V

THE APPRECIATION OF COLOUR

1. *Phenomena of Colour*

MUCH still remains to be done, not only to reconcile divergent studies, but to fill the gaps in our knowledge. The serious student is advised to consult only recent scientific publications and to be ever on his guard in the matter of nomenclature. Most young ladies still use the word 'shade' and many old scientists still use the word 'tone' for what modern writers on the artistic aspects of the colour problem call 'hue'. From what has already been said, respecting our present knowledge of the physical nature of light, of the visual organ as an instrument for the differentiation of colour stimuli, and as to the functions of the mind in the perception of light and colour as elements in things seen (stimuli projected by the mind in space), it may be inferred that colour recognition is a relative affair. The 'standardized white light' pigmentation, or actual local colour of the object seen, the quality of the light illumining it and the juxtaposition of other objects differently pigmented, or even the mere presence of light of other quality affecting other objects within the visual field, are all elements in the resultant colour which the beholder ascribes to an object. The nomenclature of colour has consequently always presented difficulties, and the root words of colour change their significance with the generations, as every schoolboy knows who has struggled with his *Georgics*. Nor are the modern masters of English literature much more concise in their phraseology. Scientific writers within the last generation, as we have seen, have been wont to vary the meanings of colour words with cynical disregard for their predecessors, their contemporaries, and their readers. A review of the more commonly accepted meanings of the colour words current among investigators and artists, some of which have already been illustrated, is necessary at this point.

HUE designates the location on the spectrum (or completed spectral circle) of any colour;

Ex.: Vermilion and chocolate are identical in hue, so are the colours of a sapphire and of a chicory flower.

TINT signifies variation from the saturated colour as found in the spectrum by the admixture of white light, or a pigment reflecting white light.

Ex.: The chicory-flower blue is a tint of the sapphire blue which is more saturated or 'deep'.

SHADE indicates variation from the saturated colour by the balanced addition of all the other pigmentary colours, including itself, i.e. black, or in the case of light by a reduction of strength or luminosity.

Ex.: Chocolate is a rather dark shade of the hue fairly represented by vermilion when the hue is saturated or spectrally pure.

TONE, which, with some of its derivatives, such as 'tonality', is frequently used where 'hue' is meant, is preferably used as signifying variation from the saturated colour (or a tint of it) by neutralization, or conversion towards grey, and properly speaking is only applicable to pigmentary colour.

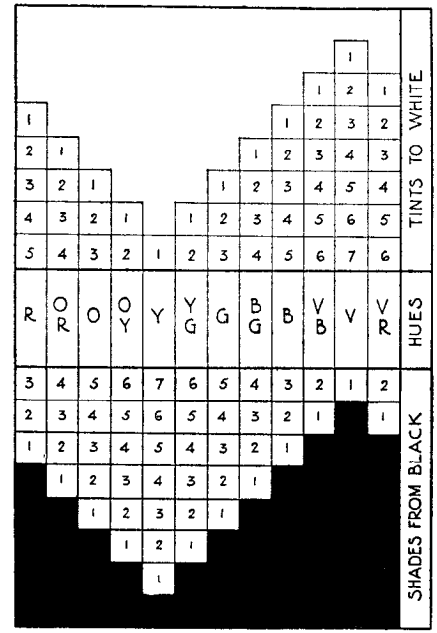

FIG. 5. Twelve spectral hues in line. Their luminosities determine the number of equally separated tints and shades of which each is capable. Blue-Green and Orange-Red can have as many tints as shades. Violet admits seven times as many tints as shades; and Yellow admits of seven times as many shades as tints.

(After Professor Arthur Pope's diagram)

Ex.: Scarlet, a nearly central red, and its complementary blue-green can be mixed through a series of tones, a neutral grey being the central resultant. If corresponding tints of these colours are involved, such as salmon and turquoise, the resultant grey will be correspondingly lighter. So long as the scarlet (or salmon) on the one hand, or the blue-green (or turquoise) on the other, predominates, the series of tones maintains its hue. Adding grey is not the same as neutralizing with a complementary. The result of

that procedure is a change of hue. Tones involving mixtures of grey are often spoken of as 'broken tones', a convenient phrase.

COMPLEMENTARY HUES may be defined as pairs, which, on being mixed, neutralize each other, i.e. with pigments they produce the effect of grey, or, with coloured lights, a lowered white light, equal to their combined luminosities. Each such pair of colours is also spoken of as antagonistic, or balancing. When complementarily

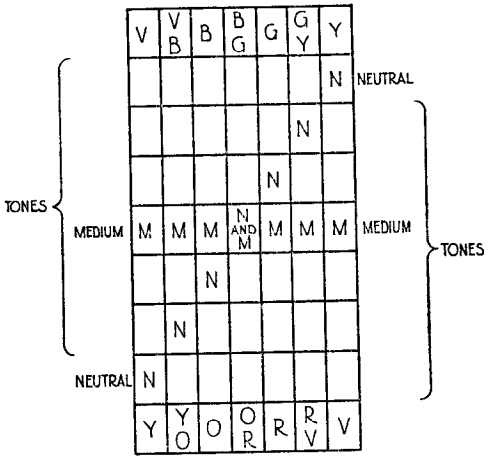

FIG. 6. As soon as neutralization begins there are tones; but the neutral tone is only at medium, half way between black and white, for the Orange-Red and Blue-Green pair.
(After Professor Arthur Pope's diagram)

coloured areas of high saturation are placed in juxtaposition, the eye is flooded by both, and, contrary to current precept, there is loss of both luminosity and saturation—each soils the other. But the juxtaposition of two areas of broken tones or tints, or even shades, complementary in hue, produces a totally different effect as in such cases there is an illusion of enhanced purity or saturation in each.

Ex.: The general avoidance in the flags of the nations (in which strength of colour and the distinction of character are fundamentals of design) of actual complementaries, and the addition of white when complementaries are involved, illustrates the case against the use of saturated complementaries.

Ex.: The bloom of a flesh-coloured carnation, and the leaves of that flower, are tints complementary to each other, and mutually enhancing.

COLOUR FLOODING, above alluded to under complementary hues, is very pronounced in the case of saturated colours selected from either of the end regions of the spectrum—the red-orange and the blue-violet groups—when placed in juxtaposition with white. Large areas of any highly saturated colour will tend to obliterate small areas of equally saturated complementaries.

Ex.: White letters in poster work may be observed to be tinged with cream or pink when on a bright red background, or with pale blue or heliotrope when on a bright blue one, and so on.

Ex.: The human eye, which at best is but a mottle of bluish or brownish shades, one or other predominating, will 'take colour' in a most marked way from a dress of its predominating hue, provided this be fairly saturated. So does the complexion. A lady's blue, or violet, eyes may be largely the result of a bright blue dress, and any man will look sunburned in a strong tan-coloured suit. When tints, or broken tones, are used in dress the result is quite different, and enhancement of eye or face colour by simultaneous contrast may occur. Green continues to provoke simultaneous contrast even when fairly high in saturation. That is to say it does not 'flood' strongly.

SIMULTANEOUS CONTRAST is most marked when the hues involved are referable on the chromatic circle to positions within 30° apart, and when tint, shade, or tone is similar in value in both colours. When the colours in question are far apart and broken, there will, as we saw, be an illusion of enhanced saturation; but when they are near, the illusion is one of displacement, the eye becoming hypersensitive to small differences.

Ex.: Place patches of yellow and yellow-green in contact, and the adjacent edge of the yellow appears orange-yellow, and that of the yellow-green appears distinctly green. But, if the patches be considerable in extent, their distant edges may be made to look identical by again provoking simultaneous contrasts with consecutive hues—orange against the yellow and green against the yellow-green.

Ex.: It was observed that saturated colour would flood white to a tint of its own hue. Simultaneous contrast between a neutral grey and a saturated colour, however, provokes in the grey a tendency towards the complementary of the saturated colour, while the saturated colour itself maintains its quality without the dulling from 'fatigue' which would be noticeable without the grey. The same patch of grey may thus be made to assume the quality of a buff, a sage, a slate, heliotrope, &c., by a juxtaposition with saturated colours complementary to these.

Ex.: A patch of broken tone violet may assume the quality of rose if placed upon a background of broken tone blue-green. On a broken tone of its complementary, a broken tone is rendered more saturated, as has been noted, but if on a broken tone from the right, or left, of its complementary, it will be driven to left or right, in simultaneous contrast.

CONTRAST is dependent on perception of difference, from the merely adequate to the extreme, and is characterized by reaction out of proportion to the actual difference in stimuli in moderate cases.

Colours, nearly adjoining in spectral hue, or only slightly distinguished in tint, shade, or tone, which suggest resemblance while separated by considerable areas of a complementary, will, in juxtaposition, reveal unexpected differences in hue, tint, shade, or tone.

Ex.: A high light on a dark object, though many shades, or degrees of perceptible difference, below the luminosity of the sky, will challenge comparison in virtue of the dark adjoining shadows. An inexpert painter would be liable to use a colour far lighter than the sky to represent this high light.

Ex.: In a tapestry it may be quite impossible to identify a golden buff used for the light side of a tree stem among dark foliage, with the selfsame buff used for the shaded side of a building in the middle distance, where the light side of the building may be a pink; yet the success of tapestry as a mural decoration depends very largely on the use of a set of colours very limited in range and in number.

Ex.: Contrast, without difference in hue, occurs where a tint is opposed to a shade. Primrose, a tint of yellow, is in strong contrast with olive, a shade of yellow. There is scope for abundant contrast within the ranges of tints, shades, and tones of any hue.

Ex.: The range of luminosity between a smooth black and a smooth white object, under a strong light, is often far less than the range between the luminosity of the white and of a short shadow cast upon the white. The blue shadow of a burnt tree on snow, for example, is darker than the charred wood on the illuminated side of the tree.

Ex.: It has already been observed that the ends of the spectrum offer extreme contrast in hue. Black and white, for any given illumination, represent the extremes of luminosity. With intense illumination all hues tend either towards yellow or violet, the division passing through the green and violet-red complementaries on the chromatic circle.

SUCCESSIVE CONTRAST phenomena correspond in a general way with those of simultaneous contrast except that in this case the juxtaposition is in time, not in space. A visual process usually called 'fatigue' plays a large part in such matters, the eye that has been fixed upon an area of saturated colour tending, on sudden removal, to convey the impression of a complementary, or negative, after-image. The cases where after-images are negative, or positive, or oscillating need not be elaborated, as design is concerned with more or less permanent arrangements of coloured objects.

Moreover, except in experiment, the eye does not fix and 'fatigue' itself on figures of uniform colour, but by constant movement renews the retinal apparatus of registration.

RECESSION in respect to the green-blue-violet group on the one hand, and ADVANCE in the case of the yellow-orange-red group, may alternatively be described as a greater persistence on an increase of distance between the coloured object and the eye in cases where the latter group of colours are involved.

Ex.: In the case of a decorative mural portrait, necessarily appearing somewhat violent in colour at arm's length, but presenting notable verisimilitude at, say, thirty feet distant, it is very unlikely that the resemblance will be preserved at sixty feet, as some of the lower or neutralized tones in which blue is mixed will have at that distance disappeared, while reds and yellows will have intensified relatively. The modelling and complexion of the face will therefore change even if a plausible colour scheme results at all distances.

CONSTRUCTED COLOUR arises from mixtures of unbalanced spectral elements; otherwise white light or neutral tones would result. The purples occur when the end colours are mixed, and lean to the reds, or the violets, according to the superior intensity (wave amplitude) of either of the ingredient-hued lights.

Ex.: Green and red lights on admixture provoke a colour sensation indistinguishable from a yellow of a luminosity only equal to their joint luminosities. Red and yellow lights on admixture act similarly in the matter of orange, but, orange being of lower luminosity than yellow, the constructed orange is more recognizable than the constructed yellow. Where the reflected lights from mixed pigments are involved, green and red fail to produce a yellow acting subtractively. A brown results, that is, a shade of yellow. The luminosity of spectral yellow is fully ten times that of spectral red or spectral green. Painting is largely

dependent on skill in constructing intermediate colours from a few ingredients, adequate in saturation and luminosity, and yellow must be one of these.

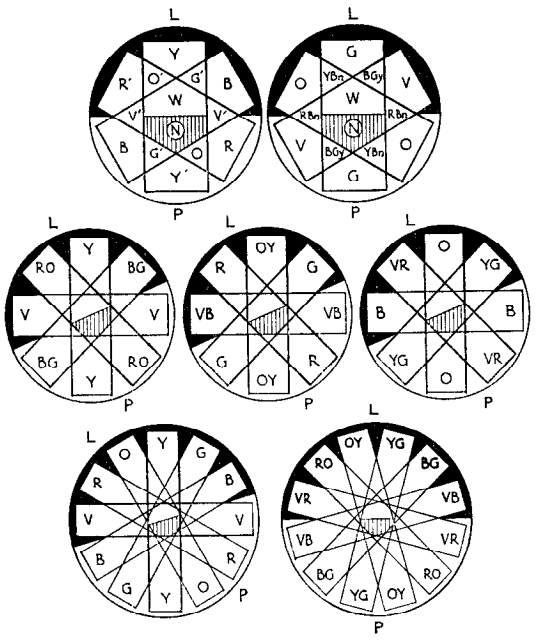

FIG. 7. Balanced groups of hues neutralize or cause whitish light, depending on whether mixed pigments or mixed lights are used. Any number of hues act thus if equidistant on the chromatic circle.

ADAPTATION of the eye to changed light is of considerable interest to the designers of buildings. A first impression is apt to be an important one, and the look of an interior, entered from a place under greater or lesser illumination, or under an illumination different in quality, may be quite unlike its appearance after one has been in it for twenty minutes.

The most important thing to be understood about adaptation is that by this faculty a new standard of white is established in reference to which all colours (or all the colours that the new light can reflect), will be evoked, in virtue of differences in wave-lengths, as distinct from actual wave-lengths. The colour sensations corresponding to the actual wave-lengths have become established in

relation to noon sunlight, which is, after all, an arbitrary standard, though one justified by its generality.

The effect of coloured lights (mixed, pure, or deficient) on white, on their own hue, and on their complementaries has already been noted.

What happens on leaving the sunlight and entering a church deriving light through stained glass of a general amber tint, let us say, is that 'white' objects (objects that would be white in sunlight) first look amber-coloured, and objects of the complementary bluish violet, if present, are indistinguishable from those of a neutral grey, but by degrees the 'white' (first seen as amber) establishes itself as white, but any amber-coloured object becomes white also. So with a red-orange artificial light; when it is first turned on, the page before one (till then seen as white in a failing bluish light) shows orange-scarlet, but in a few minutes the page is white again. Meantime, the grey haze outside has become a rather vivid broken tone of violet sharply contrasting with the woodwork of the window, whatever its pigmentation, seen under the red-orange rays. Within the room, greens and reds, though both shifted towards violet, can be appreciated. Shadows really brown are taken as neutral.

Adaptation phenomena under a steadily increasing white light tend to make the colours shift as stated above towards a yellow and a violet, while apparently losing saturation, i.e. becoming paler and paler in tint in the process.

Under a lowering intensity of illumination the colours become shades and disappear in the order of their luminosity, the brightest surviving longest and some shifting taking place.

SCINTILLATION is a device for making a colour look and keep pure, that is to say for overcoming the 'fatigue' engendered by all saturated or fairly saturated colour stimuli. 'Making the colour sing' is a phrase which, though quite unscientific, still describes the intention. The mosaic artists of the early Christian period were masters of this device, often producing penetrating and persistent colour effects with very little material of the actual hue aimed at. Suppose that a tint of a hue about midway between blue and blue-green is required. If this is produced by means of a limited admixture of material of the hue named with material of the flanking hues broken into and spotted with it, the colour sensation will be much more persistent than if the 'stimulus' is made up neat; also,

an illusion of relatively stronger saturation will be engendered. How far on each side of the hue intended one may go for ingredients depends on whether a tint, tone, or shade is being dealt with and on other circumstances such as the strength of light. In the case of a tone one may go all the way to the complementary for a small proportion of the ingredient spots, keeping chiefly to equal tones of nearby hues. When dealing with a shade, an equal admixture from all hues other than those of the predominant group centring on the hue aimed at is in order. In the case of a tint, or a highly saturated colour, one is restricted to an immediate group; and the wider this group the less of its flanking hues (as distinct from its main hue) can be employed. Distance from the beholder, strength of the light involved, and the size of the scintillation spots affect any given case. Exaggerated scintillation always defeats itself and is the sign manual of the incompetent, whether paint, mosaic, stained glass, or roof-slates are in question.

It may be worth while pointing out that when the whole field of vision is occupied by stimuli of an identical colour value under an even and adequate light, then, by adaptation, the whole field is presently seen as white. If the colour value be built up by scintillation, the time will be longer. But if this effective scintillation pattern be magnified till the field seems no longer homogeneous, then we have a *colour scheme*, of one kind or another. An arrangement or disposition in which the colours hold is a scheme; inversely, once we have scheme the colours hold.

2. *Conditions for Colour Appreciation*

Scheme is always economical of colour stimuli with reference to the resultant sensations of saturation in the hues involved. There is a moderate degree of illumination under which given colours appear most saturated (to northern eyes at least). An overcast day in winter in northern France, or southern Scotland, where the vivid reds of tile roofs, the violet-blues of distances seen through clear but humid air, and the lush greens of a moist and temperate climate are in evidence, is a revelation of saturated colour to eyes accustomed to the brilliantly lighted and consequently thinly coloured landscapes of sunnier climes. These only admit of powerful colour under unusual and transitory effects of sky, unless smoked glasses are used. It is but rarely, or for brief intervals, that the brilliant autumn foliage of the St. Lawrence

valley approaches in saturated effect the actually much lower-toned landscape of Tweedside under a November sky. The first condition, then, for seeing the available colour (experiencing highly saturated hues) is a moderate light.

Another condition, which concerns us, is the time of exposure. The blues fade rapidly on contemplation. Designed objects are usually intended for the eye to dwell on.

A third condition for colour sensation is that the retinal area stimulated be adequate, in other words, that the coloured object be big enough and near enough.

A fourth is that there be more than one hue involved; with but one in the field of vision, we see only blacks, greys, and whites, according to the luminosities involved, whatever be the wavelength.

A fifth is that antagonistic colour flooding, which reduces the saturation experienced, should be avoided.

A sixth requirement may be described as the need of either that balance of the hues present (so that they neutralize), on which schemes of contrast are based, or else that predominance of a definite hue, which is the foundation of harmonies.

3. *Colour Preference*

The hedonic values of colour sensations may now be investigated. Some persons derive the keenest satisfactions and pleasures from effects of colour; they are also sensible to dissatisfactions which they figuratively describe as pain. Pain is not of course the antithesis of pleasure—notwithstanding what the Victorian hedonists had to say on the matter. Displeasure, discomfort, dissatisfaction are much safer terms to apply in this connexion. The man who experiences no colour satisfaction naturally enjoys immunity from these sufferings.

The question, 'Are there positive colour values?', we must reluctantly answer in the negative. When a man tells you this or that colour is 'pretty' or 'beautiful' he tells you something about himself, and a little about the object, but nothing about the colour.

The attempt has often been made to ascertain by inquiry from numbers of persons what are their colour preferences; and, after tabulating the results, to draw conclusions therefrom. This misleading exercise has superseded the assumptions of inquirers who, bemused by the Darwinian theory, supposed that an arboreal

ancestry has left within us all a congenital delight in red and orange and other fruit-colours.

The German investigator who ascertained that the young men of Ontario were partial to a colour combination of 'orange and blue', but strangely had no favourite single colour, threw far more light on this matter than he either imagined, or deduced. Homogeneity in the results of other inquirers is also due to the restricted characteristics of their victims. Patagonians, Venetians, Oxonians, and hairy Ainus might be expected to give us variable tables of preference.

Inquiries among northern civilized people (chiefly male students) have been found fairly consistent, but this very consistency is due to their common experience of colour in association with certain things. Blue heads the list, and lemon yellow is at the bottom. The preference for blue is probably due to two accidents of Nature. It is the colour of high spectral saturation most widely distributed in everyday experience, and hence very readily distinguishable, analysable, and recognizable as to purity. It is also a colour associated with that creature comfort and well-being incident to fine weather. Other more artificial associational motives for this preference might be found in the dress of the navy and the sporting colours of certain universities. As to lemon yellow, it is a colour readily distinguishable, but its occurrence in the European landscape, due to the mustard weed, is unfortunately disturbing to the general balance of colour in a green land, under grey or blue skies, and the association with a citrous fruit that cannot be partaken of except as a diluted flavouring makes people say that the colour 'puts their teeth on edge'—their eye teeth, no doubt.

Then there is the colour magenta to be reckoned with, the occurrence of which, anywhere outside the range of full tropical sunlight, is deplorable. It is the bane of the gardener—the curse of the ballroom. Drenched with adequate sunshine, it may be placed in juxtaposition with scarlet and orange without offence. Saturated, it is becoming to the negress, but desolating to our women. Its tints, shades, and broken tones are invaluable in the contrivance of colour schemes. It has the accidental vice of occurring in Nature at a very high saturation, when at all; that is at a splendour of purity with which other colours cannot compete.

What this all amounts to is that people do not, and cannot, come to like one colour more than another, as colour, though they

readily fall into the illusion that they do so. Familiarity and association account sufficiently for all colour preferences, cherished or expressed, but familiarity is probably the more potent spell. Colours have no absolute values independent of the objects sustaining them.

4. *Colour Influence*

Before coming to grips with the problem of colour satisfaction, another superstition must be dealt with—'the psychology of colour'; that is to say, the theory that specific hues or certain tints, shades and tones of certain hues correspond, or tend of themselves, to arouse certain emotional complexes, or frames of mind. There is here again nothing beyond association of ideas—the past experience of the person in question. As already noted, those who share a given culture and environment have a common fund of experience and will react more or less homogeneously to colours associated with things agreeable or disagreeable, especially in the matter of the weather. We have known a child of three to become wildly excited on seeing a sunset with its reflection dancing on rippled water, and shout, 'Colours! Colours!' It was a dramatic affair of orange and duck-egg blue with massed purples and a break of red fire near the horizon. Quantitatively, there was abundance of stimulus. The attention was attracted and held—a livening experience. The familiar sky, river, and forest were transfigured. That had much to do with the excitement.

Now, in the effects of Nature, certain colours and general colour schemes are inevitably associated in the minds of the observant with certain weather conditions, than which nothing is more potent to provoke mood. High and low barometers indicate weather conditions which produce in us, as in fish, fowl, and other animals, states of exhilaration or depression; and strange are the moods we experience on a change of weather of whatever sort. Then again, the daily cycle of refreshment, activity, and rest inevitably associates itself with sunrise, 'the labour and heat of the day', and sunset. A moon rising serene through a lavender haze, and a moon struggling fitfully to shed blue-green light through driving storm-clouds, are natural accompaniments of weather conditions under which a tired man may be soothed, or stressed to breaking-point. Dawn and sunrise induce emotional reactions very different from those of sunset, yet the colour schemes involved are often identical.

And so with the natural phenomena, the woods, the sea, the hills—all have their colour changes, but it is safe to say that for those who labour and for those who rest, and for those who sport in contact with these good things of life, the frames of mind evoked are very different. 'Heavenly weather' on a lake may be aggravating to a degree to the angler, and a thundering gale at sea be extremely gratifying to a mariner driving before it to his port.

Colours in themselves—and it has been made clear that colours are as the mind makes them and far from being accurate registrations of energy transmitted in specific wave-length and amplitude—are of little significance. Colour schemes, on the other hand, can by association revive moods rather than memories. Thus the artist, without resorting to the representation of natural phenomena in landscape, may in pattern or decorative scheme, or even in the assemblage of an environment, as in the furnishing of a room, produce with calculated intent something which to the average or special beholder, but not to all beholders, is restful or startling, depressing or gay, discreet or exuberant—always provided that the beholder and the artist have a good deal in common in the way of experience of life.

The man who paints his floor ochre, his walls French blue, his doors grey, and his ceiling pink, may indeed have expressed himself, if the genius of his ego is of a blistering vulgarity. He fails as a gentleman, in so far as he obtrudes his taste unmercifully upon his guests, and he fails as a craftsman because he could get far more blueness and pinkness, and yellowness and greyness by a more skilful and economic disposition of his media with reference to the limited illumination at his command indoors.

It will be generally agreed that the above specification is not a prescription for a thing that is agreeable, and it is a condition of aesthetic activity that the emotional complex, whatever its character, be conveyed in pleasurable sensory terms. *Where colour is involved this means by a scheme.*

Now consider red, the colour of fire, of blood, of Crimean heroes. It is supposed to be attractive to fish, annoying to bulls, disturbing to man, and in the shires the foxes are said to dislike it, for obvious reasons. This is also the colour of roses, of sealing-wax, and of a tape beloved of bureaucrats. Red, as red, connotes no specific mood. The stronger tints and very slightly broken tones of red are becoming to the complexion, provoking,

especially under artificial light, an illusion of health due to the phenomenon of colour flooding. As to blue there is the old saw that it is 'the prettiest colour that's worn'—which is so in daylight, if you possess fair hair and blue eyes. It is not the colour, but the colour scheme, that does the trick, and makes hearts beat the faster; and not the colour scheme in itself, but with reference to the matter in hand. It is colour scheme that nature lavishes on highlands and islands for the delight of Sir David Y. Cameron and of ourselves very often through him; and it is colour scheme that the late Mr. Bodley devised for the glory of the Anglican Trinity at the Pendlebury Parish Church, and elsewhere. It is colour scheme that makes the parks gay with loitering humanity on summer afternoons, and its memory may leave Mme Pavlova dancing before the mind's eye long after 'the trembling string' and flittering feet have ceased to vibrate.

Colour scheme, deftly applied to occasion, is all enchantment, but a colour is ultimately interesting only in its relation to the scheme supporting it.

5. *Colour Schemes*

We pass now to an analysis of some of the more general and characteristic kinds of combination of colour. Though impotent of themselves, yet as ingredients of a work of art, or an experience in life, they can stir the heart of man.

A MONOCHROME in painting, decoration, structure, or dress, is a scheme confined, as the derivation of the word implies, to one hue, differentiation being limited to tints, shades, and tones, or to any two of these, and, in extreme cases, to one of these modifications of the parent hue.

Ex.: A sepia engraving on cream paper is a case in point. On bluish-green paper there would result tints of blue-green, neutral greys, and shades of orange or of red depending on the quality of the sepia—a contrast.

Ex.: Liverpool Cathedral, which is of red stone, constitutes a monochrome when seen in a diffused rosy light. Under a blue sky the shadows might be violet and the sunlit stone would tend to orange. Without the blue sky in the field of vision it would be a harmony; with the sky included, a contrast.

A TONALITY indicates the predominance or persistence of a hue throughout a scheme. This does not mean that the scheme is

actually confined to tones of a given hue, but that all the colours involved, or suggested, are held together by a common hue element. More than half the chromatic circle may be implied but much less than half must be actually involved and the dominant hue is central of the group. (The word 'tonality' is unfortunate, deriving from a time when 'tone' was commonly used to mean 'hue'.) Orange is the most common basis of a tonality, and usual with the Venetian school.

Ex.: A landscape seen at sunset presents a colour scheme of this kind in which a definite hue is dominant and all others are relatively modified or annulled.

Suppose the case of a red sunset; a red brick gable catches the light—a sealing-wax red of high luminosity resulting; there is snow and it takes on a salmon tint which becomes the relative white; the shadows on the snow will be mauve or violet. Objects that would be blue-green in a white light will show, of course, as neutral grey.

Ex.: Many medieval stained-glass windows have acquired, through decomposition of the glasses of all hues, a magnificent quality of tonality they never possessed when new. The same is true of many 'old masters' under an age-stained yellow varnish. A cleaned Romney may appear shockingly crude to a person accustomed to see his work under old varnish.

Ex.: Scintillation has already been referred to, and may be regarded as a scheme with respect to the passage of colour in which it occurs —a scheme, of course, of limited range and with the character of a tonality.

HARMONIES are based on a group of hues (and their tints, shades, or tones) derived from a limited region of the spectral circle. It is usual to consider three evenly differentiated hues as a minimum number and half the spectrum as a maximum range. If more than half the spectrum is involved the scheme might be considered as an unbalanced contrast of two near groups rather than as one strong group. One-third of the spectrum is usually enough if it is desired to preserve the 'form' of a harmony. A harmony may, with advantage, be strongly balanced on its central hue, either due to its superior saturation or the amount of area in the composition which it claims. A harmony (in pigmentation) designed for white light is seriously disturbed by a mixed light, and is destroyed by a light of homogeneous hue. It will be remembered that the addition of

red light to white light will make a red object seem redder, while the substitution of pure red for white light will make a red object appear as white and distort all other colours. Most harmonies are really made up of tints, tones, and shades of the group of hues involved.

Ex.: Harmony is inevitably produced in moonlight because the blue-green light sets a very definite limit to the colour sensations that can be set up by reflected light, no matter what the daylight effects of the objects seen might be.

Ex.: Under white light from which colours of every hue may arise, harmony is dependent on the presence of coloured objects, or pigmented areas, restricted as above explained. A confined view in the autumn woods, under a grey sky, would be a case in point ranging, let us say, from red to yellow-green.

Ex.: A room in cream, old gold, buff, and olive would be a harmony of about the same range as the above described autumn wood.

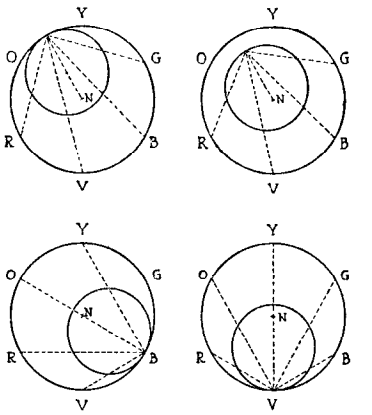

FIG. 8. The outer circles represent the 'colour wheel'; the inner circles represent the modification of colours used in harmonies based on the hue at point of contact. The hues on the edge of the large circle here neutralize gradually to N. at the centre. Thus, with a full blue, one uses a heavily neutralized tone of orange, and, for red, yellow, violet, and green, adjusted tones of these hues.
(After Professor Arthur Pope's diagram)

COLOUR CONTRAST has already been considered as a phenomenon; it is now considered as a scheme classification. As noted, it is greatest as to colour when the extreme ends of the solar spectrum are involved. A contrast may be very simply based on two widely separated hues of equal or unequal saturation, or again, it may consist of two widely separated harmonic groups. The type of contrast of most frequent occurrence in Nature consists of a harmonic group of fairly wide range set against a single complementary, or against a restricted complementary group.

Ex.: If, in the case of the autumnal woodland scene above referred to under harmonies, a bit of blue distance or a peep of blue sky be involved, we have a scheme of contrast, and the reds,

browns, and yellows will be set up in saturation if the blues be moderate.

Ex.: In painting, decoration, or furnishing it is far easier and more effective to increase the sensation of a saturated colour by the introduction of a spot of a complementary than by raising the saturation of the main colour group involved. Warm blues occurring here and there in the covering of a chair, or in a curtain, will give a golden glow to a putty-coloured wall-paper.

BLACK AND WHITE CONTRAST. Blacks, whites, and greys may be introduced into any scheme of colour contrast without affecting it. Contrast within the black and white elements is, likewise, a possible basis for a scheme, and the black and white, or dark and light grey, contrast may be subordinate to the colour contrast or vice versa. By the use of tints and shades the two systems of contrast may be inextricably interwoven.

MIXED SCHEMES. Any landscape, or street scene, or interior under daylight conditions will tend to be a mixed contrast, involving both colour and light and shade. Even if all hues are involved, some by their predominance in area, or in saturation, will tend to set up a scheme. This they do, if strong enough, by flooding collateral hues while neutralizing complementary ones; or, if moderate, by enhancing the hue character of complementaries; or again, if moderate, by increasing the hue difference in adjoining areas of collateral colour. Thus there is always a *scheme* in nature.

BALANCE. It is difficult to make out any case for the virtue of balance in the sense that all the colour present, if mixed together, should give neutrality. Balancing on the centre, or axis, of the composition is quite another matter, as when a small area of highly saturated colour balances a large one of the same hue in tint, tone, or shade. The virtue of such arrangements is in maintaining the scheme throughout the composition. Otherwise the mere presence of strong colour to right, or left, or even high, or low, in the field of vision, or picture, is apt to set up a separate scheme in its own immediate neighbourhood.

6. *Hedonic Effect of Colour*

The one analogy of service between aural and optic sensations is this, that neither through the ear nor through the eye do we derive any direct knowledge of the processes at work in these organs, nor of the vibrations that stimulate them. The sensations

of colour, and of sound, are in themselves purely subjective affairs. The fact that indistinguishable sensations can be produced by a spectral hue and a constructed colour is significant. Enough has been said above to show the very relative nature of all colour sensation and how, under a given light, the mind constructs an equivalent white sensation and a relative more or less complete set of hues based on experience under solar light. Nature rarely gives us a pure white light, but furnishes tints and tones of coloured light, pure-hued light only occurring artificially. It is very seldom, either indoors or out, that we can experience a truly balanced gamut of all hues; either some are dulled, or some are invisible. The eye may therefore be expected to have developed as an instrument which functions best under the usual conditions, when only about three-quarters of the spectrum is operative. With a tint of coloured light, all colours are distinguishable, but those of the tint group are enhanced, and those of the complementary group are more or less neutralized. With a tone of coloured light some colours are far more responsive than others.

Then, again, the colours of the spectrum vary in luminosity, and, in consequence, with a low increasing illumination some (orange, &c.) precede others in becoming distinguishable. Groups of colours of deep shade are not then easily interpreted when they belong to hues of the higher luminosity series, such as the browns.

With increase of illumination colour reflected from objects not only changes its spectral character of hue, but becomes less and less perceptible, the yellows and violets being the most persistent. Thus, objects whose colours may be in hopeless discord under a moderate light, may acquire harmonious colours on reduction or increase of illumination; that is to say, the inharmonious colours no longer exist, and are replaced by others which are harmonious.

In this category of the commoner phenomena of colour vision, no attempt has been made to expound, for each case cited, the physical, physiological, and psychological hypothesis that accounts for what is observed. Many of these phenomena are not yet accounted for satisfactorily. The intention has been, however, to keep before the mind of a reader, unfamiliar with these sciences, a general consciousness of the bearing these phenomena have on problems of colour design, and to dispel that temptation to wander down the easy paths of mystic fantasy which too often besets those who explore the boundaries between the hedonic and the aesthetic.

One simple and helpful fact emerges—the eye and all the mechanism behind it has been evolved to see in daylight, and the mind learns, through its daylight experiences, to differentiate a limited series of quantitative sensations.

These experiences have a common characteristic: the organ concerned can only derive from the images of objects sensations of such colours as are ingredients of the light falling on them. Congruity and verisimilitude in this respect is a touchstone of satisfaction and conviction in artificial colour combination. The artificial colour scheme that seems to violate this principle leaves the mind guessing, wondering, and abhorrent.

The illusion of colour preference has been exposed, but the efficacy of colour schemes in provoking mood has been admitted. This does not mean that there can be a general system of symbolism, or expression, relating schemes to moods. Where the artist and his public happen to enjoy a common experience of weather and landscape and the apparatus of life, he can make use of certain schemes involving certain colours with a reasonable hope of making others feel as he has felt. Colour, however cunningly manipulated, is not a universal code.

There is, however, a general appetite for hues of considerable saturation—an optical appetite, if you will. This appetite cannot be satisfied in very strong light. Over-stimulation is incompatible with functional efficiency in this matter as in others.

Moreover, the illusion of considerable saturation provoked by contrast, appears to be far more satisfying (because less 'fatiguing' and therefore more persistent) than actual saturation. Our delight is in easily perceived difference, rather than in a sense of the quality. Colour flooding is destructive of the renewal of stimulation; it is the symptom of excess. Mutual colour flooding, where two or more fully saturated hues are involved, is parallel in effect to a gorge of rhubarb and clotted cream—an optical indigestion or discord.

Such are the meagre functional satisfactions that 'gladden the eye' in the matter of colour, notwithstanding the fact that colour dissociated from an object reflecting or transmitting light is neither thinkable, rememberable, nor enjoyable.

Colour from light and colour from objects must be clearly distinguished by the designer. It is open to the artist in any given case to use colour in either or both of these manifestations. He is

unlikely to achieve a calculated effect unless he understands the difference between a white thing that looks red because some light bereft of orange, yellow, green, blue, and violet constituents is playing on it, and a thing that looks red because white light is playing on it, while it is absorbing all the constituents but red. He should further be able to appreciate a grisaille clerestory window, in a red-stone church, pouring light upon an altar frontal of green damask silk, as well in imagination as when facing the fact.

Colour memory, always attaching to things, and depending as it does on past experience, is not normally homogeneously developed for the whole chromatic circle. This accounts for characteristics in the arts of races and of the masters. Most painters of northern landscape can realize in hues a score of greens, a dozen of yellows and reds, half that number of blues, and about two purples. A hundred colours, based on a score of hues, represents a good equipment for an amateur. For the general public six hues and a score of derived colours is all one should expect. It is usually among decorative artists and furnishers that the best balanced colour imagination is to be met with.

Now the enjoyment of colour is very largely an affair of recognition and for that colour memory—which implies colour imagination—is the great prerequisite. Colour faculty is often a native gift, but it is extraordinary how far it can be developed by exercise; also how much it can be perverted by unsound doctrine.

And now, in conclusion, let us face the fact of colour interest transcending object interest. There is inevitably the connexion with an object. The blue that may be a delight in a scarf, to the point where the scarf is regarded, owned, worn, or painted, for the sake of the blue, would really be abominable in a roof. Passing along the street one may be attracted by colour, saturated or otherwise—the colour of a cloud, or a spire, or a tree, or a flower, or a dress, or a cheek—and one falls very readily into the illusion that it is the colour itself that gives delight when in reality it is a thing of the kind in question of that colour. This delight is nine-tenths association and the rest expectation and discrimination in about equal parts. Thus one may enjoy the flesh-colour of gladioli and the blue of delphinium chinensis in our neighbour's garden, just so long as the inconsiderate wretch does not turn these things into mud by allowing some spot of desperately saturated magenta phlox

to 'hit us in the eye'. Yet, if this same resolute stuff be in sufficient abundance to control the whole situation, sky, trees, houses, river, and all, it is as fine a sight as the 'eye' can 'feast' upon.

A developed sense implies some delicacy of mental organization; the understanding of colour phenomena (which may, or may not, be of assistance in developing the colour sense, depending on the mental make-up of the individual concerned) involves both intelligence and perseverance. As a vehicle of aesthetic activity colour is potent precisely in the degree in which it can be manipulated to elucidate form. Aptly used with that intention there are few moods that it may not on occasion serve to communicate or to enhance.

7. *Epitome*

We are now ready further to elaborate an example cited above. When holding my book near a window to the north in a failing, greying light, with a muddy shadow from my hand sprawling across the lower margins, I mended matters by switching on an electric light hard by. At once the page flushed red, and as this faded towards a new whiteness the shadow became a miracle of colour. From the thumb a yellow and a violet shadow now crossed each other in pearly greys, emerging brightly distinctive on either side, while beneath my little finger a spot of clear rose blurred in the violet of a shadow edged with buff. To call all this beautiful is perhaps to mistake the hedonic for the aesthetic in announcing a satisfaction honestly independent of its causes. Now the moment I investigate the causes this thing becomes vastly interesting, but no longer exquisite (a proper word this to apply to fine sensations). The appearance of the dot of rose hue beneath my finger was due to the double light being strong enough to penetrate the tissues and, there losing its colder elements, emerge as feeble red light to mix with the violet shadow. The white of the paper was made up of the violet and blue of a fading north light, mixed with the relatively red and yellow tinted light of the electric lamp. Where either of these lights showed exclusively on the paper, a shadow of that light appeared, and where both were excluded, a neutral shadow. It was because I am capable of making a fair representation of such a phenomenon projected on paper with water colours, and would thoroughly have enjoyed attempting that task, that the word 'beautiful' slipped out.

Scientific understanding of colour is necessary for the artist as technician, but woe betide him if his work arouses scientific interest in the beholder. It is by direct assault on the senses (in the case of colour a rather indirect and vastly complex sense better describable as a mode of knowledge) that the artist provokes response and revival of feelings with respect to the realm of things. In doing so colour is a very ready instrument to his hand.