began to explore new approaches, new vistas
> in painting, first, merely by achieving more and
> more realism. They evolved an amazing knowledge
> of perspective, light and shadow, correct proportions,
> and they used colors with an increasing freedom.[6]

This was, of course, the beginning of what we now
refer to as the Renaissance, the rebirth of humanism in
the arts. Artists were looking back to the Greek period,
taking what they found, using it, improving upon it. In
the beginning, this new awakening was used to humanize
the art used in and by the church. Eventually, however,
there was a return to art for art's sake. Objects of
beauty were created for their ornamental beauty and
"individuality in art was at last established."[7]

The art of the Renaissance was characterized by
a realism never before attained, and it was in this vein
that art would continue until the nineteenth century.

Methods of painting would improve, new pigments were intro-
duced, more was learned about anatomy, perspective and
light.

It was in the 1820s, with a show of work by an
English artist, John Constable, that the era of
Impressionism began. Working out of the studio, and
omitting unnecessary details, he concentrated on mood,
color, and motion.

From this point on, many artists would turn away from
realism in an attempt to assert themselves, their ideas, on
canvas. No longer were perspective, shadow and light,
or literal color of central concern.

It is interesting to note that just as artists
were turning away from the literal

> In 1826 [Joseph] Niepce set up a camera in the window
> of his workroom at Chalon-sur-Saone, France, and made
> what is generally regarded as the world's first true
> photograph.[8]

Niepce's first picture was not just luck and, of
course, it was not the first such experiment. But his was
the first underline successful experiment which actually combined a
compound of light sensitive chemicals with the lens of a
camera to produce a useable picture.

Unfortunately, his image was not sharp, it required
a very long exposure in the camera, and the image was not
permanent.

It was not until 1839 that all the essentials of a useful and practical method of recording a photographic image were available, and it was Louis J. M. Daguerre who received the credit.

The new medium was an instant sensation, and reactions were many and varied. Some thought it a crime against nature, others proclaimed the end of painting. Only one thing was sure, a new medium for the recording of events and the transmission of information had been born. This medium was capable of almost faultless clarity and detail never before imagined.

There were, however, 'problems with Daguerre's process. The first problem was minor and was solved prior to Daguerre's announcement. The Daguerre process produced only a single positive picture, an image on a copper plate. If more than one image of the same object was wanted, another Daguerreotype had to be made in the camera.

What was needed was a method of reproducing the camera original quickly and economically and in unlimited numbers.

William Henry Fox Talbot, an Englishman had solved the problem even before the Daguerreotype had been announced, but was too late in announcing his process to get primary credit for the invention of photography.

Talbot had devised a process in which the camera original was a negative image of the subject photographed. The use of the original negative to create a second image, a positive, could be easily accomplished. Of course the negative could be reused as many times as needed.

Talbot may also have solved the second problem, that of newspaper and book reproduction of the photograph. But again, he did not receive ultimate credit for his work.

> William Talbot...is said to have made the first half-tone in 1852 by using a cloth screen and sensitized coatings to put a continuous tone image on a relief printing plate. Frederic Ives of Philadelphia, with successive inventions in 1878 and 1886, is generally given credit for the modern halftone process of photoengraving. In experimentation at Cornell Univerwity, Ives produced a crossline screen on glass similar to the screens used today. At about the same time, Stephen H. Horgan made a halftone plate that was the first to be used by an American newspaper. His reproduction of "Shantytown" was used by the New York Daily Graphic on March 4, 1880.[9]

Thus, fifty-four years after the invention of photography, all the tools necessary for its rapid and efficient dissemination were present. No longer would images as important as those made by Mathew Brady of the Civil War have to be viewed in person or via woodcut engravings. The impact of the new medium was to be astounding. It would change the very nature of people's lives.

III. THE PHOTOGRAPH AS A COMMUNICATIVE IMAGE

The Photographic Phenomenon
in Communication

> ...much of the information in the mind of virtually
> any civilized person is picture information...as a
> means of expressing ideas and emotions, as well as
> direct facts, photography has achieved a unique
> distinction: it has altered the scope of the spoken
> and written languages, making them partially obsolete.
> For example, your mind's knowledge of Abraham Lincoln's
> face is derived, not from written accounts, but from
> the photographs of Lincoln by Alexander Gardner and
> Mathew Brady....
> Everyone had heard and read about the Nazi concen-
> tration camps for a dozen years, but the thud at the
> pit of the stomach, the rousing of the world's anger,
> did not fully come until the photographs of the
> shrunken bodies and the horror-filled faces were
> published and released in newsreels in the spring of
> 1945.[10]

In this day and age, the image in communication
surrounds most people from the time they awaken in the
morning until the time they retire in the evening.
From the morning newspaper until the late news on tele-
vision, people are in constant contact with images produced
for their edification, their enjoyment, or in hopes that
they can be sold something. "The individuals who
collectively form the audience for communicators have
never known a world not saturated with pictures."[11]

"Picture conditioning starts early in life.
Educators are discovering that the easiest way to keep

their pupils' attention is by means of pictures."[12]

Very possibly the fact that the image has such importance in the world of communications is that the image is more concrete, less abstract, than the word. The word is a mere collection of symbols, totally unrelated to the idea or concept which it represents. For instance, the word "typewriter" means nothing except as it is mentally translated and associated with the memory of a concrete object. The photograph, on the other hand, is a visual representation of the subject. Its appreciation does not depend on the knowledge the observer has of the subject.

> And precisely for this reason, a photograph is also much more limited [than the word]....it does not create the stimulating effect that the imagination-stirring abstraction of the written word does.[13]

Actually, the truth probably lies somewhere between these extreme definitions. Certainly there are words which do not stir the imagination and surely there are images which do.

It is, however, fair to say that subject matter transmitted by the written word requires the observer to think, to translate the message by means of his own experience and memory. Subject matter transmitted by means of an image, on the other hand, does not necessarily require thinking. It can be received and noted on a subconscious level.

The image communication is also less narrowly defined.

> As researcher Pierre Martineau so perceptively points out: "Rules governing words are quite rigid. They must be defined within the narrow limits to preserve mutual intelligibility of language. We are taught from early age to consider words as rigid building blocks with confined meanings. By contrast, the meaning of pictures is not hedged in and embalmed, as the teachers insist we do with words. We read whatever meaning we want to read into the picture, and do it with complete freedom."[14]

This concept of freedom associated with the observation of a visual message implies a degree of comfort with the medium as well. Baker goes on to say that "no amount of text can carry the _conviction_ of a photograph."[15] It is his contention that people are more likely to accept, and believe, a communication expressed visually than they are a communication expressed verbally or in written form.

It is fair to state, however, that the image is not, despite ease of reading, the universal communicator.

> There is considerable evidence to indicate that the graspability of shapes and colors varies, depending on the species, the cultural group, the amount of training of the observer. What is rational for one group, will be irrational for another, i.e., it cannot be grasped, understood, compared, or remembered ....For some persons, a pentagon is a perfectly graspable visual figure whereas it is a roundish thing of uncertain angularity for others. Children have trouble with identification of certain colors, which have a clear character of their own for adults. Some cultures do not put green and blue under separate perceptual headings.[16]

Members of the recently discovered Tasaday tribe in the Phillipines were unable to understand photographs of themselves. The two-dimensional object was so foreign that it was rejected, it could not be understood.

The photographic image is not foreign to the American observer, in fact he prefers it to all other types of illustration. Baker asserts:

> The American public wants realism in advertising art....
> This is why--and not just for aesthetic reasons--about
> 80 per cent of all ads feature photography, not
> drawings or paintings. Everything else being equal,
> photographic illustrations receive higher readership.[17]

Reedy, also writing about photography in advertising, agreed and expanded:

> It is probably because photography is more familiar
> to the average viewer than other media. It is an
> area where he is at home. But he responds to a com-
> paratively high level of aesthetics when presented
> photographically, whereas a fine piece of 'art' may
> discourage him from even a cursory inspection.[18]

In essence, then, an image can be rejected by an observer through lack of familiarity either with the subject matter or the technique used to produce the image.

In the communications media there are two very basic categories to which all visual messages can be reduced. These categories are "black-and-white," and "color." This is true of the print media, the television medium as well as the motion picture medium.

It is the print media and their use of photography with which this author is most concerned. Indeed, most

authors treating the subjects of color and black-and-white
photography, either singly, or together, refer to each as a
separate medium within a medium, i.e., "black-and-white still
photography" as opposed to "color still photography."
Feininger makes the following differentiation:

> Black-and-white photography is essentially an abstract
> medium, while color photography is primarily realistic.
> Furthermore, in black-and-white a photographer is limited
> to two dimensions--perspective and contrast--whereas in
> color a photographer works with three: perspective,
> contrast, and color.[19]

Generally conceded by most writers, in an artistic
sense at least, is Feininger's further assertion:

> Photography in black-and-white and in color are two sep-
> arate media. Neither is superior to the other, they are
> merely different....to decide which is better is meaning-
> less.[20]

It will be useful to make one further remark concern-
ing this particular point. It may be said that <u>artistically</u>
black-and-white and color are two separate media, and neither
is superior. But if one has a specific message to convey, one
or the other may indeed be superior in its ability to carry
the meaning.

> A color advertisement is often more <u>impressive</u> than a black-
> and-white version of the same....Color also helps the read-
> er forget he is looking at a picture. A black-and-white
> picture of a dish of ice cream is a black-and-white picture.
> A color photograph of the same subject is a dish of ice
> cream.[21]

Generally speaking, there is a rule-of-thumb to follow
in making a decision concerning which of the two media to use
in the rendering of a particular subject. If the inherent

interest in a subject is in its form than black-and-white is probably the preferable medium. If the inherent interest is in its color, then the choice is obvious.

It would be very pleasant indeed if the choice were that simple.

Color: Its Reality and its Symbolism

Color was first used by primitive man to make images of the objects and animal creatures which concerned him in his environment. The study of the nature and use of color has been going on ever since. Indeed, the problems of the nature, sources, and uses of color have occupied, in various degrees, many of the most gifted philosophers and scientists of all time.

Dean B. Judd, in his introduction of Goethe's Theory of Colors, relates the essence of Aristotle's view of the subject:

> Aristotle based his view of color on the observation that sunlight on passage through, or reflection from, an object is always reduced in intensity, or darkened. Since by this operation colors may be produced, he viewed color as a phenomenon arising out of the transition from brightness to darkness, which in a sense it is; or, stated less clearly as it usually is, Aristotle viewed color as a mixture, or blend...of black and white. An essential part of this view, widely held up to Newton's time (1642 to 1727), is that all true and pure light, such as light from the sun has no color, and color must be some sort of constituent or material permeating opaque and transparent objects and media, capable of altering or degrading the pure light incident upon them....[22]

Newton showed the opposite to be true when, in 1665, he passed a beam of light through a prism and

discovered that the beam of light contained the full
spectrum of visible colors.

> "Newton divided the colors into seven because of his
> belief in the mystic properties of the number seven,
> but most observers see six at normal intensities and
> as few as three if the intensity is low."[23]

"When the experiment is performed under suitable conditions,
there are over 1000"[24] detectable colors in the band of
light spread by the prism.

The fact that color is contained in light, and
is not an inherent or essential constituent of an object
creates and defines many of the problems associated with
the study of the nature of color. The scientist can
define color, he can measure it, he can specify it in
terms of the wavelength of radiant energy. This would
seem to simplify the study of color. The fact is,
however, that this measurability only simplifies the
problem for the scientist. As long as scientific
instruments can be constructed to certain physical
tolerances, color can be created, registered and recorded
with great accuracy. But when a human observer is
introduced, variables which are difficult to deal with
are introduced.

During the two hundred years following Newton's
historic experiment with the prism, astronomers, physicists,
mathematicians, poets and physicians, as well as painters
and chemists contributed to the store of knowledge of color.

Theories concerning the functions of the colors in relation to one another were advanced, theories of how the eye sees color were tested and observations concerning visual phenomena were noted.

Working in the late 1800s, William Ostwald set out a

> simple system which he soon discovered had to be based on measurement related to the three essentials of vision: light, the human eye, and sensation....He was the first to distinguish between the colors of the spectrum (seen only in a dark room) which he called unrelated to the world outside, and the surface colors or our everyday experience which he called related to it.[24]

It is pertinent to note that only one of Ostwald's three essentials of vision, light, is not a variable. The human eye is obviously an object of infinite variability. Sensation is virtually an unknown. No one can say for certain how a given red will appear from one person to the next.

Ostwald did define, however, the basic sensations:

> There are six fundamental color sensations:
> | The achromatic | 1. | whiteness |
> | | 2. | blackness |
>
> | The chromatic | 3. | yellowness |
> | | 4. | redness |
> | | 5. | blueness |
> | | 6. | greenness |
>
> ...It is true that greenness can be produced by a mixture of yellow and blue paints, but a true green sensation is not yellowish or bluish.[26]

It is upon this definition of the basic sensations that Ostwald's analysis rests. This color system is a

sphere which has at its equator an infinite number of hues. From pole to pole of the sphere run the basic achromatic values, from white at the top to black at the bottom. Colors are then located and noted by their position relative to the polar gray scale and the pure chroma equator.

By using this system of notation, one can not only determine, with exactness, where a particular hue lies in relation to others, but, according to Ostwald's definitions, the relative positions can be used to determine harmonies. Harmony, however, is in the eye of the beholder. If the statement is to be taken literally, then the eye itself is of some importance.

The eye is a complex mechanism which is often likened to the camera. This analogy, however, oversimplifies the mechanism it is trying to describe. It is true enough that, like the camera, the eye has a lens which is capable of focusing on both near and far objects. It is also true that, like the camera, the eye has an iris diaphragm which allows the organ to adjust itself to lighting situations of higher and lower intensity. Here, generally speaking, is where the analogy breaks down.

The camera, once it is loaded with film and set for the proper exposure, focused for the proper distance, is ready for exposure to light. The shutter is tripped

(the eye has no shutter) and the image is recorded.

The eye on the other hand, is constantly focusing, adjusting and recording images, and it is far more adaptable than the camera-lens/film combination.

This infinitely superior adaptability is due to the fact that the eye contains, in its retina, thousands of nerve endings which are sensitive to light in a way no photographic emulsion can be. Some of these nerves are sensitive to motion, some to color. Some of the nerves are effective in very low levels of illumination, some are effective in full sunlight.

> The nerve endings themselves may be divided roughly into two types known as "rods" and "cones." It is known from comparative physiology that animals that have only the rod type of nerve ends in their eyes are sensitive only to light intensities, while those that have both are sensitive also to color.
> These types of nerve endings are not equally distributed over the retina. Approximately in the center of each retina...the fovea...there are about 34,000 cones and each of these has a separate nerve which is believed to connect to both halves of the brain. Here is the seat of the best vision.[27]

The rods, which are found around the periphery of the eye, share nerve connections to the brain, unlike the cones which each have individual connections. The rods are insensitive to color.

The rods give us night vision, and it is for this reason that after dark, we cannot distinguish color. We are in a light level below the effective sensitivity of the cones. Therefore, a strawberry, by moonlight, is not red.

Because of the fact that the cones, the most
sensitive of the eye's nerve endings, are concentrated in
the center of the eye, "our eyes give us a broad picture,
but the picture is really only sharp in the center."[28]
Yet another difference from the camera, which can be
made to see its entire field of view with equal sharpness.

Because the eye contains both rods and cones,
which give it wide adaptability over large ranges of
illumination, it is again far more complex than the camera.
"The range of intensities visible to the eye is far in
excess of a million to one."[29] This is at least one
thousand times superior to the film in a camera.

Even with all this adaptability and sensitivity,
the eye, like any organ, is subject to fatigue.

> Freshness or fatigue of the nervous system tells
> powerfully upon color decisions, and even momentary
> fatigue of the retina may play us unwelcome tricks.
> It may cause delusions....[30]

A relatively brief and succinct statement summing
up these "tricks" or "delusions" can be found in Itten's
The Elements of Color:

> If we gaze for some time at a green square and then
> close our eyes, we see, as an afterimage, a red
> square. If we look at a red square, the afterimage is
> a green square. This experiment may be repeated with
> any color, and the afterimage always turns out to be
> the complementary color; it seeks to restore equilibrium
> of itself. This phenomenon is referred to as successive
> contrast.
>   In another experiment, we insert a gray square in
> an area of pure color of the same brilliance. On yellow,
> the gray will look gray-violet; on orange, blueish-gray;

or red, greenish gray....Each color causes the gray to
seem tinged with its complementary. Pure chromatic
colors also have the tendency to shift each other
towards their complements. This phenomenon is referred
to as simultaneous contrast.[31]

So we see in this short discussion of the phenomena
of simultaneous and successive contrast one of the short-
comings of the eye. When the nerves become fatigued, they
begin to seek equilibrium.

This is a problem which the colorist must learn
to handle, for it will affect each viewer of his work in
the way that he sees the colors and their relationships.

Wolfgang Von Goethe was the first to formally propose
his observations of the afterimage as a constant, a Law.
He observed it initially as a girl in a red dress against
a white wall. When the girl passed the wall, he saw,
against the wall, the perfect afterimage of a girl in a
green dress, the complementary afterimage.

A further problem to the colorist is created by
this adaptability of the eye and its tendency to seek
equilibrium. It is also a further example of the short-
coming of the camera/eye analogy.

This problem manifests itself in the fact that
the eye is adaptable to changes in the spectral quality of
the illumination under which observations are made. That
is to say, the eye can adapt itself, indeed, force itself,
to ignore spectral changes in light.

When the eye is exposed for a long time to a scene
illuminated, for example, by an ordinary incandescent
light, the average color entering the eye is roughly
equivalent to that of the light source itself, that
is, as the eye looks first at one and then another
of the objects the average quality of the light seen
tends to approach that of the incandescent light.
Since such a light is weakest in the blue end of the
spectrum and next weaker in the green relative to the
red, the eye tends to become quite sensitive to blue,
somewhat less so to green, and least to red, and all
stimuli are seen with the eye in this condition be-
cause the long exposure makes recovery slow. This
eye sensitivity distribution, however, is opposite to
the energy distribution of the source....This
phenomenon is known among psychologists as "color
constancy" because it tends to make the color of objects
constant regardless of the energy distribution of the
general illumination.[32]

This color constancy will fail, however, if light

intensities, i.e., levels of illumination, are not con-

stant. Hues will intensify as the level of illumination

lowers. The artist can count on his landscape to look

the same to him as well as to others, and faithful to the

subject, only if he takes into account the illumination

under which it will be viewed.

To this point, we have dealt mainly with the

physical aspects of color and the physiological aspects

of the observer of color. It is important, perhaps of

ultimate importance, to deal with the psychological

aspects of color.

There have been attempts to describe the specific

moods of various colors and to draw generalizations from

their symbolic use in different cultures. But next to

nothing is known about the origin of these phenomena.

Luscher asserts:

> "A newly born child developing the ability to "see" begins by being able to distinguish contrast, that is: "brightness" and "darkness"; next comes the ability to distinguish movement, and after that shape and form. The recognition of color is the last development of all."[33]

Luscher goes on to say:

> "....The distinguishing of color, its identification, naming and any aesthetic reactions to it...are the result of development and education rather than of instinct and reactive response."[34]

Indeed, there is a widespread belief that the expression of color is based on association. Red is said to be exciting because it reminds us of the connotations of fire, blood, passion, etc. Green calls up the refreshing thought of nature, and blue is cooling like water. But the theory of association is not to be written off as a process of mere learning.

It is known that strong brightness, high saturation, and hues corresponding to vibrations of long wave length produce excitement. A bright, pure red is more active than a subdued grayish blue.

Some experiments have demonstrated a bodily response to color. It was found that "muscular power and blood circulation are increased by colored light "in the sequence from blue--least, through green, yellow, orange, and red."[35]

Though the experimental data agree with the psychological observations on the effect of these colors, there is no telling whether we are dealing here with a secondary consequence of the perceptual phenomenon or whether there is a more direct nervous influence of light energy on motor behavior and blood circulation.

Medical doctors and psychiatrists find that people suffering from physical and psychological deformities of the brain often have serious reactions to color, such as anger, effusive happiness, loss of balance and dizziness.[36]

Though it was stated at the outset that little is known about the phenomenon of the symbolic meaning of color, and that reaction to color is more than mere learning, it is a fact that artists use color in a very calculated manner to achieve meaning, and these colors and meanings are connected in a more or less fixed pattern.

> Blue stands for sky, heaven and water. Green may also be water, but it generally means hope, the color of spring, the renewal of life....It also symbolizes jealousy and fear....Red is the color of blood; courage, sacrifice. Black is death, the underworld, mourning, desolation. White is purity, chastity... cowardice....Yellow means sun...wealth...cowardice ...disease....Purple is emblematic of rank...authority....Scarlet, a yellow-red hue of very high saturation, is a sign of rank...is also applied...to women of ill repute. Gray means colorless, figuratively as well as literally."[37]

Though the foregoing assignments of color-perception relationships are those of only one observer and cannot be taken to be universal or definitive, this author used the assignments

of relationships to show that the same color can mean
many different things, and to show that certain colors
have definite psychological and symbolic connotations.

The above author argued the psychological effect
of color strictly from the standpoint of the hue involved,
which is, at best, a narrow conception of the potential
impact of the medium. This is not to say that the hue
in question is not important, but that it is only one way
of looking at the problem.

Another author takes the position that saturation,
color balance, and relationships are of utmost importance:

> "Highly saturated colors create vigorous, virile,
> or aggressive impressions, emphasizing the power of
> powerful subjects. Pale pastel shades should be used
> for sophisticated, pensive, or delicate subjects and
> to suggest more languid moods. Light colors are
> joyous and gay, dark colors, moody and sombre. Com-
> binations of complementary colors produce the most
> powerful effects. Clashing colors symbolize conflict
> and violence. Some colors--red, orange, yellow,
> yellow-green--are "warm;" others--blue, blue-green,
> purple-blue--are "cold."[38]

In terms of the categories mentioned above, i.e.,
"warm" and "cold", no discernible attempt has been made
to group the expression of the various colors under more
general terms. References to these categories are found,
without exception, in all discussions of the theory of
color. These categories are strictly subjective, as,
indeed, most discussion of color theory is, and have little
reference to pure hues. However, just as invariably as

the categories appear, the hues red and blue are associated with "warm" and "cold", respectively.

Itten associates the "warm" and the "cold" colors not only with colors as they are found in nature, but goes a step farther in proclaiming that the colors do not have fixed patterns of value inference, but that they often vary with the situation. Indeed, he asserts, as almost no other author does, that the meaning conveyed in one situation may be the opposite of the meaning conveyed by the same color in another situation.

> "the deep blue of the sea and distant mountains enchants us; the same blue as an interior seems uncanny, lifeless, and terrifying...in the dark of night, a blue neon light is attractive, like blue on black, and in conjunction with red and yellow lights it lends a cheerful, lively tone. (Note: almost without exception, other authors prefer to relegate blue to an impression of total passivity.)
> ...redness in the face denotes wrath or fever; a blue, green or yellow complexion, sickness, though there is nothing sickly about the pure colors. A red sky threatens bad weather; a blue, green or yellow sky promises fair weather.
> On the basis of these experiences of nature, it would seem all but impossible to formulate simple and true propositions about the expressive content of color."[39]

We see here that at least one author is reluctant to place any categorical limits at all on color perceptions, and does so at all with the qualification that these categories are meaningful only as the situation in which the color is found dictates. This, it seems to this author, is a reasonable basis for a meaningful discussion of the derivable impressions for colors.

If this is a reasonable basis for the discussion
of the phenomenon of color, the problem of assigning
superiority to color over black-and-white as a medium
of expression is truly futile.

In photography, it is generally agreed that
color has the potential of greater reality. This is not
to say that color cannot, or is not, used in an abstract
way. It is merely to say that if reality in the picture
is of utmost importance, then color may be the more
expressive medium for that reality. There is, however,
definite

> ...danger inherent in the potential 'realism' of
> color photography. In essence, one might say: a
> good color photograph can be superb; a bad color
> picture is less convincing than a photograph in
> black-and-white.[40]

The danger lies in the fact that if the color is not
properly recorded, it will not truly reflect the reality
of the scene. This is due to the fact that "...in a
color picture the effect of the structural composition
tends to be eclipsed by the color effects."[41]

The merit, then, of color, lies in its capacity
for realism, for the conveyance of that which was
actually present at the time the image was made. If,
however, the color is not authentic, the image, as well
as its message, will probably be rejected. The expressive
content of the image may be lost and distorted communication

has taken place. When communication is desirable, and for some reason, color cannot be faithful or authentic to the subject, the only recourse is a message without color, i.e., the black-and-white photograph.

The black-and-white image does not have the potential for realism inherent to color, but it is often able to relate a message where color cannot.

Black-and-White: Its Reality and Its Symbolism

The image in black-and-white is essentially concerned with the shapes of things, with the interplay of light and shadow, and with the definition of spatial relationships. In dealing with these fundamental characteristics of most subject matter, the black-and-white image can be incredibly intricate and detailed. But

> Most professional photographers will agree it is usually more difficult to produce an outstanding black and white photograph than an outstanding color slide. One reason is that a black and white does not have the visual stimulation inherent in a color slide.[42]

Again, one finds evidence that people want the realism of color in order to create the feeling that the subject is actually present and the image on paper is only a window opening onto it. In comment upon the pen-and-ink drawings, etchings and lithographs of the nineteenth century, von Goethe wrote:

> A picture in black and white seldom makes its
> appearence...such works, inasmuch as they can attain
> form and keeping, are estimable, but they have little
> attraction for the eye, since their very existence
> supposes a violent abstraction.[43]

It is the feeling of this author that the assertion of von

Goethe and others who comment in this vein are doing the

medium the injustice of condemning it for its strongest

virtue.

> Some of the most effective means for symbolization
> exists in the graphic black and gray and white of
> black-and-white photography....ordinarily color
> imitates, but does not symbolize a property of a
> subject. For this reason, as far as freedom of trans-
> lation from reality into picture is concerned, black-
> and-white photography offers an advantage over color.[44]

The black-and-white image is capable of reducing the image

to its basics, and displaying its utmost detail without

introducing the complication of color rendition with its

attendant pitfalls. For example, to photograph the

Venus de Milo in color would risk possible complication

for no gain. Her existence is an abstraction in itself,

her shape is of utmost importance, her color completely

meaningless.

Rudolph Arnheim, in commenting on form and its

meaning to the observer, states:

> Shape is one of the essential characteristics of
> objects grasped by the eyes. It refers to the spatial
> aspects of things....It concerns, first of all, the
> boundaries of masses. Three dimensional bodies are
> bound by two-dimensional surfaces. Surfaces are
> bound by one-dimensional borders-for example, by
> lines.[45]

Inasmuch as the image in black-and-white is con-
cerned with the reduction of the world, a world full of
color, to its form, its light and shadow and its basic
spatial relationships, there can be little argument over
the assertion that it is a medium of abstraction. That
it holds little stimulation or attraction, as von Goethe
alleges, is an allegation which may be disputed.

> Broadly speaking, in color vision, action issues from
> the object and affects the person; in order to per-
> ceive shape, the organizing mind goes out to the
> object.
>   A literal application of the theory might lead
> to the conclusion that color produces an essentially
> emotional experience, whereas shape corresponds to
> intellectual control.[46]

Arnheim goes on to admit that this may be an over-
simplification, but this author believes strongly
that the essence of Arnheim's statement contains a truth
of great interest to the communicator working in the
medium of black-and-white.

The point was made previously that the letters of
the alphabet, as a means of communication, are, by nature,
so abstract that the observer is forced to think, to
imagine, in order to translate the letters into some
sort of meaningful message.

If this is true, it may be reasonable to further
assert that a black-and-white photograph is more capable
of stirring the imagination of the observer because it
is an abstraction. If further speculation may be

permitted, this may be the response to which Arnheim was referring when he mentioned "intellectual response," i.e., a mental involvement on the part of the observer in a conscious or unconscious attempt to convert the monochromatic image before him into the colors of the real world.

The communicator working in the medium of black-and-white has some of the same problems as the worker in color, despite the differences in their media. One of the main obstacles which the black-and-white worker encounters is the previously mentioned adaptability of the eye, which, in observing a scene, is able to quickly look into shadows and see detail, and just as rapidly shift its gaze and observe detail in glaring highlight areas.

Once again, the faulty analogy of the eye and the camera presents itself. If the black-and-white medium is to convey a convincing and authentic message, it must approximate as closely as possible the original scene in a tonal relationship which is actually quite different in the print from the subject in reality.

Black-and-white film and photographic paper, quite simply, are not capable of reproducing a scene in the way that the eye would actually see it. As was previously observed, the eye is capable of observing, in

the same scene, a brightness range of over one million
to one. Black-and-white photographic paper is capable of
a range approximately one hundred to one.

Therefore, not only is the black-and-white image
an abstraction of reality in the sense that it lacks
color, but its brightness range is so limited, in relation
to the capabilities of the eye, that the most skillful
manipulation of the tools of the medium are required to
create a believable image.

However, this very problem, if properly solved,
gives the worker in the medium of black-and-white an
advantage over the worker in color. This advantage is
control.

> The power of the artist to hold us lies in his ability
> out of the overwhelming abundance of Nature to select
> a pattern, an order which we can take in.
> This is well recognized by the monochrome pictorial
> photographer. His reputation often depends upon his
> ability to turn the straightforward record given by
> the camera into a pleasing picture, by various forms
> of control during exposure and printing. Control of
> this type is only available to the colour photographer
> to a most limited extent...and Nature rarely obliges
> with a colour scheme which can conveniently be
> framed on the ground glass of the camera.[47]

When color photography first became a practical
reality, it was greeted with the same enthusiasm which
the Daguerreotype enjoyed in 1839. In spite of the fact
that the process was incredibly complex relative to black-
and-white, there was an overwhelming rush to it. As the
years passed, the process simplified and became more

economically feasible.

During the late 1920s and early 1930s, more
and more workers dropped black-and-white in order to
specialize in the new field of color. The realism, the
fidelity and the increasing simplicity intrigued everyone
who took the time to notice.

One of the most successful and famous color
photographers of the late 1930s made the following comment:

> ...I am sure that eventually black and white photography
> will be obsolete.[48]

In view of the present state of black-and-white photography,
it would seem that success with the medium of color
photography does not necessarily qualify one to become a
prophet.

The Photographic Image as A Vehicle of Expression

The photographic image is a pervasive force in
the society of the twentieth century. Images of all types
surround each person as he conducts his daily affairs.
Depending upon the nature of an individual's daily tasks,
the images he encounters may have been produced for any
of a number of reasons.

He may encounter images intended to inform him
about the news of the day, or pictures intended to educate
him about events of the past or facets of his job.
Pictures may be used to convince him to buy something,

or take a certain course of action, or possibly merely
to show him something which he had not seen before.

Simply stated, he may encounter a _record_ photo
(news, documentary, picture of an art object or architecture),
a _descriptive_ photo (text book illustration, advertising
pictures, portraits, propaganda), a _scientific_ photo
(photomicrograph, astrophotograph, medical photograph),
an _expressive_ photo (a visual expression of an emotion,
an idea, or concept in which the subject is a vehicle for
that message), or a _creative_ photograph (the subject of
the photograph, if recognizable, is secondary in importance
to pure harmony, shape, or technique of representation).[49]

The above classification of the types of photographs
an individual is likely to encounter tends to categorize
images into one mold or another, and, in the opinion of this
author, dangerously oversimplifies the nature of the medium.

In light of the images made by Dorothea Lange of
Dust Bowl conditions in Oklahoma in the 1930s, it is fair
to say that the documentary photograph can, also be
incredibly expressive. It is equally possible for the
scientific photograph, in the eye of the observer, to be
truly beautiful in its representation of shape, color and
harmony, as, for example, color pictures of crystalline
formations.

The examples could go on, but it should be clear

that any attempt to define the nature of an image simply
and categorically is probably doomed to fail.

Any photograph, regardless of its intent, is a
distortion, and not a true record, at least psychologically
speaking.

> ...the onlooker is tempted to believe that the events
> retained on plate and print existed for some time and
> perhaps still continue to exist...the still photograph
> telescopes and distorts time....[50]

Therefore, any time a camera is used to record, document,
or express an idea or emotion, the result is likely to be
observed in such a way that the original scene is somehow
altered by the observer.

All this is merely to say that the concept of
a photograph accomplishing nothing more than the provision
of a record of an event is remote, and must be consciously
sought.

Of course, examples come to mind, for instance,
the police photographer's record of the scene of a crime,
or the insurance investigator's record of a scraped fender.
There are, of course, many more possibilities. However,
if a true record of any subject is sought,

> ...all wide-angle and telephotographs, all high-speed
> photographs as well as time exposures of subjects in
> motion, and all photographs that are completely sharp
> in depth would have to be rejected because they show
> things in a form in which the eye cannot see them in
> reality. And one would have to reject as 'unnatural-
> istic' every black-and-white photograph because it
> lacks color, and every color photograph because it
> lacks real depth.[51]

In spite of the opinion of this author that there
is no such thing as a photographic image which is totally
unaffected by the photographer, there is no doubt that
there are two basic ways that the making of an image can
be approached. Using different terms, but describing the
same phenomena, Feininger states:

> The difference between...forms of rendition is essen-
> tially the difference between fact and feeling. An
> illustrative photograph should be factual--true to the
> subject....
> On the other hand, an interpretative approach...
> is personal and subjective, reflecting a photographer's
> response to his subject or his symbolic use of it.
> Such photographs are carefully considered statements....
> They embody the feelings and thought that a photog-
> rapher has about a subject rather than the surface
> aspects of it.[52]

It is to the latter that further discussion is
addressed.

> Every...artist gives birth to a new universe, in which
> the familiar things look the way they have never looked
> to anyone. This new appearance...reinterprets the
> ancient truth in a grippingly fresh, enlightening
> way.[53]

This, basically, is the province of the "creative"
photographer. The presentation of the world in a way it
has never been seen before. He need not consciously
distort the subject, i.e., alter the color, the shape,
or the perspective (although he may if it suits his
purpose). He only need look at the object, analyze it,
and, if possible, render it in such a way that the common-
place becomes exalted, or the exalted commonplace; make

the ugly beautiful or render the beautiful less so.

> The essence of the creative act appears to be an
> attempt on the part of the photographer to create
> a wholly new object. Although he might conceivably
> do this by so modifying the appearance of an existing
> one that it appears like a new object, this hardly
> seems to come within the meaning of the term. The
> new object he creates is normally a _picture_ rather
> than a presentation of an object.[54]

The creation of this new object is not an easy

task for the photographer. It is true that through his

selection of film, lens, and even camera, he can exercise

a certain degree of control over the final image. Indeed,

any choice he makes in these matters is, consciously or

unconsciously, an exercise of control. But

> The photographer can not enjoy the same control over
> color as a painter does. A painter is completely
> free to make changes in his pictures, in whole or
> in part, on a purely subjective basis and to accord
> with his personal sentiments and conceptions. The
> photographer, in most cases, is dealing with color,
> shades and contrasts as they exist.[55]

It is the very "dealing" with these elements that

causes the image created by the photographer to be a

unique contribution to the world. Any choice he makes

is expression, and

> Without...expressive forces the picture is reduced to
> the presentation of pure matter. To offer matter
> devoid of form, which is the perceptual carrier of
> meaning, is pornography in the only valid sense of the
> word, namely a breach of man's duty to perceive the
> world intelligently. A harlot (Greek, _porne_) is a
> person who offers body without spirit.[56]

IV. A PORTFOLIO OF EXPRESSIVE WORK

The following discussion, as it relates to the
portfolio of photographs, is meant only to describe for
the observer some of the author's thoughts as he made the
images. It is in no way intended that the discussion,
however brief or lengthy, direct or restrict the thoughts
of the observer as he views the work.

It is therefore appropriate for the author to make
the following request of the reader: please observe the
images before reading any further.

The author finds it difficult to put into words
the meanings which these images hold. It is made more
difficult by Arnheim's assertion that

> Few artists would be...able to tell in words what they
> intend to say....experience has shown that artists
> driven by the desire to convey definite messages...
> are likely to fail. They are in danger of tying their
> imagery to stereotyped symbols.[57]

In spite of this warning, an attempt will be made
in the next few pages to verbalize the author's attitudes
and emotions surrounding each of the images. Collectively,
the purpose of the work is to convey a point of view
taken by the author. This point of view, basically, is
that in everything that surrounds each person, every day,

there is something of beauty, if only he will take the time to look. Iowa is not known for its lovely scenery, yet beauty abounds, and is often unnoticed.

Inasmuch as each of the images is numbered, they will be referred to in the following discussion by those numbers. None of the images has been assigned a title.

Image Number One

For the author, this rendering of a brick wall has become his mental definition of the concept "red." It may be of interest to note that this wall is part of a building in which bricks are made.

Additionally, this is an example of how the camera/film combination creates a world which the eye never sees. Upon direct observation, the color of the wall does not have such saturation, and the brain refuses to perceive the window as blue. The blue of the window, however, creates an interesting interplay of color, and gives the eye a place to rest.

Image Number Two

The dead tree, in a field of emptiness, conjures up thoughts of solitude, contemplation, perhaps loneliness and death.

Created by the author primarily as a solution to a problem in composition, the lonely tree has given the

author an opportunity to make an interesting observation.
It is almost universally admired by older observers, and
has been virtually rejected by young observers. The
meaning of this phenomenon is open to interpretation.

Image Number Three

Here, in contrast to the previous image, there is
some of the inspiration of newness, life, the hardiness
of young living things.

While the subject matter is entirely made up
of "cool" colors, there is still vigor and a feeling of
activity.

Image Number Four

This is a graphic representation of the passing
of a way of life. Once the large home of a farm family,
all that remains is the outer walls of the house.

The windows and doors present a study in line
which gives the photograph the ability to portray a third
dimension.

Image Number Five

Perhaps one of the better examples of this author's
feeling that beauty is everywhere if only a person would
take time to see it. The reflection of the sun and a dead
tree in a quietly rippling stream makes an interestingly
abstract pattern. Photographers will often "create" such

a scene by focusing the lens through textured glass or plastic. Such manipulation is not necessary.

Image Number Six

A place where the proprietor will sell anything from the freshly emptied wine bottle shown in the center of the picture to a "genuine brass pot dug from the sands of Iran" (not shown).

Actually, this is the interior of an old restaurant-turned-antique-shop. Abandoned stools at the cafe counter create depth, as do the receding shelves and earthen jugs.

Image Number Seven

The subject here is rarely thought of as an object of beauty by farmers who must deal with it. Yet the intricacy of form and line might be the envy of the most expert engraver. Indeed, the colors are so muted that the picture is almost monochromatic, allowing shape, form and line to come to the fore. Yet color is important to the subject, and it would not have been as effective in black-and-white.

Image Number Eight

Here success in presentation depends upon portrayal of intricate detail, the delicate pattern in the boards created by ripping saw teeth. The fine lines of the weeds, contrasted with the dark mass of the wood create an

interesting contrast. One cannot help but wonder what life was like when men cut their own lumber to make the buildings they used.

Image Number Nine

Clover is considered by many farmers to be a crop and it is looked upon by suburban gardeners as a nuisance.

To the photographer, it can be a thing of rare beauty in its simplicity and a source of regal color in an otherwise monochromatic composition.

Image Number Ten

The usual reaction to this picture is "When were you in Arizona?" Actually the scene is only a few minutes from Ames, Iowa, at the Ledges State Park.

The natural limestone cliffs present the photographer with unique possibilities to study light and shadow, line and texture. The cliffs are massive when observed in person, and forbidding when viewed in harsh sunlight. Here, hazy sky conditions gave the cliff delicacy and beauty.

Image Number Eleven

Just as in image number eight, texture and detail are important to this composition. However, here color is important in the different reds found in the bricks, and in the rusty latch.

Primarily a study in texture and line, color materials were selected for its rendering because the color in the scene is too important to be left out.

Image Number Twelve

One of the most overpowering temptations which a photographer must learn to resist is that of using color photography to portray brash, loud color simply because the medium is equipped to handle it. Some of the most effective work is found in the "high-key" photograph, in which there is little color.

This is an experiment in that direction. Little color can be found, and very little contrast. Even though it is a picture of ice, one does not shiver when looking at it, and may even experience a sense of softness in the subject.

Image Number Thirteen

The emphasis here is on shape mechanically exaggerated by an extreme wide-angle lens. The author made the picture solely as an experiment with the lens in an attempt to learn its capabilities and drawbacks.

Distance is greatly exaggerated and lines toward the edges of the picture are no longer true to the subject. In fact, the tree in the center was no more than ten feet from the camera, and the leaves in the foreground were actually quite small.

Image Number Fourteen

Old paint over older paint creates a pattern in
line and color. There were so many directions in this
subject that, almost unanimously, observers ask if this
was a double exposure. Actually, when the author photographed
the wall, he was afraid that there would not be enough
contrast to permit the viewer to see all that was there.
Rather than diminishing it, the photographic process
actually heightend the contrast.

Image Number Fifteen

Hopefully the observer will find this an interesting
study in color, line, and texture. The whole effect of the
image is dependent upon the angle of the light striking
it and the light changed so fast that the author was
permitted only two exposures of this scene before it
disappeared.

Image Number Sixteen

One observer has remarked that this is reminiscent
of "crinkled tin foil," and few know immediately what the
subject matter was. An abstract composition in white,
blue, and black, it is yet another impression of reflections
in rippling water.

Image Number Seventeen

To each person who has attended Iowa State University, the Campanile will have a different meaning. To an observer who is not familiar with this symbol of Iowa State, it will perhaps have no meaning. To the author, the creation of this view of the often-seen landmark was an experiment to determine if a new presentation could be achieved.

Additionally, it was an experiment to see if color negative film could be made to "look into the sun" the same way that color slide film can. It is the author's opinion that in this instance it did as well or better.

Image Number Eighteen

At the time the author was present, the wind was coming up and dark clouds were moving in on the horizon, a storm was imminent. Yet there is nothing threatening about this summer storm; the delicate living things will survive.

Image Number Nineteen

A single ray of sunlight through the trees illuminated these dying flowers on the floor of the woods, creating a bright spot juxtaposed against dark masses of muted color. In addition to color contrast, there is a contrast of shape in the large, irregularly degenerated leaves against the smaller leaves and the flowers.

Again, this exposure had to be made quickly because

the natural spotlight was very brief.

Image Number Twenty

In architectural photography, the two factors of crucial importance are lighting and perspective. The light must show the structure to advantage in terms of texture and detail, and the lines of the structure must appear as they would to the first-hand observer. Here, the lighting was perfect, early morning cross-lighting. Careful observation will reveal that though the boards which make up the wall are straight, the window frame is actually crooked.

Image Number Twenty-One

The massive amount of blue and white could have created in the observer in intense impression of cold, but it is the author's opinion that this is a "hot" image. The leaf, covered with ice, serves as such a vibrant contrast to its surroundings that it is overpowering in spite of its size, and its color creates warmth in the scene.

Image Number Twenty-Two

The author had intended that this be another example of beauty in the commonplace, and to many observers this seems to be the case. Each has asked what the subject matter actually was. Unfortunately, some see it as blood

running out of bullet-holes. This is hardly what the author had in mind.

The subject matter is a rusty air-conditioner casing and the author had intended the photograph to be an abstract creation in flowing and unusual color.

Image Number Twenty-Three

The sun coming from behind these weeds actually causes the colors of the leaves and flowers to vibrate with color as if they were generating their own light.

Again, the ability of the camera/film combination to render fine detail accurately is the strong point of this rendering.

These are weeds growing along a creek which serves as the outlet for the sewage treatment plant for the town of Nevada, Iowa. If a cliché may be permitted, "beauty is where you find it."

Image Number Twenty-Four

The use of color control in the making of color prints is of paramount importance if a believeable image is to be created. Occasionally, the photographer will find it to his advantage to slightly alter the color in order to make a point or alter mood or content.

Here is an example of that type of control. The observer will note that there is a very slight magenta cast.

When printed "straight," i.e., fully color corrected, the scene has a cold appearance. When printed with the slight deviation from true color, the interplay of color creates a warmth in the scene despite the snow on the windowsill.

Image Number Twenty-Five

Possibly the best example this portfolio has to offer exemplifying the ability of black-and-white to portray reality and at the same time create an abstraction in line and shape.

Observed first hand, with color vision, these leaves have no real intrinsic interest. Indeed, they are very ordinary. Rendered in graphic black-and-white, shape becomes paramount and the arrangement of the clusters, hopefully, becomes interesting.

Image Number Twenty-Six

Perhaps just the opposite effect is displayed here. The shape of these leaves is of no importance relative to the spectacular display of color. The author confesses here to surrendering to the temptation to portray vibrant color for its own sake.

Image Number Twenty-Seven

Another example of the capability of black-and-white to create abstraction. This image differs from number twenty-five in that there was no effort to

portray the shape or spatial relationship as the eye might
see it. Indeed, a wide-angle lens from a low position
was purposely used to exaggerate the linearity of the
window.

Image Number Twenty-Eight

An idyllic scene which employs one of the most
used devices to add the third dimension, depth, to an
otherwise two-dimensional medium--the "S" curve. One
wonders where the stream might lead.

Image Number Twenty-Nine

In the view of the author, this is very complex
in terms of its meaning to him. A wide-angle lens was
used to distort the presence of the rock, which constitutes
over two thirds of the area of the view. To the author,
the rock is "forever." The moss, which adds a touch of
color, belongs there, but is not permanent. The leaf
will never come again.

Image Number Thirty

This was made for the sheer enjoyment of the
repetition of pattern and the strange faces in the rocks.
Before the print was mounted, many observers did not know
how to view it, right-side-up, or up-side-down.

Image Number Thirty-One

A subtle study in which line and color contribute to the illusion of a third dimension. Fog during daylight hours is such a rare condition in Iowa that the author, contrary to the best interests of the traveling public, sometimes finds himself wishing for it. In this weather, color is muted, sometimes almost monochromatically, and the opportunities for making pictures which take advantage of the phenomenon are nearly endless.

V. SUMMARY AND CONCLUSION

The point has been made that the image is an ever-present force in the lives of most men and women. This has been so ever since the first Stone Age man carved the image of an elk into the wall of his cave.

In the case of primitive man, the image was an attempt to control the forces of nature and the unknown. In today's society, the universality of the image is creating a world in which anything which can be photo-graphed can be taken out of the world of the unknown and put into the visual vocabulary of each and every person who is willing to take the time to look. The camera lens has traveled from the protective world of the womb to the corners of our solar system.

Because of this universality of the image in communication, it is essential that the medium be studied and fully understood. Practitioners within the medium may only be effective if they are fully aware of the power which they may potentially exercise.

It has been asserted that much of the knowledge attained by most people is picture knowledge. Few Americans living today ever met Sir Winston Churchill in

person, but his face is familiar to millions largely
due to photography.

It is therefore important, in view of its potential,
that the picture communication be utilized effectively by
knowledgeable practitioners. If mankind is ever to become
what Marshall McLuhan referred to as a "global village,"
it is certain that the image will play an important role.

But the roles of the image in education and
communication are not its only importance. As was pre-
viously noted, observers with little or no artistic
training are capable of responding to a comparatively high
level of aesthetics when presented with photographs created
for their own sake. This may be due to the fact that
people are more familiar with the medium than they are
likely to be with the other arts.

This is not to say that pictures can be neatly
categorized and divided into groups according to their
"educational," "communicative," or "aesthetic" value.
It was observed by the author, during the course of his
research, that many writers concerned with the subjects of
images and communications tended to indulge in just such
categorization. While this may be convenient for the sake
of discussion, it is possible for the reader to come away
with the impression that an educational picture, ipso
facto, has no aesthetic appeal and an artistic rendering

of a subject cannot possibly be used to convey hard information.

It is this author's contention, "thesis" if you will, that such mutual exclusion is absolutely not the case. The pictures to which this study is an accompaniment are a serious attempt at an artistic statement concerning the Ames, Iowa, area. Yet it is also hoped that factual information is presented concerning the locale, and that communication has taken place in reference to the author's feelings and point of view. Indeed, the motivation for the pictures has a basis in all three of the aforementioned "categories."

This assertion on the part of the author gives rise to certain suggestions for possible concrete research involving his images. Do they, after all, communicate a valid and sympathetic point of view, or are the photographs distortion by selection? Can they be considered artistic at all, or are the pictures merely the output of a photographer who is reasonably competent with his machinery? Certainly there are many questions which could be asked about the pictorial presentation, its meaning and impact.

Whatever the intended role of the image, it is always created with the intent that it be seen and appreciated. In reference to the author's portfolio, it is hoped that a point of view was communicated to the

observer, and that it was found to be a pleasing body of work.

Certainly the author's equipment was not unusual, nor were the processes which were used to make the prints. The only unique factor in the creation of the works was the author's eye. The process of "seeing" is difficult to describe or analyze. It is humbly hoped that a new and different view of the world was presented.

VI. FOOTNOTES

[1] H. W. Janson, <u>History of Art</u> (New York: Harry N. Abrams, Inc., (no date)), p. 19.

[2] Ralph Fabri, <u>Color--A Complete Guide for Artists</u> (New York: Watson-Guptill Publications, 1967), p. 16.

[3] Ibid.

[4] Janson, <u>History of Art</u>, p. 132.

[5] Fabri, <u>Color--A Complete Guide for Artists</u>, p. 17-18.

[6] Ibid., p. 18.

[7] Ibid.

[8] Richard Rudisill, <u>Mirror Image</u> (Albuquerque, N.M.: University of New Mexico Press, 1971), p. 33-34.

[9] Arthur T. Turnbull and Russell N. Baird, <u>The Graphics of Communication</u> (New York: Holt, Reinhart and Winston, 1966), p. 18.

[10] John R. Whiting, <u>Photography is a Language</u> (Chicago: Ziff Davis Publishing Co., 1946), p. 5.

[11] William A. Reedy, <u>Impact--Photography for Advertising</u> (Rochester, N.Y.: The Eastman Kodak Company, 1973), p.3.

[12] Stephen Baker, <u>Visual Persuasion</u> (New York: McGraw-Hill Book Company, 1961), p.2.

[13] Andreas Feininger, <u>Successful Color Photography</u> (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1954), p. 16-17.

[14] Baker, <u>Visual Persuasion</u>, p. 3-4.

[15] Ibid., p. 7.

[16] Rudolf Arnheim, <u>Art and Visual Perception, a Psychology of the Creative Eye</u> (Berkeley and Los Angeles: University of California Press, 1965), p. 31.

[17] Baker, <u>Visual Persuasion</u>, p. 10.

[18] Reedy, <u>Impact--Photography for Advertising</u>, p. 10.

[19] Feininger, <u>Successful Color Photography</u>, p. 4.

[20]Ibid., p. 5.

[21]Baker, Visual Persuasion, p. 98.

[22]Johann Wolfgang von Goethe, Theory of Colors (Cambridge, Mass.: The M.I.T. Press, 1840), p. V.

[23]Ralph Evans, An Introduction to Color (New York: John Wiley and Sons, Inc., 1948), p. 107.

[24]D. A. Spencer, Color Photography in Practice 3rd. ed. (New York: Amphoto, 1969), p. 18.

[25]Egbert Johnson, Basic Color, An Interpretation of the Ostwald Color System (Chicago: Paul Theobald, 1948), p. 3.

[26]Ibid., p. 9.

[27]Evans, An Introduction to Color, p. 98-99.

[28]Johnson, Basic Color, An Interpretation of the Ostwald Color System, p. 111.

[29]Evans, An Introduction to Color, p. 103.

[30]Munsell, A Color Notation, p. 42.

[31]Farber Birren, Itten--The Elements of Color (New York: Van Nostrand Reinhold Company, 1970), p. 19.

[32]Evans, An Introduction to Color, p. 133.

[33]Max Luscher, The Luscher Color Test (New York: Random House, 1969), p. 14.

[34]Ibid., p. 15.

[35]Arnheim, Art and Visual Perception, a Psychology of the Creative Eye, p. 275.

[36]Edward Jones and Harold Gerard, Foundations of Social Psychology (New York: John Wiley and Sons, Inc., 1967), p. 338.

[37]Fabri, Color--A Complete Guide for Artists, p. 63.

[38]Feininger, Successful Color Photography, p. 271.

[39]Johannes Itten, The Art of Color (New York: Reinhold Publishing Corp., 1961), p. 130-131.

[40] Feininger, Successful Color Photography, p. 11.

[41] Harold Mante, Color Design in Photography (New York: Focal Press, 1972), p. 94.

[42] "The Rewards of Black and White Photography," Los Angeles Times Home Magazine, 2 June 1974, p. 30-35.

[43] von Goethe, Theory of Colors, p. 334.

[44] Feininger, Successful Color Photography, p. 15.

[45] Arnheim, Art and Visual Perception, a Psychology of the Creative Eye, p. 32.

[46] Ibid., p. 274.

[47] Spencer, Color Photography in Practice, p. 361-362.

[48] Victor Keppler, The Eighth Art (New York: William Morrow and Co., 1938), p. 18.

[49] Ralph Evans, Eye, Film, and Camera in Color Photography (New York: John Wiley and Sons, Inc., 1959), p. 236-252.

[50] Jurgen Ruesch and Weldon Kees, Nonverbal Communication (Berkeley and Los Angeles: University of California Press, 1956), p. 12.

[51] Andreas Feininger, The Complete Photographer (Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1966), p. 232.

[52] Ibid., p. 39.

[53] Arnheim, Art and Visual Perception, a Psychology of the Creative Eye, p. 38.

[54] Evans, Eye, Film, and Camera in Color Photography, p. 373.

[55] Mante, Color Design in Photography, p. 8.

[56] Arnheim, Art and Visual Perception, a Psychology of the Creative Eye, p. 140.

[57] Rudolf Arnheim, Visual Thinking (Berkeley and Los Angeles: University of California Press, 1969), p. 297.

[58]Interview with Kenneth L. Henderson, Retired,
Ames, Iowa, 3 March 1974.

VII. REFERENCES

Albers, Josef. Interaction of Color. New Haven: Yale
    University Press, 1963.

Arnheim, Rudolf. Art and Visual Perception, a Psychology
    of the Creative Eye. Berkeley and Los Angeles:
    University of California Press, 1965.

_____. Visual Thinking. Berkeley and Los Angeles:
    University of California Press, 1969.

Baker, Stephen. Visual Persuasion. New York: McGraw-Hill
    Book Company, 1961.

Birren, Farber. History of Color in Painting. New York:
    Reinhold Publishing Co., 1965.

_____. Itten--The Elements of Color. New York: Van
    Nostrand Reinhold Company, 1970.

Elisofon, Eliot. Color Photography. New York: The Viking
    Press, 1961.

Evans, Ralph. An Introduction to Color. New York: John
    Wiley and Sons, Inc., 1948.

_____. Eye, Film, and Camera in Color Photography.
    New York: John Wiley and Sons, Inc., 1959.

Fabri, Ralph. Color--A Complete Guide for Artists. New
    York: Watson-Guptill Publications, 1967.

Feininger, Andreas. Successful Color Photography.
    Englewood Cliffs, N.J.: Prentice-Hall, Inc., 1954.

_____. The Complete Photographer. Englewood Cliffs,
    N.J.: Prentice-Hall, Inc., 1966.

Goldsmith, Arthur. The Photography Game. New York: The
    Viking Press, 1971.

Henderson, Kenneth L. Retired, Ames, Iowa. Interview,
    3 March 1974.

Hurley, Gerald D., and McDougall, Angus. Visual Impact
    in Print. Chicago: American Publishers Press, 1971.

Itten, Johannes. The Art of Color. New York: Reinhold
    Publishing Corp., 1961.

_____. The Elements of Color. New York: Van Nostrand
    Reinhold Co., 1970.

Janson, H. W. History of Art. New York: Harry N. Abrams,
    Inc., (no date).

Johnson, Egbert. Basic Color, An Interpretation of the
    Ostwald Color System. Chicago: Paul Theobald, 1948.

Jones, Edward, and Gerard, Harold. Foundations of Social
    Psychology. New York: John Wiley and Sons, Inc.,
    1967.

Keppler, Victor. The Eighth Art. New York: William
    Morrow and Co., 1938.

Luscher, Max. The Luscher Color Test. New York: Random
    House, 1969.

Mante, Harold. Color Design in Photography. New York:
    Focal Press, 1972.

Munsell, A. H. A Color Notation. Baltimore: Munsell
    Color Co., 1946.

Reedy, William A. Impact--Photography for Advertising.
    Rochester, N.Y.: The Eastman Kodak Company, 1973.

"The Rewards of Black and White Photography." Los Angeles
    Times Home Magazine, 2 June 1974, p. 30-35.

Rudisill, Richard. Mirror Image. Albuquerque, N.M.:
    University of New Mexico Press, 1971.

Ruesch, Jurgen, and Kees, Weldon. Nonverbal Communication.
    Berkeley and Los Angeles: University of California
    Press, 1956.

Spencer, D. A. Color Photography in Practice. 3rd. ed.
    New York: Amphoto, 1969.

Turnbull, Arthur T., and Baird, Russell N. The Graphics
    of Communication. New York: Holt, Reinhart and
    Winston, 1966.

von Goethe, Johann Wolfgang. Theory of Colors. Cambridge,
        Mass.: The M.I.T. Press, 1840.

White, Minor. The Zone System Manual. 4th. ed. Dobbs
        Ferry, N.Y.: Morgan and Morgan, Inc., 1968.

Whiting, John R. Photography is a Language. Chicago:
        Ziff Davis Publishing Co., 1946.

Wolfman, Agustus. 1973-74 Report on the Photographic
        Industry in the United States. New York: Modern
        Photography, 1974.

VIII.   ACKNOWLEDGMENTS

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Thanks to Kenneth L. Henderson, a "Rennaissance-man" whose work in photography will always be an inspir-ation to me, and without who's help this work would have been infinitely more difficult.

To my wife Jan...there are no words...

IX. APPENDIX A: TECHNICAL INFORMATION
ON THE COLOR IMAGES

The film used for all of the color images was
Eastman Kodak Ektacolor, Type S. The film was exposed
according to Eastman's instructions, i.e., at an ASA
rating of 100.

This film was chosen because of its inherent cap-
ability of rendering what can be considered a "natural"
color quality.

After exposure, the film was developed in Eastman
Kodak C-22 Color Chemistry, according to printed in-
structions.

The paper selected for the making of the prints
was Agfa-Geveart Agfacolor MCN 111. The paper was exposed
according to instructions and processed in Agfa-Geveart
Agfacolor Chemistry according to instructions.

The choice of Agfacolor paper was based upon the
author's experiments with several products currently on
the market. Agfacolor was found to have superior color
quality, contrast, and ease of handling.

Camera equipment used was of two basic types,
35mm and 120. The 35mm cameras used were manufactured

by Nikon. The 120 cameras were manufactured by Mamiya. The models were, respectively, the Nikon F and the Mamiya C-33.

The enlarger used was an Omega, model B-3 Autofocus. The color filters used in the enlarger were of the five-inch acetate type, manufactured by Eastman Kodak.

Lenses used on the cameras were as follows: (Nikon) 24mm f/2.8, 35mm f/2.8, 50mm f/2, 55mm f/3.5, 105mm f/2.5 and 135mm f/3.5; (Mamiya) 65mm f/3.5 and 105mm f/3.5.

Lens used on the enlarger were a Bausch-Lomb 50mm f/4.5 for the 34mm negatives and a Baush-Lomb 90mm f/4.5 for the 120 negatives.

The light meter used in the exposure of the Ektacolor film was manufactured by Gossen, the Luna-Pro model equipped with the spot-metering attachment.

The following exposure information is useful to the reader only in the context that it may serve to further inform him as to the conditions prevailing when the negative was exposed. It is in no way implied by the author that such pictures can be consistently made in the same way. This is due to the constantly changing nature of atmospheric conditions and available light.

Individual Exposure Data on the
Color Images

1. Nikon, 50mm f/2, 1/250 sec. at f/5.6.

3. Nikon, 55mm f/3.5, 1/125 sec. at f/11.

5. Nikon, 105mm f/2.5, 1/1,000 sec. at f/2.8.

7. Nikon, 35mm f/2.8, 1/30 sec. at f/5.6.

9. Mamiya, 65mm f/3.5, 1/125 sec. at f/5.6.

10. Nikon, 55mm f/3.5, 1/30 sec. at f/11.

11. Nikon, 55mm f/3.5, 1/15 sec. at f/16, tripod.

12. Nikon, 135mm f/3.5, 1/500 sec. at f/5.6.

14. Nikon, 35mm f/2.8, 1/125 sec. at f/8.

15. Nikon, 24mm f/2.8, 1/60 sec. at f/8.

16. Nikon, 55mm f/3.5, 1/125 sec. at f/11.

17. Nikon, 35mm f/2.8, 1/30 sec. at f/5.6.

18. Nikon, 35mm f/2.8, 1/30 sec. at f/11.

19. Nikon, 35mm f/2.8, 1/30 sec. at f/4.

21. Nikon, 55mm f/3.5, 1/500 sec. at f/5.6.

22. Nikon, 35mm f/2.8, 1/125 sec. at f/8.

23. Nikon, 135mm f/3.5, 1/30 sec. at f/11, tripod.

24. Nikon, 35mm f/2.8, 1/250 sec. at f/8.

26. Mamiya, 105mm f/3.5, 1/500 sec. at f/11.

28. Nikon, 24mm f/2.8, 1/30 sec. at f/11.

29. Nikon, 24mm f/2.8, 1/60 sec. at f/16.

30. Nikon, 35mm f/2.8, 1/250 sec. at f/8.

31. Nikon, 35mm f/2.8, 1/30 sec. at f/5.6.

X.   APPENDIX B. TECHNICAL INFORMATION
ON THE BLACK-AND-WHITE IMAGES

The film used for image number six and image number eight was Eastman Kodak Panatomic-X film. This film was chosen for these images because of its inherent contrast and its ability to render fine detail.

. The film used for all the other black-and-white images was Kodak Tri-X Pan film. The choice of this was necessitated by the film's inherent high speed (light-sensitivity) which allows small lens openings for increased depth-of-field (sharpness in depth).

Neither film was exposed according to the manufacturer's instructions. It is the author's custom to slightly underexpose his black-and-white film. Rather than an ASA of 32 (American Standards Association determination of relative light sensitivity) for Panatomic-X film the author used an ASA of 50. For the Tri-X film, rather than an ASA of 400 which is recommended, the author used an ASA of 650. These deviations are relatively slight, but it is the experience of this author that the negatives yield better highlight detail when the film has been slightly underexposed.

The film developer used was Eastman Kodak D-76, chosen because it is particularly suited to the production of negatives which yield a high degree of sharpness.

As in exposure, the instructions for the development of the film provided by the manufacturer were disregarded.

The method by which the film was developed was determined by the relative contrast of the subject matter of the image.

Very briefly, if the subject matter was a scene of "normal" contrast, the film was developed normally. If the subject matter was of "higher than normal" contrast, then the film was developed for less than the recommended time in order to preserve the highlight detail. Conversely, if the scene was of "less than normal" contrast, the film was developed for more than the recommended time, in order to artificially increase contrast.

This treatment is known as the "zone system of exposure and development," and is very effective in the treatment of black-and-white images. It is not within the province of this study to enter into an explanation of this process. There are several excellent references on the subject, and the reader is referred to Minor White's

The Zone System Manual as perhaps the most readable treatment of the subject.

The processing steps following development were according to instructions.

The paper selected for the making of the prints was Eastman Kodak Kodabromide F-2. This paper was chosen for its rich tonal gradation and its "cold" black (when the print is viewed in sunlight, there is no hint of a brownish cast in the black areas). It is a glossy paper of good surface reflectance and high apparent sharpness.

The paper was processed according to the instructions provided by the manufacturer.

Camera and enlarging equipment were the same as noted in Appendix A.

Individual Exposure Date on the Black-and-White Images

2. Mamiya, 105mm f/3.5, Tri-X, 1/500 sec. at f/16, exposure in enlarger for Kodalith Ortho, 5 sec. at f/8.

4. Nikon, 24mm f/2.8, 1/15 sec. at f/16, tripod.

6. Mamiya, 65mm f/3.5, Panatomic-X, 20 sec. at f/32, tripod.

8. Mamiya, 65mm f/3.5, Panatomic-X, 1/30 sec. at f/8, tripod.

13. Nikon, 24mm f/2.8, Tri-X, 1/30 sec. at f/16.

20. Nikon, 55mm f/3.5, Tri-X, 1/250 sec. at f/8.

25. Nikon, 35mm f/2.8, Tri-X, 1/30 sec. at f/16.

27. Nikon, 24mm f/2.8, Tri-X, 1/60 sec. at f/16.

XI. APPENDIX C: TECHNICAL INFORMATION ON THE PRODUCTION
OF TRANSPARENCIES FROM THE ORIGINAL PRINTS

In order to produce acceptable copies of the prints
on transparency film, a number of problems had to be
solved. The first problem, and the most basic, was the
lighting of the prints for copying. Correct lighting is
essential for the preservation of detail and color quality.

It became clear to the author at the outset that
ordinary photo-flood bulbs in reflectors would be totally
inadequate. This was due to the physical nature of the
original prints. The photographic paper used to make the
prints, because it has a matte finish, tends to scatter
light striking it in all directions.

The lighting procedure followed for the correct
presentation of prints for first-hand viewing is perfectly
capable of solving this problem. Normally, for viewing,
the print is illuminated from above, and the light is set
at an angle radical to the plane of the image so that
reflections will be directed out of the usual line of
sight of the observer.

However, this results in uneven lighting. The
first-hand observer is not aware of this problem because
of the adaptability of the eye. As was previously

observed, the camera has no such ability. Because of this shortcoming, even lighting of the print to be copied is essential.

Unfortunately, due to the surface quality of the original prints and the requirement of more than one light for balanced over-all illumination, light-scattering became a problem of paramount importance.

The effect of light-scattering is a general reduction of contrast and a lowering of color saturation in color prints. In black-and-white prints, contrast is also reduced and highlight areas are "washed out," i.e., devoid of detail. It is therefore a problem which cannot be ignored.

"The most satisfactory way of copying pictures, both from the standpoint of ease and results, is to use polarized light."[58] Polarized light totally eliminates the scattering of light at the source.

In order to understand this concept, a little understanding of the nature of light is necessary. All light sources, with the exception of lasers produce light which vibrates in all directions. Inasmuch as the light is moving in all directions, when it strikes a subject, it will reflect in all directions. The effect of a polarizing screen is to screen out all light except that vibrating in a certain plane, say, horizontal. This

effect is accomplished by the fact that the screen is
a series of finely etched parallel lines which pass only
light vibrating in a direction which is also parallel to
the lines. Needless to say, the etched lines are not
visible to the unaided human eye.

The author purchased, at a scientific supply
house, a large piece of polarized sheeting. The sheet
was cut to the size necessary for the complete covering
of the light sources.

In order to effect the polarization of the light
sources, the axes of the polarizer material over each of
the lights (two were used) must be parallel to each other.
In order to determine the axes, the sheets were simply
sandwiched together, held up to the light, and rotated in
relation to each other until complete opacity was achieved.
When no light passes through the two sheets, the axes are
exactly 90° from one another.

The axes were then marked and the material
placed over the lights. The work table was set up, the
work area delineated, and the camera placed on a tripod
above the center of the work area. The two lights were
positioned on either side of the table, each on a light-
stand set exactly thirty-six inches from lens-to-subject
axis and thirty-six inches above the level of the table.

The polarization of the light sources is of no

value unless a polarizing screen is also placed over the
lens. Once the polarized light strikes a light scattering
subject, it will be caused to vibrate randomly. In order
to eliminate the randomly vibrating light, the third
polarizer is necessary.

The adjustment of the third polarizer is simple.
The author merely placed a piece of aluminum foil on the
table, switched on the lights, and adjusted the screen on
the lens until the foil no longer showed any sign of
reflection.

It was at this point that the author discovered
that the polarizer screens were buckling from the heat
of the lamps. Small electronic flash units manufactured
by Kako, Inc., were substituted for the tungsten bulbs.

Eastman Kodak Kodachrome 64 was selected for
making the copies. This film was selected because its
color and contrast specifications were considered to be
particularly suited to this type of work. As of this
writing, this film is new on the market and was, prior
to this author's experiments, untested by him. It is
the opinion of the author that this film surpasses the
quality ascribed to it by the manufacturer.

The film was exposed according to instructions
and processed by the manufacturer. User processing is
not possible with this film.

Exposure was determined by the use of an electronic flash meter manufactured by the Wein Company.

The camera used was a Nikon F and a 55mm f/3.5 Auto-Micro-Nikkor lens was selected because it is specifically designed by the manufacturer to give quality results in this type of work.