

Introduction

The book "Interaction of Color" is a record of an experimental way of studying color and of teaching color.

In visual perception a color is almost never seen as it really is -- as it physically is.

This fact makes color the most relative medium in art.

In order to use color effectively it is necessary to recognize that color deceives continually.

To this end, the beginning is not a study of color systems.

First, it should be learned that one and the same color evokes innumerable readings.

Instead of mechanically applying or merely implying laws and rules of color harmony, distinct color effects are produced

-- through recognition of the interaction of color --

by making, for instance,

2 very different colors look alike, or nearly alike.

The aim of such study is to develop -- through experience

-- by trial and error -- an eye for color.

This means, specifically, seeing color action

as well as feeling color relatedness.

As a general training it means development of observation and articulation.

This book, therefore, does not follow an academic conception of "theory and practice."

It reverses this order and places practice before theory, which, after all, is the conclusion of practice.

Also, the book does not begin with optics and physiology of visual perception, nor with any presentation of the physics of light and wave length.

I Color recollection -- visual memory

Just as the knowledge of acoustics does not make one musical -- neither on the productive nor on the appreciative side -- so no color system by itself can develop one's sensitivity for color. This is parallel to the recognition that no theory of composition by itself leads to the production of music, or of art.

Practical exercises demonstrate through color deception (illusion) the relativity and instability of color. And experience teaches that in visual perception there is a discrepancy between physical fact and psychic effect.

What counts here -- first and last -- is not so-called knowledge of so-called facts, but vision -- seeing. Seeing here implies Schauen (as in Weltanschauung) and is coupled with fantasy, with imagination.

This way of searching will lead from a visual realization of the interaction between color and color to an awareness of the interdependence of color with form and placement; with quantity (which measures amount, respectively extension and/or number, including recurrence); with quality (intensity of light and/or hue); and with pronouncement (by separating or connecting boundaries).

The table of contents shows the order in which exercises usually lead our investigation.

Each exercise is explained and illustrated -- not to give a specific answer, but to suggest a way of study.

If one says "Red" (the name of a color) and there are 50 people listening, it can be expected that there will be 50 reds in their minds. And one can be sure that all these reds will be very different.

Even when a certain color is specified which all listeners have seen innumerable times -- such as the red of the Coca-Cola signs which is the same red all over the country -- they will still think of many different reds.

Even if all the listeners have hundreds of reds in front of them from which to choose the Coca-Cola red, they will again select quite different colors. And no one can be sure that he has found the precise red shade.

And even if that round red Coca-Cola sign with the white name in the middle is actually shown so that everyone focuses on the same red, each will receive the same projection on his retina, but no one can be sure whether each has the same perception.

When we consider further the associations and reactions which are experienced in connection with the color and the name, probably everyone will diverge again in many different directions.

What does this show?

First, it is hard, if not impossible, to remember distinct colors. This underscores the important fact that the visual memory is very poor in comparison with our auditory memory. Often the latter is able to repeat a melody heard only once or twice.

Second, the nomenclature of color is most inadequate. Though there are innumerable colors -- shades and tones -- in daily vocabulary, there are only about 30 color names.

II Color reading and contexture

The concept that "the simpler the form of a letter the simpler its reading" was an obsession of beginning constructivism. It became something like a dogma, and is still followed by "modernistic" typographers.

This notion has proved to be wrong, because in reading we do not read letters but words, words as a whole, as a "word picture."

This was discovered in psychology, particularly in Gestalt psychology. Ophthalmology has disclosed that the more the letters are differentiated from each other, the easier is the reading.

Without going into comparisons and details, it should be realized that words consisting of only capital letters present the most difficult reading -- because of their equal height, equal volume, and, with most, their equal width. When comparing serif letters with sans-serif, the latter provide an uneasy reading. The fashionable preference for sans-serif in text shows neither historical nor practical competence.

First, sans-serifs were designed as letters not for texts but for captions, when pictorial reproductions were introduced with stone lithography. Second, they produce poor "word pictures."

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This illustrates that clear reading depends upon the recognition of context.

In musical compositions, so long as we hear merely single tones, we do not hear music. Hearing music depends on the recognition of the in-between of the tones, of their placing and of their spacing.

In writing, a knowledge of spelling has nothing to do with an understanding of poetry.

Equally, a factual identification of colors within a given painting has nothing to do with a sensitive seeing nor with an understanding of the color action within the painting.

Our study of color differs fundamentally from a study which anatomically dissects colorants (pigments) and physical qualities (wave length).

Our concern is the interaction of color; that is, seeing what happens between colors.

We are able to hear a single tone. But we almost never (that is, without special devices) see a single color unconnected and unrelated to other colors. Colors present themselves in continuous flux, constantly related to changing neighbors and changing conditions.

As a consequence, this proves for the reading of color what Kandinsky often demanded for the reading of art: what counts is not the what but the how.

III Why color paper -- instead of pigment and paint

When, more than 20 years ago, this systematic study of color was begun, it occurred almost as a matter of course that the studies would be done in color papers. At that time there was some concern among teachers that students might be reluctant to substitute paper for paint. Since then, obviously, the attitude of students -- and of teachers -- has changed.

In our studies, color paper is preferred to paint for several practical reasons. Paper provides innumerable colors in a large range of shades and tints ready for immediate use. Though a large collection is needed, it is not expensive to assemble when one does not rely on large prepared paper sets representing specific color systems, such as the Munsell or Ostwald Systems (the least desirable are "tuned" sets, claiming to be failure-proof).

Sources easily accessible for many kinds of color paper are waste strips found at printers and bookbinders; collections of samples of packing papers, of wrapping and bag papers, of cover and decoration papers. Also, instead of full sheets of paper, just cutouts from magazines, from advertisements and illustrations, from posters, wallpapers, paint samples, and from catalogues with color reproductions of various materials will do. Often a collective search for papers and a subsequent exchange of them among class members will provide a rich but inexpensive color paper "palette."

What are the advantages of working with color paper?

First, color paper avoids unnecessary mixing of paints, which is often difficult, time-consuming, and tiring. This is true not merely for beginners alone.

Second, by not exposing the student to discouraging failures of mixing and imperfect matching of spoiled paints and papers, we not only save time and material, but, more important, gain a continued active interest.

Third, color paper permits a repeated use of precisely the same color without the slightest change in tone, light, or surface quality. It permits repetition without disturbing changes caused by varying application of paint (thinner or thicker -- even or uneven); without traces of hand or tool resulting in varying density and intensity.

Fourth, working with color paper rarely demands more equipment than paste (heavy rubber cement is best), and a single-edged razor blade instead of scissors. This eliminates tools and equipment for handling paints, and therefore is easier, cheaper, and more orderly.

Fifth, color paper also protects us from the undesired and unnecessary addition of so-called texture (such as brush marks and strokes, incalculable changes from wet to dry, or heavy and loose covering, hard and soft boundaries, etc.) which too often only hides poor color conception or application, or, worse, an insensitive color handling.

There is another valuable advantage in working with color papers instead of with paints: in solving our problems again and again we must find just the right color which demonstrates a desired effect. We can choose from a large collection of tones, displayed in front of us, and can thus constantly compare neighboring and contrasting colors. This offers a training which no palette can provide.

IV A color has many faces -- the relativity of color

Imagine in front of us 3 pots containing water, from left to right:

WARM

LUKEWARM

COLD

When the hands are dipped first into the outer containers,
one feels -- experiences -- perceives -- 2 different temperatures:

WARM (at left)

(at right) COLD

Then dipping both hands
into the middle container,
one perceives again
2 different temperatures,
this time, however,
in reversed order

(at left) COLD -- WARM (at right)

though the water is neither of these temperatures, but of another, namely

LUKEWARM

Herewith one experiences
a discrepancy between physical fact and psychic effect called,
in this case, a haptic illusion -- haptic as related to the sense of
touch -- the haptic sense.

In much the same way as haptic sensations deceive us, so
optical illusions deceive. They lead us to "see" and to "read"
other colors than those with which we are confronted physically.

To begin the study of how color deceives and how to make use of this,
the first exercise is
to make one and the same color look different.

On the blackboard and in our notebooks we write:

Color is the most relative medium in art.

Challenging examples of very surprising color changes are shown.
Then the class is invited to produce similar effects

but is not given reasons or favorable conditions.
It starts, therefore, on a trial-and-error basis.

Thus, continuing comparison -- observation -- "thinking in situations" --
is promoted, making the class aware that discovery and invention
are the criteria of creativeness.

As a practical study we ask that 2 small rectangles of the same color
and the same size be placed on large grounds of very different color.

Soon, these first trials are collected and separated into groups
of more and less promise.

The class will become aware that change is a result of influence.
The influencing color is distinguished from the influenced color.

It is discovered that certain colors are hard to change, and
that there are others more susceptible to change.

We try to find those colors which are more inclined to exert influence
and to distinguish them from those which will accept influence.

A second class exhibition of more advanced results should clarify
that there are 2 kinds of changing influences working in 2 directions,
light on the one side and hue on the other. And both occur simultaneously --
though in varying strength.

Since 2 pieces of the same paper, therefore of the same color,
are to appear different -- and, if possible, incredibly different --
we must compare them under equal conditions.
The only colors which are factually different are the large grounds,
though they are alike in size and shape.

Because of the laboratory character of these studies
there is no opportunity to decorate, to illustrate, to represent anything,
or to express something -- or one's self.

Here, successful studies present a demonstration. Since they cannot be
misread or misunderstood, they prove understanding both
of the principle involved and of the materials to be manipulated.