The importance of light and colour in design is often realized in our daily experience. On every hand, ever changing play of nature’s subtle and complex colour palette, resulting atmospheric effects, dynamic colour music and certain reactions. From the tropics to the arctic, man is surrounded by the mysterious glamour of the play of changing light, the long low sunset of the arctic, the hot sultry glow of the limpid jungle atmosphere, the nostalgic gloom of the eclipse, the ominous sky suddenly rent by blinding gleam—all exert an hypnotic power, dramatic in effect.

The designer who consciously uses light and colour to influence, control and enhance his design, — whether it be a lamp, a chair or a whole room, — recognizes that these elements are closely associated with the other basic elements of design, — line, pattern, texture, form and space.

What is Design?

We may well ask the fundamental question, "What is design?" If we take the definition, "Design is the orderly arrangement of things for use and beauty," we find the essentials which have always been emphasized in design: the planned arrangement according to basic principles; the organic quality which constitutes its form; the direct outgrowth of its function or use; the aesthetic quality which generates a sense of visual satisfaction as well as an inner awareness of the meaning of the design.

Robert G. Scott, in his book Design Fundamentals, gives his definition: "Designing means creative action that fulfills its purpose." Here we are reminded that design is the result of "creative action"; in other words, it involves real results from a series of acts or processes in which certain elements are combined according to accepted laws and principles, and the result fulfills the purpose for which it was intended.

The fulfillment of function (the "functional theory") for which we hear so much these days) implies that its form shall express the meaning or intention; that, since cannot exist apart from the material, the form shall express that material from which it was fashioned; and that the form shall be the logical outcome of the method by which it was built or put together.

Thus it is evident that every design has both an aesthetic and an intellectual aspect. Visually, we see and appreciate the relationships of line and form, pattern and texture, light, shadow and colour; intellectually, we recognize and appreciate the material and structural relationships we know to be there.

Design in Practice

The practitioner, — the designer who creates for a purpose, — works with basic elements and employs basic principles or rules for their correlation and integration. The Basic Elements: line, form or mass, space, texture, pattern, light, colour. The Basic Principles: unity, balance, rhythm, harmony, direction, dominance or emphasis, proportion, scale.

Habitually, most of us look at things without really seeing them. We are surrounded by countless objects, patterns and textures. We think we know what each looks like. We have seen millions of leaves, for example; yet when we inspect one closely we find unexpected structural patterns of great beauty.

Much of our knowledge of things depends on touch as well as sight. Our fingers convey impressions of rough and smooth, hard and soft, just as our eyes tell us of form and colour. Every surface has texture, one that is either natural to the material or the result of fabricating or finishing processes.

By considering the object itself, the purpose it must serve, the spirit it should express, the designer determines the material best suited to the task. Whatever the designer's tools and materials, he works with the same basic elements and applies the same basic principles of composition listed above.

The elements of light and colour are, in many ways, the most important. Light is the medium which, through lights and shades, reveals and defines forms in space and surface patterns and textures. Where there is light there is bound to be colour, since light is colour. These two closely interdependent elements are at once visual and emotional in their use: each defines visually; in addition, each expresses or creates a mood, a feeling, a quality.

Light

Basically, light is, of course, essential for good visibility. In the design of the lighting for any interior, the provision of the right amount and the right kind of light in the right place is the major consideration. Through careful control of the quantity, colour, direction and distribution of light,
the lighting engineer can create just the right seeing conditions for the activities that take place within an area, whether it be a restaurant, a living room, a business office, a corridor, an operating room, or a beauty parlour. Light thereby fulfills its prime function of providing good visibility; but light also has an equally important and parallel function as a creative or expressive element of design.

Light is more than just a convenience by which to see things, a means of revealing or explaining the visual aspects of a form or a design; it is an emotional language with power to induce and maintain moods through its direction, intensity, quality and colour. As an element of spatial design, it unifies, explains and emphasizes forms in space. The shadows it casts define both form and space, underlining the brilliance of the light itself. In themselves, they form patterns and become integral parts of a design, frequently evoking emotional or symbolic ideas.

Light and shadow thus enhance and control the visual appearance of a design, while in a room they establish and maintain an emotional atmosphere consonant with the intended spirit and use of the space.

**Light as Colour**

Of the controllable aspects of light,—its quality, quantity, colour, direction and distribution,—colour is often misunderstood and neglected. Although we remember our fundamental physics of light and the experiment in which white light is broken down into its component colour wave lengths by being passed through a prism, we generally fail to connect this phenomenon with the daily experience we call “seeking colour.” We think of colour as something we look at, rather than the sensation produced by light reflecting from a surface at a certain speed and wave length which produces the visual reaction we call a colour.

Without light, colour could not exist. In a completely black room, paints have no colour: the colour sensation does not occur until light strikes the paint surface and reflects therefrom into the human eye. If the paint appears to be green, it is because the peculiar consistency of the paint is such that it absorbs all parts of the white light falling on it except the green wave length, which, reflected from the surface to the eye, produces the sensation we call green.

Architects and interior designers find these two elements of design,—light and colour,—inseparable; one cannot be planned or controlled without providing for the other, and each exerts a strong influence on the other.

**Colour Definition**

The sensation or phenomenon which we call colour can be defined specifically by determining its hue, its value and its chroma. Colour authorities may vary in the terminology, but all recognize (i) that there are characteristics which differentiate one colour from another and therefore determine the name or hue; (ii) that colour may vary in the amount of light reflected from its surface and can therefore be described as having a light or dark value; and (iii) that colour may vary in its intensity or concentration of pigment, from very strong to very weak or greyed chroma.

The study of these three dimensions of colour has led colour authorities to establish certain standards of measurement and comparison which facilitate matching and mixing, as well as provide a basis for harmony.

**Colour Mixture**

Early in the study of colour, time must be spent experimenting with coloured pigment and coloured light. One must ascertain how each is mixed to produce an infinite number of hues and colour tonalities. The mixing of complemen-
tary pigment colours to produce either greyed chrome or a neutral grey, and the mixing of shades of colours to produce the shades between, reveal the process of considering both the values and the chromas of the basic pigment being mixed. In contrast to the subtractive mixture of pigments (in which each colourant subtracts light from the mixture) light is subtracted from light, and the mixing of coloured light becomes an additive process (the wave lengths of the coloured lights add up to produce a new totality of colour for the eye). Light is added to light.

**Peculiarities of Human Vision**

No colour in nature exists entirely separate from other colours; seen always in conjunction with other sights, it is the relationship of two or more colours which creates the remembered effect. Not only does a strong object appear to “colour” a weaker one adjacent to it, but the eye itself does a lot of “colouring” as it reports sensations. The physiological process of seeing colour involves vibrations and reactions within the eye which, in turn, convey a report about the colour.

The phenomenon of after-image,—in which the eye retains an impression of colour seen, which affects the colours seen immediately thereafter,—must always be considered in the juxtaposition of colours in a design. The fact that the eye is always looking for relief from intense colour, causes it to introduce a film of the complementary colour over anything seen immediately afterward. This may cause an impression of brightness or a sense of colour which actually is not there. This phenomenon accounts for the fact that shadows on coloured surfaces appear to have a complementary hue; hence a roughly textured surface always looks greyer in chroma than a smooth surface of the same colour.

The phenomenon of irradiation causes the eye to evaluate the apparent size of the light form seen against a dark background and conversely to contract the dark form in front of a light background. The phenomenon of fusion or colour merger causes the eye to mix the mosaic of two or more colours, noting them into another colour quite unrelated to the parent colours. Landscape painters of the late nineteenth century developed this reliance upon the spectator’s eye to do the mixing in their impressionist paintings to its logical conclusion in their technique of broken colour.

**Visual Appearance of Colour**

Not only do we have to anticipate the ways in which the mechanics of human vision will alter the colour long used in a design, but we also have to recognize that colour appear to have certain qualities which convey definite impressions of temperature and space.

*Colour “temperature.”* The colours in the red half of the circle of colour described as cheerful, luminous, and its opposite as cool, calm, and grey. To determine the apparent size of objects, the eye has a tendency to reduce the size of objects which are far away, and vice versa.

**Advancing colours** or personable colours are those which tend to come forward; the size of the eye, in the case of a room, increases as it moves from the door, to the wall, and to the ceiling, which is, in close association with the ceiling, the furthest point in the room.

We design the size, character and colour we can express in the planes of the room, and maintain the right size, character, and colour we can express in the planes of the movement.

The study of all these phenomena is still in its infancy, and the satisfaction of the eye and the visual comfort of the human observer the first and last word, for if the eye is disturbed, as it is by extreme values and contrasts, the mental function is disturbed, and for the individual and the collective the eye is the organ of the soul.
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colour (from purple to greenish yellow) can be
referred as warm colours,—those which are active,
life, and a glowing richness to any design. They focus
on an object, a part of a design or the wall of a
room, giving that element significance by increasing its
apparent size. If used in too great quantities, such warm
colours may become irritating and disturbing, creating
sense of tension or confusion.

The remaining colours on the blue half of the circle are
called cool colours,—those which are passive or
ing, tranquil, restful and quiet. They create an at-
mosphere of rest and relaxation; they extend the range of
an and disperse the attention, separating the parts of a
n and making it seem less crowded because of the
action in the apparent size of each part. Used in
quantities, cool colours may create a cheerless,
various, almost heart-like effect which becomes cold and
revel.

"Solid color." Some colours, because of the inherent
ness of their appearance, seem to be solid and therefore
ify the forms on which they occur. Other colours ap-
fumeous, translucent, or transparent, removing the
se of solid form or plane. Thus the reds and ear-
those could be described as form defining colours, while
iches and more intense chromas could be described as
in destroying colours. Generally speaking, the darker
aces and the more intense chromas will establish the
ace of solid form, while the lighter values and the greyer
ness of any colour will create the sense of atmospheric
. Suitability of colour to the object or design becomes
important. The obvious solidity of a bulky, massive
air for definite tones of darker value or richer
than, say, a light orchid pink upholstery which
create a bulging, balloon-like effect.

Fading and retreating colour. A third "effect" is
sively allied to temperature and colour solidity,—
that warm and solid colours not only establish very
stably the planes on which they occur, but they tend to
move forward in the composition,—to expand visually
the size of the object or to reduce the sense of space in
sense of a room. Conversely, cool, powdery or smoky
es tend to destroy solidity, to recede from us, and
to reduce the apparent size of an object or to expand
sense of space. It thus becomes possible to control the
kind effect of length, width or height in a given space.

In the small room, for instance, the use of warm tones, like
very popular amber-buff, will reduce the apparent size
the space by as much as 20 or 25 percent. Visually, the
room appears small and cramped; psychologically, it ap-
sest still and lacking in freshness.

FUNCTION OF COLOUR
We design objects and enclose spaces with planes,—
mental, vertical, sloping or curved. Each has its own
acter and texture. Through the appropriate use of
cour we can define not only the form or space, but, by
planes of colour creating that space, we can also direct
ovement of people into and through the space.

Furthermore, these planes of colour will help to create
and maintain the emotional moods and reactions of these
people while they are in the space. It becomes apparent,
therefore, that colour fulfills the dual function of defining
space and establishing emotional atmosphere. In both
these capacities, it is a creative agent,—creating space or
defining form on the one hand, and creating mood on the
other.

COLOUR PSYCHOLOGY
In all the colour qualities and phenomena mentioned
thus far, the process of visual transcription and inter-
pretation has been involved. It is the impression which the
visual appearance creates and which is transmitted to the
individual that defines the form and colour. However, the
"seeing" of colour also involves the "feeling" of colour,—
the reaction to the emotional connotation of colour. Subtle
colour variations and their association with our personal
experiences of enjoyment and delight enrich our apprecia-
tion of the sensation of colour in a way which no mere
optical experience of "seeing" colour can equal.

Individually, we have certain colour preferences, while
we find others inimical, depressing or distasteful. Tradi-
tionally, we have come to associate certain ideas and
qualities with certain colours. Often there is a great
variety of conflicting associational ideas: red, for instance,
has been connected with early Christian martyrdom, with
flags of nations, with robes of church officials, with revo-
lution, with Christmas, with St. Valentine's Day, with
Mother's Day, with danger, with the 4th of July, with the
R.C.M.P. uniforms.

Furthermore, emotional associations are generally
linked with colours: red suggests courage and strength,
danger, war or passion; orange conveys a note of warmth,
happiness, harvest plenty, laughter and glory; yellow, the
colour revered by oriental religions, may suggest sunshine
and cheerfulness, or, in its harder tones, cowardice, deceit
or decay; green symbolizes victory or safety, and supplies
all the satisfying and restful character of the subtle nuances
found in nature; blue suggests peace and, although in-
clined to be "cold," is the most soothing of colours; purple
has been reserved traditionally as the badge of royalty.

The designer must understand the psychological re-
tions to and the associational ideas of colour in order to
create the desired effects of gaiety, charm, vibrancy, soothing
quiet, freshness, or etc. which a particular space for
human occupancy or use may demand.

COLOUR HARMONY
Much has been written about the combination of colours
into harmonious colour schemes, but we should remember
that the "rules" are merely guides. The success of any
colour scheme depends largely on the many conditions
attendant to the situation. Any one colour cannot be a
"bad" colour; rather, it is its combination with particular
values or chromas of other colours that is unsuccessful.

The arrangement of colours in a design of any kind in-
volve three types on contrast: (i) Contrasts of value (light
versus grey versus dark) are, of course, basic to visibility:
we see things because of light and dark contrast. A great
variety of effects,—sharp emphatic accents of black and
white, or subtle nuances of tonality in greys,—is to be
achieved in the manipulation of values alone. (ii) Con-
trasts of chroma (pure versus greyed colour) produce ex-
citing counterpoints of emphasis through rich intensities
seen against greyed, subtly tinted backgrounds. Thus focus, accent, vibrancy and colour insistance are achieved through the relative power of colours. (iii) **Contrasts of hue** produce the endless variety of colour combinations which seem ever tailor-made to create new and fresh designs and spaces for living. Actually, any colour can be combined successfully through the careful manipulation of their values and chromas in relation to the proportionate areas of each. Nevertheless, it is often helpful to recall certain basic colour combination patterns which usually will produce effective results:

- The monochromatic scheme, with values and chromas of one colour.
- The analogous scheme, with several neighbours from one part of the colour circle.
- The complementary scheme, with the two colours at the opposite ends of any diameter in the colour circle.
- The split complementary scheme, with the two neighbours of one of a pair of complements substituted for that colour.
- The adjacent complementary scheme, with the neighbour of one of a pair of complements added to the pair.
- The analogous complementary scheme, with the complement of one of a group of analogous colours added to the group.
- The double complementary scheme, with two pairs of complements.
- The triadic scheme, with three colours equidistant on the colour circle.

One must remember that the creation of a harmony of colours depends not only on the colours used, but upon the values and chromatic intensities of those colours as well as upon the proportionate relationships of the areas of those colours. The same fundamental principles of good design must be applied in the planning of the colour scheme as are utilized in the creation of a design itself. — balance, unity, contrast, emphasis, rhythm and repetition.

**Light and Colour**

Colour thus becomes a defining or explanatory agent in design as well as an emotional medium capable of establishing and maintaining atmosphere and mood. Having become acquainted with the physical properties of colour itself as well as with the ways we see it and feel its influence, the designer must investigate the interaction of light and colour. What happens when light falls on colour, — how it reacts, is absorbed or reflected; how light is broken into its component parts to create colour; how the colour of light affects the colour on which it falls; how these reactions can be regulated and controlled by foresight and careful planning. Both light and colour are elements of spatial design and act as agents to unify, explain and emphasize forms, patterns and textures in space.

Light, except that proceeding directly from a light source to the eye, is always coloured by reason of its being reflected from coloured surfaces. Colour sensation, as revealed or produced by light reflecting from coloured surfaces, actually precedes form sensation. Thus colour, light and form are inseparable. Too often this fact is overlooked and colour is thought of as an applied disguise without relation to the form it clothes. Design involves the orchestration of colour, form, pattern and texture bathed in and revealed by that impalpable medium, light.

Colour schemes are effected by conditions of nature as well as artificial lighting. — by dazzling sunshine, by sunlight, by cold clear greyness, by heavy mistiness in a region; the medium colours and broken tints from regions of grey misty atmosphere, the radiant and glowing solidity of colour in the clear vibrant atmosphere of the Rockies.

**Light and Colour on the Stage**

Light as a plastic, interpretive medium is best utilized by the creative work of the twentieth century stage designers.

The stage set is the actor’s environment; it aids in imparting to life the words and characters of the play; it establishes the mood of the play; it creates the environment for the actor (the time and place); it is not only the medium for the actor to perform in, but also the medium which enhances it. Obviously it is not the stage setting or spectacle that makes theatre, but the performance.

The performance of a play is a living picture seen through the filter of the colour scheme. — the latest design, the costume, the lighting, the sound effects, the music. The designer, after his is absorbed or reflected; how light is broken into its component parts to create colour; how the colour of light affects the colour on which it falls; how these reactions can be regulated and controlled by foresight and careful planning. Both light and colour are elements of spatial design and act as agents to unify, explain and emphasize forms, patterns and textures in space.

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