

COLOUR-CONTROL

*The Organization and Control
of the Artist's Palette*

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INTRODUCTION

Looking back on the pilgrimage which every art student must make, one imagines that the journey might have been shortened, if, at certain points, a sign-post had been placed by some former traveller in order to save long, wasteful and useless detours.

In the experience of the writer of this book there is one special obstacle which stands to-day in the way of all students who have a love of colour and the desire to use and control it.

The difficulty is in the great increase of the range and power of the pigments which modern chemistry has provided for the artists, while the tradition which might guide a student in their use is obscure or entirely lost. No adequate technology has yet taken its place, nor has any clear indication been given that might serve in organizing and directing the new powers. At no time in the history of painting has the way of the art student been so uncertain.

Compared with the technology of other arts, which music for example, the science which should control the artist's palette of to-day is fragmentary and incoherent. Few painters or schools are agreed upon the principles which should determine the organization of the instrument which is in our hands, or upon any systematic statement that might direct its control.

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There are those who believe that the modern confusing in the use of paint, and the lack of consistent teaching as to the organization and control of the palette, the lack also of agreement among individual artists, are advantages; that each artist should make his own experiments, should find his own style. The considerations dealt with in this book aim at establishing an order which does not restrain, but gives an increase of freedom and certainty of workmanship in place of the present wasteful and anarchical disorder of the palette. It is intended for students who feel the need for instruction in the use of an instrument that has become greatly enriched in its range, an instrument needing clear understanding for its precise control, capable of an infinite delicacy of expression and of great power.

To place this instrument with its intricate resources in the hands of an uninstructed student, however talented, is unreasonable. It is to condemn him to years of wasteful experiment in order to discover initial facts and principles which should be preliminary to any profitable study. Such a course would be as absurd as to tell a student of music to make his own experiments without help or any instruction in the practical tradition of his instrument, or in musical harmony.

Most painters can remember years of laborious trial and effort which might have been saved, and endless experiments of which no record has been kept.

There are books giving important and useful infor-

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mation as to the chemistry of pigments, and treatises on the theory of light and color, but few of these deal with the problem of the practical organization and control of the artist's palette, nor with related problems of composition which occur in the painting of any formal colour-scheme.

During along period of search and experiment it has become increasingly clear that the solution of the problem of controlling our modern range of pigments in work which aims at composition, rather than the mere representation of natural harmonious form and colour, must depend upon finding and establishing a scale or order which is related to the principles of chromatic harmony and of rhythm.

The object of this book is to state the preliminary facts which bear upon this matter and to describe such an order. By reference to a scale bearing a true relation to the principles of chromatic rhythm one may find with certainty the essential key or group of pigments needed for any given scheme, and in painting, maintain during the work a precise control over the chosen group on the palette. One may gain access in this manner to the entire range and power of our modern orchestra of colour.

To reach this point is a step in an important direction, for, finally, the creative power of expression in colour must be dependent on the training of the artist to see and think in terms of a rhythmical mode, no less than on the training of technical skill.

INTRODUCTION

It is the hope of the author that this book may serve to point a way which in his experience leads to simplicity and certainty of control in the use of colour. It is well, however, to remember the words of ancient wisdom “. . . the teaching is only of whither and how to go, the vision itself is the work of him who hath willed to see.”

F.M.F.

CHAPTER I

THE PROBLEM OF THE MODERN PALETTE

In mediaeval times tradition in the arts was preserved by the system of apprenticeship. A master took into his workshop a few apprentices chosen for their talent and promise. To these, gradually, the master imparted his knowledge and experience. Very rarely was this traditional knowledge recorded. Masters of painting were inclined to be jealous and secretive, handing on their wisdom only to favoured pupils. The secrecy of the Van Eyck brothers was notorious among the Flemish painters. Even so late as the 18th century in England, Sir Joshua Reynolds was so jealous of his own methods that many of the memoranda in his note books were written in a code known only to himself. Records of full descriptions of technical methods have been extremely rare and fragmentary. A notable exception to this general rule is the valuable record made by Cennino Cennini who, as an old man, wrote his treatise on the methods of painting and of many craft processes in the early 14th century.

The coming of the industrial age, and the gradual disappearance of the system of apprenticeship with its intimate relationship of master and pupil, caused a still

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greater loss of tradition in many of the arts and artistic crafts. The loss of tradition moreover has been accompanied by a great increase in the resources of the painter, as modern chemistry and manufacture have added a new range of powerful and permanent colours to the artist's palette.

To gain an idea of how slight and fragmentary are the records of any of the ways or methods of work of the masters of painting prior to our own time, and excellent source of information is Charles Eastlake's *Materials for a History of Painting*, published in 1847, but, slight as it is, his careful research collected and recorded many fragments of valuable information.

Apart from the written records of painters' methods we have always the paintings themselves, and it is possible to learn something of the old masters' methods by careful and close examination of their own work. Unfinished pictures in our National Galleries of several of the great masters give important information of constructive stages, but a great deal that is still more important can never be guessed. Their experience of many great masters which might have been inherited has been entirely lost. We can see what materials they used and can follow the successive stages of their work, but the principles whereby they worked and the conscious intelligence and science of their methods lie deeper than the obvious and visible facts. We know, for instance, the small range of colours on the palette of Velasquez, and

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can follow the movements of his brush, be we do not know his method of controlling that small group of pigments so as to combine precision of form with such exquisite subtlety of tonal relationships.

The new situation inevitably seems to the student of art in our day to be disorderly and confused. On one side a great wealth of beautiful material for all artistic purposes; colour more pure and powerful than ever before in the history of painting; the traditions of its craft uncertain. No two schools agreed in methods of instruction, especially in the organization and control of the painter's vital instrument, his palette and his new range of splendid colour.

In this situation we can at last begin to set our house in order by making a survey of our position; and by examining the principles of which we need to be aware in order to re-organize our resources. The loss of ancient traditions may perhaps be balanced by other values gained from the science of our own time. The first step is to consider the elementary facts that bear upon our problem, the re-organization of our confused palette so that it may become an instrument of precision under simple control.

CHAPTER II

ALTERNATIVES

In order to attain freedom and control of the palette in painting it is obviously necessary to establish a practical order in its organization and a consistent method in its use. To fulfil these two requirements has been the painter's problem at all times. It was comparatively simple when the range of pigments was small, but in modern times has become exceedingly difficult. One cannot now carry the whole range on one's palette.

The solution of the problem lies between two main alternatives. Either we must choose a restricted fixed palette, or find some way of selecting particular groups or keys, as the musicians do, to serve each scheme of colour we wish to express.

(1) RESTRICTED PALETTES

It is evident from the study of the work of the early and mediaeval masters of painting that some of the greatest achievements have been attained by very simple means and by a palette far more limited in range than our own.

Many painters of to-day and of recent times, to whom the whole modern range has been available, have delib-

RESTRICTED PALETTES

erately limited their palette to a small group of pigments which they have habitually used, finding more freedom in that limitation than in the use of a fuller range. Portrait painters have especially practiced this limiting of the colour range. The necessities of their work, in which character and form are more essential than elaboration of color, have conduced to simplification of the colour problem. The fact that the portrait painters' work is done mostly indoors under a North light also tends to limit the range both of colour and tone.

The portraits of the distinguished Irish painter, the late Sir William Orpen, are examples of great simplicity in this respect. At the time of his visit to Edinburgh in 1914 to paint a portrait he came to see the work at the College of Art.

On one occasion, on my asking him how eh would advise students with regard to the simplification of the palette, he gave me the surprising reply that in painting his portraits he used only four colours beside White and Black. These were Vermilion, Burnt Sienna, Yellow Ochre and Cerulean Blue.

My interest in this remarkable simplification was increased as I realized its close resemblance to the palette of Sir Henry Raeburn, the Scottish portrait painter of the late 18th Century, who used a limited range that was almost identical. Raeburn's palette comprised White, Black, Vermilion, Burnt Sienna, Raw Sienna, and Prussian Blue. His practice of painting directly with moder-

RESTRICTED PALETTES

ately thin paint on a white linen twill canvas of the kind called 'ticken' (showing a diagonal line in the weave), and primed to a luminous white surface, made it possible to obtain a high power of colour with Raw Sienna, which is slightly translucent. The only other difference from the Orpen palette is Raeburn's use of Prussian Blue. The more durable Cerulean Blue was not known in his time, but the position of both on the colour-chart is nearly identical.

If one examines critically the record of methods of any of the masters of painting one finds, both in craft-methods and in the selection of the pigments used, a continuous tradition of simplification and economy.

The methods of the masters of portraiture have perhaps tended to simplification and directness more than other kinds of painting, owing to the necessities of the work, which must be done with speed.

In earlier days, when the available range of colour in pigments was far smaller than that provided by modern chemistry, the limitation of the palette was determined by the smallness of the available supply. What was then a necessity is not so now.

Velasquez and Rembrandt had six or seven available colours where we have a bewildering list of dozens offered by the colour makers.

It is obvious that in the art of portrait-painting, where the range of colour is limited and the work comparatively simple in design, many of the new powers of

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colour could be ignored or rejected without much loss.

In outdoor painting it is different; the new range and intensity of the modern pigments, especially the series of Cadmium compounds (to mention only one group) could not be set aside. They provided a means of adventuring in an entirely new field. The beauty of sunlit landscape could be expressed as never before.

Experimenting with the new extension of power, Claude Monet and the succeeding schools of impressionists explored the possibilities of the new field, inventing technical methods and finding new ways of using paint to express effects of brilliant light.

The revolution of their day was, to some extent, scientific. It dealt mainly with the uses of the new resources for the expression of colour-relationships hitherto beyond the reach of paint.

The use and power of the new pigments were at first shown in marvels of realistic painting. Their real value as an extension of the means of poetic expression was less obvious, for the new range of colour was not yet adapted to the necessities of organization and control that would make the new palette fully available and effective.

Steps in this direction were already evident in the work of certain artists, mostly notably in the painting of James McNeill Whistler and in his teaching with regard to the control of the artist's palette.

Whistler's aesthetic philosophy, as stated in his cele-

RESTRICTED PALETTES

brated 'Ten - 'clock' Lecture is more widely known than the intense care that he gave to the technical problems of the etcher and painter. To the students of his class of 'apprentices' in Paris, Whistler explained principles which are fundamental in the consideration of the order and economy of the artist's palette.

His own range of colour was severely limited, but carefully and, as he claimed, 'scientifically' organized. He avoided the modern extensions of the range of artists' colours, never using the Cadmium series nor the other high-intensity colours with which the sunlight painters were experimenting. Hew was intent on painting delicate harmonies of dusk and of quiet interiors. His brightest power in Yellow, for instance, was Yellow Ochre. He rarely painted out-of-doors in full daylight, and would veil the North Light in his studio to a subdued tone, preferring to express the delicate harmonies of his nocturnes and the subtle relationships of his gently illuminated portraits. He said to his 'apprentices' that, so far, he had learned to control this quiet group of colours. . . . 'but someday we shall control the full orchestra.'

A point of importance in his palette-arrangement was the consistent grading of his main colours. In the Yellow group, for instance, he placed a descending scale of Yellow Ochre, Raw Sienna, Raw Umber. In Red, he placed in similar order, Vermilion, Venetian Red, Indian Red. In Blue, Cobalt and Mineral blue.

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In passing from a higher to a lower passage of illumination in painting, he would use the corresponding lower grades of pigment in each group.

Whistler's palette was practically a palette of three main colours, controlled with great simplicity by the principle of grading each colour-series in corresponding steps. This principle, which rendered Whistler's palette an instrument of extremely delicate precision within its limited scope, may obviously be applied to the organization and control of a much wider range. His method was a step in the direction of simplification by an order which is not made by arbitrary selection.

Apart from recorded tradition there is visible evidence in work by the masters of painting in all periods, early and modern, of many individual methods whereby the problems of the palette have been solved. The examples given in detail in this chapter are types showing advantages gained by limiting the range of colours on the palette to the smallest possible group essential to the work in hand; also the advantage to be gained by an orderly organization of a larger group. Both kinds of economy contribute to freedom in the control of the palette.

A narrow restriction to a perpetually limited palette cannot, however, be a satisfactory or final solution of our modern problem. It may give freedom of control, but at too great a cost. The old restrictions are no longer necessary. They are liable to give colour-habits rather

GROUPS OR 'KEYS'

than colour-control. With the wealth of the range provided by modern chemistry at our disposal it would be absurd to accept limitations that deprive us of its use. Rather our course is to attain simplicity and freedom by some means that will give us control of the whole new range; to find methods no less precise than those that were determined by the old limited supply; to find a systematic order appropriate to the new power.

(2) SELECTION BY MEANS OF GROUPS OR 'KEYS'

An artist who would attain to mastery of the modern resources must first become intimately aware of the range and character of the pigments that are available and fit to be used for permanent work. Then one of two alternative courses is open: wither to select a series or group to form a permanent palette for general use, or to choose a particular group for each colour-scheme that is to be painted.

It is obvious that one cannot carry the full modern orchestra of colour on one's palette. It is also obvious that no single limited group will suit all schemes of colour-composition. Groups of varying colour and power must be chosen if we intend to make use, in painting, of the full available range. This is analogous to the choice made by musicians of a particular 'key' in which a melody or composition is to be played. This alternative course will give freedom and precision in the control of colour, provided that the choice of the particular group

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or 'key' is appropriate, and that the method of its control on the palette is consistent.

The colour-makers offer a list of more than one hundred different tubes of artists' colour. Of these perhaps thirty are sufficiently reliable and distinct in character to be considered and held in reserve. These supply a range of from two to four grades of colour-power at each of the main points in the scale of pigments used by artists. This scale or chart is given in its correct form below. Familiarity with the scale is important to all colourists, as it enables one to estimate the exact hue of particular pigments by reference to its fixed points.

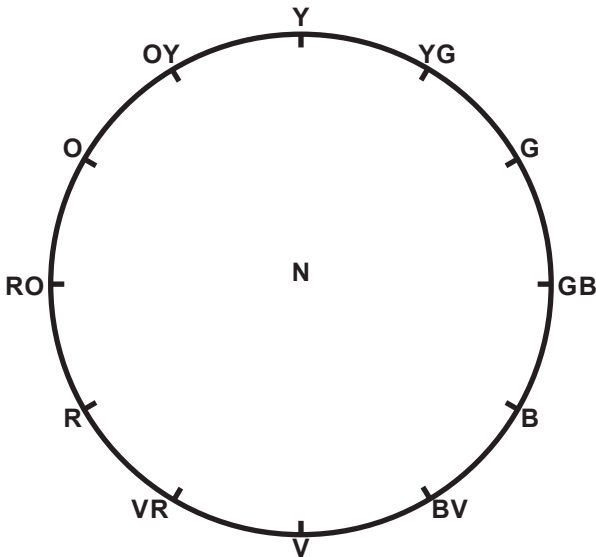


FIGURE 1

GROUPS OR 'KEYS'

To the colourist and paint-mixer its use as a standard reference is as essential as the use of the mariner's compass to the navigator. But it should be remembered that the colour-chart is a scale of ideal pigments, not a chart of the spectrum.

To the painter the primary colours have always been Red, Blue and Yellow, for out of these three he can, by mixing, make all the others, to a limited degree.

In dealing with coloured light a quite different series is primary. For instance, rays of Blue and Yellow light thrown together on a white screen do not give a green, but a neutral grey; the result of blending rays of coloured light being different from the result of mixing coloured paint.

It is necessary in considering the problem of the painters' palette to keep this elementary distinction clear. To the painter the most important group of his range of colours must be Red, Blue, and Yellow, for by these he can at least make a reduced tint of any other colour. They are, one might say, the parent-colours in paint, but they do not as a group make the most effectual basis for an artist's palette, for the relationship or interval between each of the three is exactly equal, without bias or rhythm. In the construction of the colour-chart of pigments, however, the three parent-colours are the fundamental starting points.

CHAPTER III

KEY CONSTRUCTION

In the previous chapter the advantages of narrowly restricted palettes have been shown.

It is obvious that the alternative method of a group or key system must have still greater advantages, for by its use one might retain the simplicity of the restricted palette and yet have the use of the whole modern range of colour.

In seeking the basis of such a system of key-construction, there are certain facts of common experience which have an important bearing on the problem; especially those relating to the influence that juxtaposed colours have on one another according to the interval between them on the colour-scale, and to their intensity.

There is the fact that contrasts are most violent between colours at opposite points of the scale, especially if the notes of opposite colour are used with equal strength. This violent clashing of colour is naturally avoided where harmony is intended, yet may be an important and valuable resource in expressing a dramatic contrast.

Tones at the next point on either side of the one opposite to a given note have a less violent power of contrast and are commonly described as tones of harmo-

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nious contrast. These near-opposite tones enhance and vivify one another powerfully, yet without the sense of violent opposition. Such contrasts and nearly-opposed intervals of colour give qualities of great beauty and splendour. They are points of value in a colour scale. As the intervals between any two opposite points on the chart are diminished, the sense of contrast is gradually reduced as the points approach one another. The essential colour-character changes step by step, lessening in distinction as the interval diminishes.

These facts must have consideration in determining an effective scale of chosen colour points.

If our choice were to be limited permanently to three fixed colours, it is obvious that Red, Yellow, and Blue, which stand at equi-distant points on the painter's colours-chart, will give the greatest power and range obtainable by any fixed group of three pigments. The colours formerly called secondary, namely, Orange, Green and Violet, can be obtained by their mixture, although of lower intensity than the original three.

The accompanying figure shows the relative position of these three main points, also the extent and position of the area controlled by their mixture. It is a symmetrical figure with unvaried intervals between the points, and stresses evenly the three main points without any bias in any direction. It is essentially an uninteresting and static figure, having only the advantage of being the largest possible triangle within the circle. Its colour-intervals are monotonously regular.

KEY CONSTRUCTION

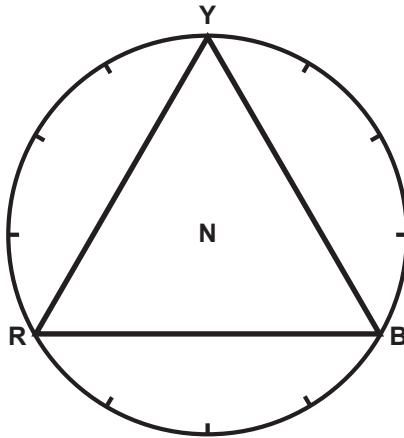


FIGURE 2

By revolving the triangle within the circle, the position of the stressed points may be changed, but the colour intervals remain the same and no advantage is gained.

If, however, we choose three colours at points of unequal intervals as shown in Figure 3, we gain several advantages. We have the greatest possible variety between the three main points, the intervals being relatively four, three, and five. The new triangle has a definite bias, as shown by the position of the circle described round it. Two of its points, moreover, are at the position of harmonious contrast, thereby enhancing one another yet avoiding the violent clashing of the direct opposite.

The area controlled by mixtures of the three is slightly less than that of Figure 2, but in every other way this figure has the advantage. No other choice of three-col-

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our points on the chart will give so great a combination

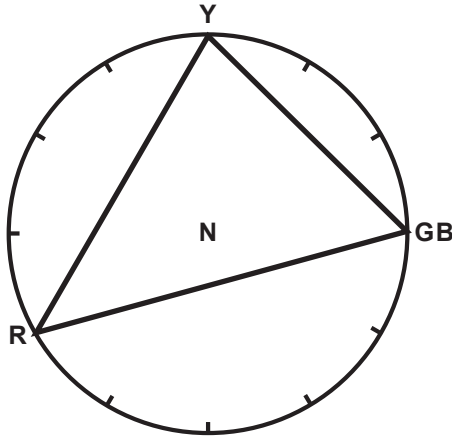


FIGURE 3

of advantages,—namely, maximum variety of intervals, a large controlled area, avoidance of direct opposites, two points in harmonious contrast. It is obviously the most useful choice of relative intervals for a palette limited to three colour-points. It contains elements of rhythm and harmony. By revolving the figure on the center of the circle the bias may be given in any particular direction of the field of colour and the chief stress made at any desired point.

This figure gives advantages as the basis of organization of a palette far beyond the power of the triad of Figure 2.

If, for example, a fourth point is added at BV, as shown

KEY CONSTRUCTION

in Figure 4, a large new area is brought under control. The new point at BV avoids the clash with point Y and the new area is as large an area as any that can be added.

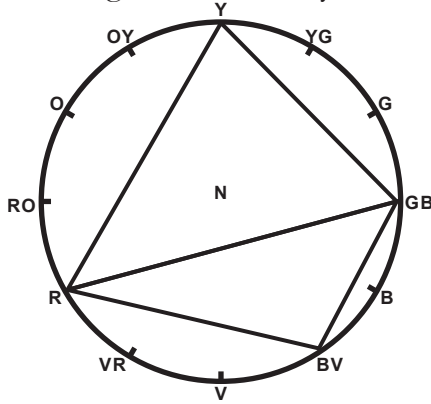


FIGURE 4

The next point of greatest value while still avoiding the clash of opposites, is point O.

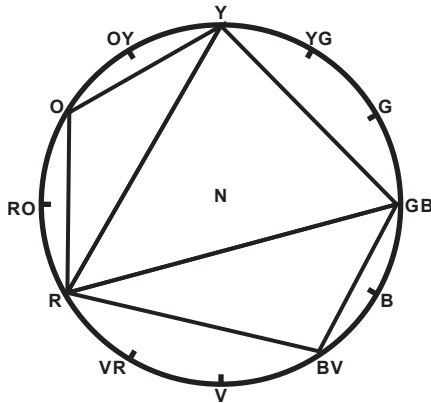


FIGURE 5

KEY CONSTRUCTION

These five points would provide a powerful and harmonious palette, each colour being strongly enhanced by a nearly opposite colour. The area of the field of colour is the greatest that five points can include within a circle of twelve.

If a further addition is desired, only one more point can be added without producing an opposite clash of colour. This would be at YG or at VR. Either of these will add the largest area still available without producing a clash by direct opposition. If YG is chosen as the sixth point a corresponding area can be added on the other side at VR. These two points are in direct contrast.

This seven-pointed figure has characteristics possessed by no other figure that can be made by seven points in a circle of twelve. It encloses almost the entire area of the circle. Each of its points is in harmonious contrast with two nearly opposite points, excepting one pair which is in direct opposition.

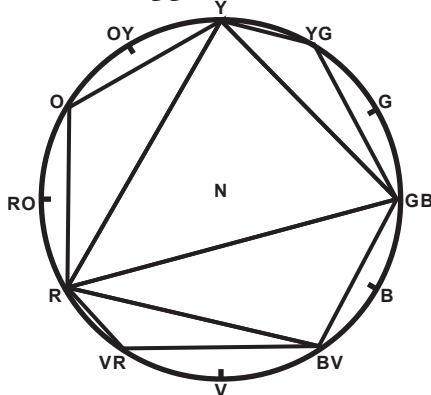


FIGURE 6

KEY CONSTRUCTION

Each of this pair of opposed points is within a short interval of its neighbouring colour. The power of the group or key is thereby greatest at these points of direct and nearly direct opposition. The enrichment of colour at these nearly opposite regions may serve for complete contrast, or for the so-called harmonious contrast of nearly opposite points. The character of a chosen key is determined mainly by the position of these opposed regions.

By revolving the complete figure on its center its points will touch a different series of seven colours at each movement of the figure. At each step in its revolution the points will indicate a series of seven colour-points having the characteristic of maximum control of the area of the field, a majority of harmonious relative positions, and one pair in direct opposition. Twelve groups or keys in succession are available by this means, each having distinct character and power.

It follows from the order of the successive steps in the construction of the 4•3•5 figure that there is only one other figure that could serve in precisely the same way. This would be the same figure reversed, each step being taken in the counter-clockwise direction. This figure is of exactly equal importance and usefulness. It provides twelve other distinct colour keys each having its own character. If the shape of the completed 4•3•5 figure is cut out and turned over, keeping its key-point at R, its reversed form is as shown in Figure 7.

KEY CONSTRUCTION

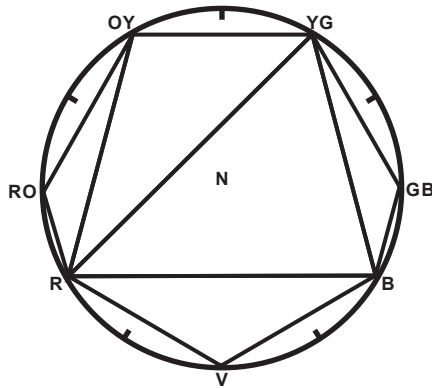


FIGURE 7

By revolving the figure on its centre within the circle of the colour-chart in the counter-clockwise direction its points mark the succession of twelve new keys. There is a remarkable correspondence between the intervals of this reversed key and the intervals of the minor key in the musical scale.

The advantage of a constant sequence of colour-intervals in harmonious order, combined with the free choice of the starting point of the sequence, will be obvious to all students of colour-composition. Its use renders our great modern range of colour practically available without burdening the palette, and gives to the painter a new freedom and power. Familiarity with its order enables the artist to see and think of colour in terms of a rhythmical mode. By its use the palette becomes an instrument under precise control.

KEY CONSTRUCTION

DEFINITIONS AND SPECIAL NOTES RELATING TO KEY-CONSTRUCTION

Definition of a Key of Colour. (With acknowledgements to the Encyclopaedia Britannica—Articles on Music)

A key in painting is a rhythmic system in which there is never any doubt as to which color (pigment) or combination of colours shall make a required tint or tone, nor of the relations between that tone and the other tones in the system.

Definition of Harmony in colour-composition

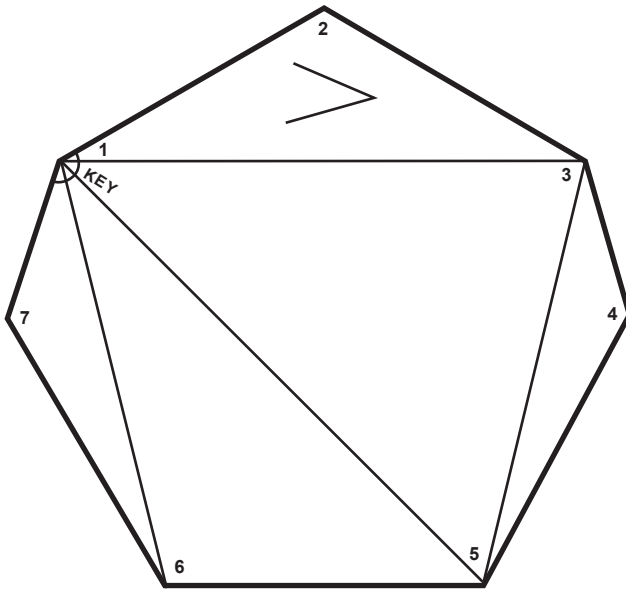
Harmony in colour-composition is the organization in a formal design of combinations of notes or tones of colour on principles whereby their chromatic properties interact with lays of rhythm and with the vital motive of the design.

Particular features of the seven-point key

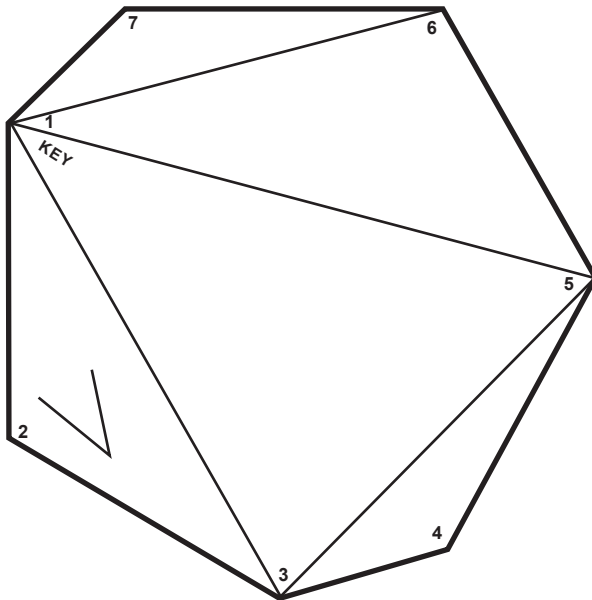
The key-note is connected with and may modify all the seven notes of the figure, except one (No. 4). See Figure 8 (a). With this it is in direct opposition. The key-note is present in tone-mixtures of every area except those of the 3•4•5 area.

The points of the main triad (1:3:5) control all tones of the main area, and one or more of the points is in touch with every area of the key.

The only two points in indirect opposition are outside the main triad.



(a)



(b)

FIGURE 8

KEY CONSTRUCTION

Notation-Signs for Keys of Colour.

The figures (a) and (b) given above show the seven points of a key formed (a) in the clockwise direction, and (b) in the counter-clockwise direction; each figure starting from the same key-point and each figure identical in the order of its intervals. By revolving these figures on their centre within the colour-scale all the possible keys are to be found; twelve in the clockwise direction and twelve counter-clockwise. Each of the twenty-four possible keys is distinct, although some of them consist of the same series of colours; but in these cases the controlling main triad is always different, so that each key has its distinctive character.

To indicate keys by notation-signs, the distinction between the two kinds may be simply rendered by a small arrow-point above the letter, thus:

Key Orange, clockwise	Ö
" " reverse	Ö̂
" Green-Blue, clockwise	Ö̂B
" " " reverse	Ö̂B̂

CHAPTER IV

PALETTE ORGANIZATION

In order to organize a palette in correspondence with the principles of key-construction proposed in Chapter III the first step is to fix the position of the seven colour points so as to give the greatest convenience and ease in work.

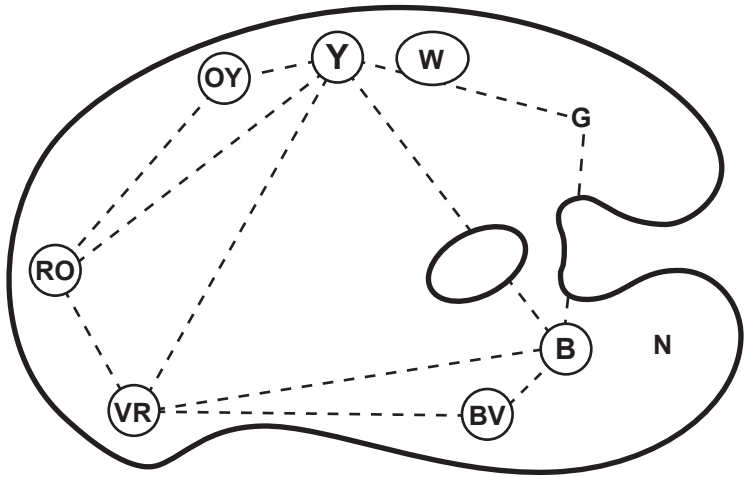


FIGURE 9

Whether the palette is carried or fixed on a table there are obvious advantages in placing the (pigment) colours in their natural, with Yellow in the center at the upper edge and the others in their order at either side as in

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Figure 9. Mixtures are most easily made from a series placed in this order: the palette becomes a field of colour in which one moves freely and unconsciously, finding or modifying tones in their proper area. The seven points or steps in a key allow plenty of space for work if an orderly habit is established. The palette becomes a responsive free instrument, as the violin or piano to a musician.

An important principle in the making of tones in a given key is that a note of colour should only be modified by mixture with a neighbour-colour or a colour of the same area and not by promiscuous mixing across the palette. This principle will be found to be fundamental in preserving harmony. Its observance marks the difference between true control and the careless 'hit or miss' practice which cannot become constant or reliable: it does not preclude the use of 'broken colour' nor effects that are obtained by 'spot painting,' but it does away with promiscuous and uncertain colour mixing.

The natural order of this consistent method of colour-mixing is best seen by reference to Figure 10. The fundamental triad of the key is Y-B-VR. The center area of the field of colour represented by the triangle Y-B-VR can be controlled by mixtures of the three colours, Yellow, Blue, and Violet-red, making neutral tones in the neighbourhood of the point of complete neutrality at N, or making tones on increasing intensity towards the sides of the triangle, or of maximum intensity at its

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three extreme points.

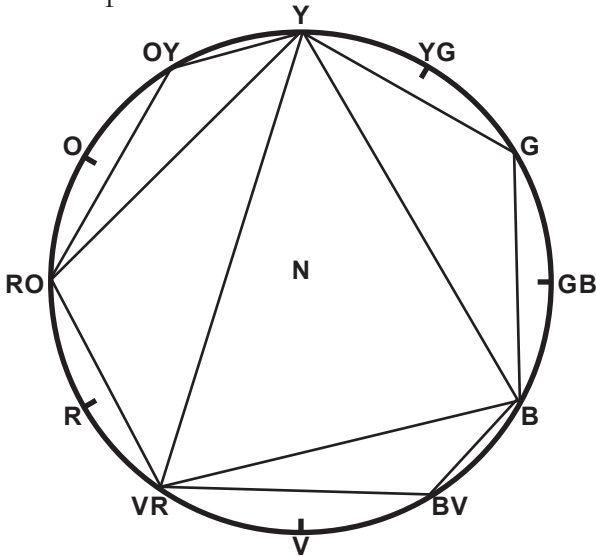


FIGURE 10

If, however, a tone of green is required of higher intensity than can be made by mixture of Y and B, the mixture YB must be enhanced by the addition of colour at G, giving thereby the control of the area Y-G-B. Similarly the addition of colour at RO gives control of the area Y-VR-RO and the remaining two points BV and OY complete the two remaining small areas B-BV-VR and Y-RO-OY. Under this order of control there is never any doubt as to the particular colour or colours that are to be used to make the colour-tone at any point within the range of a key of colour. Promiscuous mix-

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ing becomes useless and inconsistent.

It is simple in this way to control a large part of a scheme by the three colours of its fundamental triad alone. These will make or modify nearly all the tones which indicate form receding from light into shadow. In these receding passages colour becomes increasingly neutral until, in deepest shadow, the consciousness both of surface and of colour disappears.

In any colour-scheme expressing form in tones that are consistent with our experience of vision there is a difference in character between the colour of the fully illuminated planes and that of planes receding from the light. As the receding planes move away from the light their distinctive colour lessens, becoming not only darker, but also different in character owing to colour reflected from the surrounding objects. The distinctive colours of illuminated surfaces are gradually lost as their form recedes into shadow, until in deep shadow all tones have a common quality of tone and colour. This common quality of shadow-tones is an essential element in any method of control of colour in painting. In primitive Italian painting all receding form passed into brown shadows of 'terra d'ombra.' The name of that colour still persists in our Raw Umber.

The use of Raw Umber for shadow tones continued in Italian and Dutch painting until the early scientific 'impressionism' of the French School made the classic protest of its period that 'les ombres portees sout

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froides,' and colder grey shadows gave a new character to the studies of the 'plein-air' school of landscape in Paris in the latter half of the nineteenth century.

This fact of a common element of quality of colour in shadow or 'tone' passages is of importance in establishing the method of control of a key. It is generally true that, as the French landscape painters taught, cast shadows are cold relatively to the more fully illuminated planes, but also that the cold cast shadows are modified by warm reflected light, while the warm illuminated planes are modified by cold high lights. These general facts are broadly true of objects under simple effects of light. They have been exhaustively used and rendered by all students of realistic representational painting. In practice a usual method has been to reduce the intensity of a local colour by colour of an opposite or complementary character in the tone passages, or by a mixture of two or three other colours to produce tone. These methods have been, and are still, empiric and personal solutions of the problem. There is no clear agreement between artists nor consistent instruction given in the schools of art as to the principles which must determine a final and scientific method of control.

Under the proposed method of control by a key system the tone problem becomes simple. The deepest tones of the shadow are rendered by mixtures of the three colours of the fundamental triad of the key. In the key shown in Figure 10 the triad is Y-B-VR. At each

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of these points, the colours suited to the tonality of the scheme are placed on the palette. By their mixture all the deeper and more neutral tones can be made. The large area Y-B-VR is entirely controlled by the triad. As the colour of planes emerging into light becomes more intense than that of the planes in shadow, the area Y-B-VR is entirely controlled by the triad. As the colour of planes emerging into light becomes more intense than that of the planes in shadow, the area Y-B-VR would be increased in the directions needed. For instance, if a mixture of the colours placed at Y and B produce a green tone which is not sufficiently intense for the needs of the scheme the field may be increased by placing a higher power of Green at G, thereby adding the area Y-G-B to the field already controlled by the fundamental triad. Similarly, an additional range may be added by placing a colour of sufficient intensity at BV in order to produce stronger combinations than are possible between B and VR. On the red side of the palette the mixtures between Y and VR give tones of only moderate intensity toward the central region of the field. If, therefore, stronger powers in the direction of Red and Orange are needed, the area under control may be increased by adding high intensity colours at RO and OY. With colour at the seven points of the figure the area is now the greatest that is practicable for the control of a colour scheme of which the keynote is Yellow, and the fundamental triad Y-B-VR. There is no doubt at any

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point as to which combination or mixture of colour is necessary to make a required tone. No haphazard or cross mixing can have any advantage, but must produce inconsistent tonality or dirty colour.

It is obviously necessary in the organization of a palette to place the pigment upon it in an order corresponding to the natural order of colour, whether the form of a palette be square, or curved in the shape of the traditional studio-palette. If this disposition is established and maintained the palette becomes a field of colour which can be used with freedom and certainty. It conforms directly with the order of the keys of colour, and its use becomes an unconscious habit, as with a musical instrument.

CHAPTER V

GRADING AND ADJUSTMENT OF THE PALETTE

In choosing the grades of colours to be used on the palette one needs to be familiar with the full range of available pigments and with their position on the colour-scale. It is obvious that each distinct colour has various grades. These grades are variations in both intensity (or strength) and pitch (or depth). For instance, in yellow, we have a series of several available grades, Cadmium, the yellow of highest intensity and pitch; Yellow Ochre, a yellow of moderate intensity and pitch; Raw Sienna, lower in pitch but of fairly high intensity; Raw Umber, low both in intensity and pitch. Similarly, in the Orange range Cadmium Orange is the highest both in intensity and pitch; Mars Orange is of lower pitch but of high intensity; Burnt Sienna, still lower in pitch but also of high intensity; Burnt Umber, very low in pitch and low also in intensity. And so on with the other series of colours.

It should be realized in choosing colours that their usefulness is partly determined by intensity, for the pitch of a colour can be raised by admixture with white. This raising of pitch reduces the intensity of opaque colours, but with transparent or translucent colours the addition

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of an opaque white at first raises the pitch, and increases or reveals the colour-intensity. For example, the deep violet alizarin appears nearly black, but, if white is added, the colour becomes an intense violet. If more white is added the colour gradually loses in intensity as its substance becomes opaque and its translucency disappears.

On the other hand a colour of high intensity may be reduced by admixture with black. In this case, the pitch of the colour is also reduced. Cadmium Yellow, for instance, cannot be reduced in pitch without loss also of intensity. The value and usefulness of the umbers and other deep colours is in the fact that they have the highest intensity possible at their low pitch.

The colours chosen to be placed on the palette for a given scheme should be a series whose pitch and intensity correspond with the main tonality of the scheme.

For example, in the key B-R-OY, a palette might be arranged in either of the following ways:

1 HIGH INTENSITY

- B. Cerulean Blue
- V. Cobalt Violet
- R. Cadmium Red
- RO. Cadmium Red-Orange
- OY. Cadmium Moyen
- YG. Zinc Yellow plus Viridian
- GB. Cobalt Green

2 LOW INTENSITY

- B. Bleu Saphir Fixe (Le Franc) or Prussian Blue
- V. Spectrum Violet (Alizarin)
- R. Indian Red
- RO. Venetian Red
- OY. Mars Yellow
- YG. Opaque Oxide of Chromium
- GB. Viridian

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If in using the low-intensity palette, whose tonality is controlled by B-R-OY, there should occur the need for a note of colour of an intensity higher than the general range of the palette, this can be added at any point without disturbing the harmony of the palette, provided that the control is continued under the low intensity triad B-R-OY. Such additions of extra power might be needed, for instance, in a quiet indoor key of colour in which there might occur fabrics of brilliant 'local colour' or flowers, or any object of a colour more intense than the general range of the key.

Conversely, in painting a sunlight scheme with a palette of high intensity, an exceptionally deep note of local colour might require a corresponding addition to the palette. But, it should be remembered that admixture of a colour with black, or with a neutral black and white tone, has another effect, in addition to the immediate effect of reducing its intensity and pitch. The reduced mixture appears to be colder in colour, as if one had added a bluish tone to the original. This fact is important. It follows that if one wished to reduce the intensity of a colour without altering its true colour-quality, or hue, the added tone should be a lower power of the same colour and not a neutral. For instance, it might happen that the key of colour best fitted for a scheme would be a series slightly lower in tone than the highest possible grade of intensity. It would be an advantage in that case to reduce or 'tune' the colour at each point of

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the key by a slight admixture of a lower grade of the same colour. Otherwise, one would need two grades at each point.

In choosing a series of (pigment) colours for the key of a given scheme it is usually the yellow point, or the colours next to yellow, that determine the series. If the yellow is of a quiet tone the rest of the key must also follow suit. Or a yellow of the highest possible pitch and intensity such as the light Cadmium Yellow will need colours of maximum intensity and pitch at the other points of the key. In either case the pitch of the (pigment) colours will naturally be in a descending order down either side of the circle from yellow to violet, even though all of them have equally high intensities. For example, vermilion has as high intensity as Cadmium Yellow but it is darker or lower in pitch.

In grading colour at the main points of a given key one has the alternative choice of (1) grading by the method of the Whistler palette, that is by descending series of different pigments (as described in Chapter II) or (2) by a succession of tones made by reducing the intensity and pitch of the colours at the key points by mixture. In practice this is preferable, for several reasons. It makes the graded succession of tones truer than they can be made when each step in the succession introduces a new pigment and a new quality of colour, which is inevitable in the old method. For example, in grading the succession at the Yellow point Whistler used Yellow Ochre,

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Raw Sienna, Raw Umber. These three make very nearly a true series in descending steps of Yellow, for they are practically of the same nature and constitution, being, all three, natural earths stained with oxides of Iron. If, however, we wished to extend the series at the upper end to a lighter power of Yellow, there would be a jarring discrepancy. There is no reliable colour of high intensity and pitch at that point except Cadmium Yellow, which is so different in quality from the earth colours that its introduction would be out of key. Possibly that is the reason why Whistler did not use it and preferred to limit his schemes of colour to harmonies of quiet interiors and of landscape after sundown.

At the Red point his three grades, Vermilion, Venetian Red, Indian Red were still more obviously out of the true line.

If, on the other hand, one were painting a high-pitched scheme requiring Cadmium Yellow at Y, a lower grade of Yellow, of true Yellow quality, and intensity equivalent to Yellow Ochre, can be readily made by careful mixing with small additions of the other two colours of the triad of which Yellow is a member. Similarly with each of the other two points of the triad.

The required grades of the fourth and fifth points are then made by mixture with the grades of the two triad-points adjacent to them in each of the areas to which they belong. And finally, when necessary, grades in similar manner may be made at the sixth and seventh points

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of extreme opposition.

A palette graded and tuned in this way is far more true in colour than a palette graded by a succession of different pigments and is capable of more direct work, for nearly all the tone-mixing has already been done. All that is still required in the act of painting is the modification of already established tones with white to raise their pitch or with neighbour-tones to influence their colour. A consistent unity is ensured in this way that is impossible with the complication of grades composed of several colours.

In making neutral or near-neutral tones the unity of a scheme is best maintained if the neutral is mixed beforehand from the three colours of the main triad, and the use of black paint avoided, for it inevitably introduces a new quality that is foreign to the colour scheme. Only where an absolute neutral is required should a pure black paint be used.

There is a further advantage in observing these conditions in the grading and adjusting of the key-tones of a scheme of colour. It produces a wide range of selection in the choice of a key. For not only are there twenty-four different keys available (see "Chapter III") but each of them may be pitched at a high or low or medium intensity and graded downwards from that point.

The value and importance of these advantages are very great. The tuning and adjustment of the palette before working, although simple, requires close atten-

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tion and care, but if truly done it ensures the maximum freedom and speed in work. Without observance of the principles that determine the practical control of the painter's instrument the order of a key-system would be of little value. Nor has a key-system any value as a prescription for making colour schemes, but to those artists who work with the new resources of colour in any of its modern applications the key-system liberates from old disorderly ways and opens new fields.

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The range of colours provided for the artist's use by modern chemistry is so ample that it is possible to find a series that will meet the needs of almost any key which is constructed on the lines indicated. There are, however, some gaps in the range of available pigments at certain points which are still to be provided; there are certain colours which lie halfway between adjacent points of between the grades of intensity on the scale of a hue. For instance, Burnt Sienna may serve nearly equally at RO, or at O, as a deep semi-translucent colour of strong intensity. In such cases, an adjustment or 'tuning' of a pigment is needed to bring it definitely to its required point. Each colour used should be effective at its particular point. In the case of Burnt Sienna a trace of any deep red Ochre, or of Purple-Red Cadmium will tune it to RO.

In the region of Green, the available colours of high

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intensity are limited. The bright English Emerald Green (Called Vert Véronèse by French makers) is barred from unrestricted use owing to its liability to blackening by certain colours. The so-called 'permanent Greens' are mixtures of uncertain composition. Between the Cadmiums and the Green-Blue point on the colour-scale, there is no high –intensity Green available for free use. A sound and satisfactory way out of this difficulty is to use Zinc Yellow of the Lemon Cadmium, tinged with a trace of Viridian at the point YG, and if a high-intensity Green is required at the point G, to use the same mixture with a little more Viridian to make a true Green.

The following is a list of the most commonly used artists' colours of known constitution placed in order relatively to the colour scale and to their grade or pitch:

YELLOW: Cadmium Yellow. Yellow Ochre. Raw Sienna. Raw Umber.

YELLOW GREEN: Zinc Yellow. Opaque Oxide of Chromium (a warm opaque Green of great strength at a middle pitch).

These colours are only approximate to the YG point and require 'tuning' to make their position true to the scale. Other colours at this point are Vert Zinobre of the French and Dutch makers, and Alizarin Green, but these are not reliable. Several of the so-called permanent Greens, including Cadmium Green, are useful at the YG points, but these are all mixtures, usually of Cadmium Yellow and Prussian Blue or Cadmium Yel-

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low and Viridian. It is preferable to make such mixtures for oneself, or to modify the nearest approximate colour at any point by 'tuning,' that is, by adding some of its next neighbour on the colour-chart.

GREEN: Emerald Green (Arsenio-Arsenite of Copper) is permanent, if used alone or with colours free from Sulphur. It is blackened by the Dadmiums or Vermilion. This color should not be barred from the palette entirely, for no other colour has the same power or beauty at its particular point. M. Vibert in his lectures at the Beaux-Arts in Paris recommended its use with the Chrome Yellows and advised students not to abolish it from the palette. Martin Fischer however condemns it as unfit for his Permanent Palette. At present the lack of powerful green pigments of high pitch must be compensated by mixtures, as in the case of Yellow Green. By 'tuning,' as described above, the Cobalt Greens may be used at the Green point for tones of medium pitch. Terre Verte is a beautiful and classic green of low intensity and great permanence.

GREEN BLUE: Pale and deep Cobalt Green. Viridian (called Vert E'meraude by the French makers).

BLUE: Cerulean Blue (a compound of Zinc and Cobalt). Prussian Blue—Low in pitch and of great intensity, but not perfectly permanent. A useful and permanent blue of low pitch and moderate intensity has been made by LeFranc, Paris, called Bleu Saphir Fixe. It tends slightly to Green-glue. Martin Fischer recommends a

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Blue-green oxide which is a fired mixture of Chromium Oxide with Cobalt Blue.

BLUE VIOLET: Cobalt Blue lies between B and BV but comes nearest to the BV point. Ultramarine Blue, low in pitch, but of great intensity. A low intensity blue-violet must be made by mixture or 'tuning.'

VIOLET: Cobalt Violet—Pale and deep. Mineral Violet, a compound of Manganese, of less reliable permanence. Ultramarine Violet. Alizarin Violet, a very powerful colour of low pitch when undiluted with white; is of fairly good reputation but liable to be injured if mixed with iron oxides or Viridian (See Martin Fischer—The Permanent Palette).

VIOLET-RED: Rose Madder and the range of madder and alizarin colours are the only high power colours available at this point. Ultramarine Red is recommended by Martin Fischer. Mars Violet—a beautiful and permanent low-intensity and low pitched colour. Cadmium Red-Purple lies between VR and R.

RED: Vermilion. Cadmium Red—The Cadmium Reds are inclined towards scarlet, except the so-called Cadmium Red-Purple. Indian Red.

RED ORANGE: Orange Vermilion. Cadmium Red-Orange, Venetian Red.

ORANGE: Cadmium Orange. Mars Orange. Burnt Sienna. Burnt Umber.

ORANGE YELLOW: Cadmium Moyen of French makers corresponds to Deep-Cadmium of most Eng-

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lish and American makers. Our middle Cadmium is usually paler. According to Vibert the Cadmium Moyen is the normal colour to which all the Cadmiums tend to revert. Mars Yellow—A fine and powerful yellow inclined towards orange, and permanent, as are all the Mars colours (a series of graded oxides of iron which range from Yellow to Violet). Mars Brown—A deep orange-yellow of low intensity.

This list, although elaborate, is not necessarily complete or final. It gives a series of the colours that are available and in common use. Obviously they cannot all be carried on the palette. The most practical solution in my experience is a key of seven colours chosen for their qualities both of grade and of hue, and carefully tuned. The time spent in this preparation and adjustment saves a far greater expenditure of time in perpetual adjustments during work. If the key-colours are true to their relative points in hue, and are also adjusted to the general tonality of the scheme to be painted, the seven are amply sufficient. The only addition of practical value is the addition of the absolute neutral, Black, which with White has important uses in making or modifying neutral or near-neutral tones, especially neutral tones in full light. For swiftness in mixing a pure neutral, the use of black is obviously an economy both in time and material.

It's best however to avoid black in shadow-tone passages and to use it only for neutral planes in the light.

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For all tone passages it is better to use neutral mixtures of the main triad. These triad-mixtures are more luminous than mixtures of black and more easily modified and blended with the other tones of their key. The triad-mixtures also have an important use in limiting the depth of the darkest tones of their key.

CHAPTER VI

PALETTE-CONTROL

Take, for example, a palette arranged in the order shown by the accompanying diagram. It is in the key of R, and consistently 'tuned' as describe in the previous chapter.

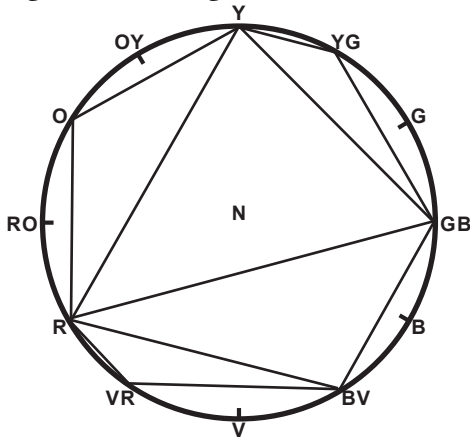


FIGURE 11

Its main triad is R-Y-GB. Such a palette might be useful for an indoor portrait. The main triad provides colour of moderately full intensity at its three points, and, by their intermixture, any tones between those points and the neutral point at the center may be made. These three will do the main work of the

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picture. They should be so placed on the palette as to correspond approximately to their relative position on the diagram, and the working area between them kept free from mixtures of other colours.

The point of next importance is point BV, which provides fourth colour of corresponding intensity, and by intermixture with R or GB, or both, gives control of the new area, R-GB-BV, and of any tones between those three pints. But the intermixture of these last three cannot produce a neutral. The nearest to neutral in this area will be those mixtures of Red and Green-Blue approaching the mid-way point on the line R-GB. If the bluish near-neutral tone at that point were not sufficiently neutral for a tone required, one would then pass over the line into the area of the main triad and make the required neutral by missing R-GB-Y. A neutral obtained in any other way would confuse the palette. Any haphazard cross-mixing will destroy the harmonious control of a scheme of colour. Consistent tonality and ease in painting can only be assured by a constant order in the control of the palette.

So far the large area covering the greater portion of the entire field is controlled by four colours R-Y-GB-BV. These four may be used in their full power, or, by mixture, any modification of them as they pass into tone may be made. In painting a scheme consisting of colour-areas of moderate intensity under simple lighting, a single pigment to supply each point is sufficient.

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To extend the palette beyond the scope of the four colour-points R-Y-GB-BV, the next point of greatest advantage is obviously the point O, giving the power to increase the mixtures of Yellow and Red to full intensity at O, and so to control the area R-O-Y. Five colour points now control the large area R-O-Y-GB-BV in the three divisions (1) R-Y-GB (2) R-GB-BV (3) R-O-Y, not more than three colours being needed at any one time in making any tone in the total area under control.

Only two further points can be added with advantage to this main group of five. These are the two points VR and YG which give a definite bias and power of opposition to the two sides of the palette at VR and YG. As described in Chapter IV these opposite points may be used to make a deliberate clash of colour or may serve in strong 'harmonious contrast' with their near opposite points Y and R respectively. Their use, however, will only be made in the field of the two additional areas R-BV-VR and Y-YG-GB. Their addition does not in any way complicate or confuse the palette, provided that they are used alone or only with the neighbouring colours in their groups.

Used in this way the palette is extremely powerful and complete within the order of its key-point at R; its main triad R-Y-GB; its near-opposite points of greatest enrichment R-VR and Y-YG. If its order is preserved by habitual practice, avoiding all chance or haphazard cross-mixing, one may paint during long periods of

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work without confusion or strain.

As a working principle, it is best to use the main triad of a key for all tones that it can produce within its own area, and to pass to the second or third areas only when the demand for an extended range makes the new area necessary, or to the two points of opposition only when they are needed either to enhance the power of their neighbours or to give the clash of the direct opposite. In the reverse order one should return from the outer areas to the central area of the triad as the illumination of a passage of painting diminishes and approaches to more neutral tones.

Such a method of control will naturally impose a constraint at its first experiment or adoption, but by practice becomes unconscious and automatic, with advantages of freedom and precision which no haphazard use of the palette can give.

CHAPTER VII

COLOR NOTATION

The colour-chart, to which reference has been made in preceding chapters, has important uses for all who are concerned in the management of colour for any artistic purpose. Its first use is to serve as a standard of order in the range of ideal colour, with especial reference to coloured pigments. It is the painter's and colour designer's chart, as the spectrum is the chart of colour for the physicist in the study of light, or the mariner's compass the guide in navigation.

The elementary fact upon which the painter's chart is based is the fact that to the painter the most important or 'primary' colours must be Red, Blue, and Yellow, for from these an approximation to all other colours can be made by mixture. No other three has this power.

Blue and Yellow paint make a green mixture; Yellow and Red make an Orange; Red and Blue make a sort of violet. But these mixtures are not as intense as the original three, and in the old days used to be called secondary colours. Mixtures of the secondary were called 'tertiary' colours.

A chart of the limited field of colour controlled by Red, Yellow, and Blue would be most simply made by

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drawing a triangle with Red, Blue, and Yellow at its points, and the neutral point at its centre, as in Figure 12. The secondary mixtures, Orange, Green, and Violet would come mid-way on the three sides of the triangle.

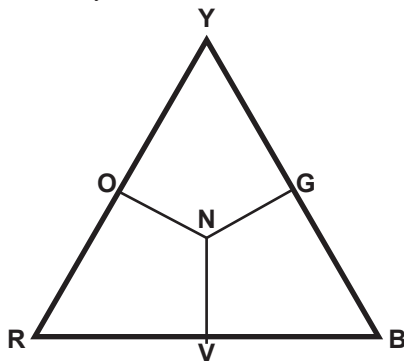


FIGURE 12

The relative strength of the secondary mixtures to the primaries would be as the distance from the neutral centre to the mid-way points, compared with the distance from the neutral centre to the angles of the triangle. The figure 12 considered in this way may become a scale of intensity as well as of colour or hue.

Placed in a circle as in Figure 13, the length of the radius from the centre N to any point within the circle becomes a measure of colour-intensity.

The extended modern range of coloured pigment of high power, such as the Cadmiums, Cobalt Violet or the Emerald Oxide of Chromium (Viridian), have now

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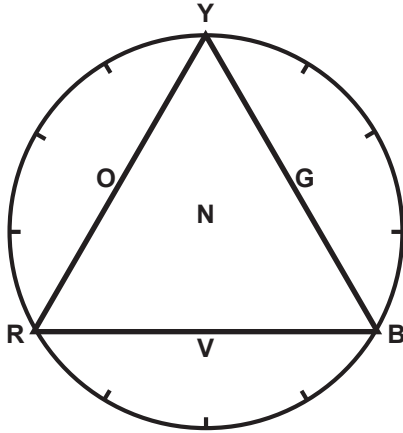


FIGURE 13

provided us with colours at the points formerly called secondary, but equal in power to the original primaries, so that the chart of the new powers of paint becomes as in Figure 14 a full circle with the old secondary points extended to the circumference.

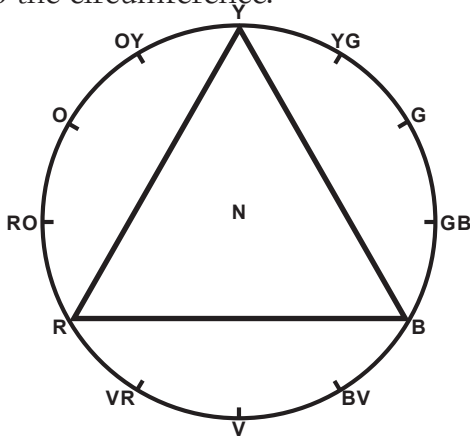


FIGURE 14

COLOUR NOTATION

It is convenient to add intermediate points halfway between the main colours. Many important coloured pigments come at these intermediate points, Viridian, for example, is a Green blue, Venetian Red, a Red Orange. Rose Madder approximates to VR.

The chart in this form becomes a scale of hue (to use a word having a more closely limited meaning than the word colour) showing the inevitable order of the field or range available to the painter or colour-designer.

For general purposes it is best to keep the natural order in the position of the main points of the series, placing Yellow at the top of the chart as it is the colour highest in pitch (the range between white and black), and Violet, the lowest in pitch, at the bottom. Then one has a progression from light to dark equally on both sides of the circle, through the 'warm' colours on the left and the 'cold' colours on the right, the maximum point of 'warmth' at the extreme left at RO, and of 'coldness' on the right at GB. The terms 'warm' and 'cold' colours are terms of association, do doubt from red-hot coals, and the greenish-blue of ice-cold things, but are none the less useful and expressive.

Perhaps the greatest use of the colour chart is in enabling a student to think about colour in an orderly way, and especially in developing a colour-memory. Transient effects are more easily remembered if the relationship of the main tones is noted in reference to the colour-in-

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tervals of the chart. The chart may even be used as the basis of a system of colour notation.

THE EDINBURGH SYSTEM OF COLOUR NOTATION

(This system, which was devised by the present writer during the period of his Directorship of the Edinburgh College of Art, was the outcome of many friendly discussions of colour problems with the aged Royal Scottish Academician, Hugh Cameron, who, in the remarkable landscapes of his later years, worked entirely from memory. He stated that his practice in memorizing transient harmonies of colour was by making careful observation and records of colour-intervals. From these conversations came the suggestion of the main idea which is developed in this book.)

In order to record any particular note of color, three essential facts must be stated: (1) its hue; (2) its intensity; and (3) its pitch.

(1) hue is indicated by the position the note would take if it were placed in proper order relatively to the colour-points on the Chart. If the note to be recorded is intense in colour, this is a simple matter. It can be placed at or near its particular point without difficulty. Notes of faint color or low intensity are less easily placed. The colour of ivory, for instance, which is low in intensity but high in pitch, would be placed slightly to the warm side of Yellow, between OY and Y. A note

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of colour that is low both in intensity and in pitch also needs care in estimating its position. The colours that we call brown may lie anywhere between RO and OY according as they incline to warm red-brown or cooler yellowish-brown, or to points in between.

For purposes of colour-notation a simple way of recording the position of any note with reference only to its hue is to draw a short stroke in the direction corresponding with the direction of a radius of the colour-scale which would touch the point desired on the circumference. A dot at the starting point of the stroke will indicate its position as the center. It is as if one made the sign of a small clock-hand. This is simpler and quicker than writing initial letters, for one's eye measures an angle readily, as we read the time on a clock-face that has no numbers for the hours. Thus, the sign for Red would be ↗ or for Yellow, ↓ or Blue ↘.

These signs only indicate hue, but even in this simple form are useful as shorthand notes.

(2) The intensity of a note of colour may also be recorded by reference to the colour chart. The neutral point at the center is the point of lowest intensity; all points on the circumference are points of maximum intensity. It follows that any radius may be marked to indicate steps or grades of intensity. The simple signs used here may be modified in this way. Thus, the sign of ↗ would signify a Red of full intensity. A pale red note would be indicated by the sign ↗ meaning a red of low

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intensity, and so on; the short stroke across the radius showing, by the length that it cuts off from the centre-dot, the comparative intensity of the note of colour in relation to the maximum which the full of the radius stroke would indicate. By this means the modified sign indicates both hue and intensity, the colour chart serving as a scale for both purposes.

(3) To determine pitch a separate scale is needed. The pitch of a note of colour is determined by the position to which it corresponds on a scale of the range of tones which can be made between white paint and black paint. A note of colour for example may be described as Yellow, slightly inclined to Yellow-Orange, and of low intensity. Without an indication of its pitch, the note might be the colour of ivory or a dark cool brown.

It is not difficult to estimate the pitch of a note of colour by reference to a simply graded scale ranging from black at the bottom to White paint at the top. It is most convenient to make this scale in nine steps or spaces numbered from zero at the Black end to 8 at the white space. This gives an even number four for the middle tone, and even numbers again at the alternative divisions.

Placing a brilliant pale Cadmium Yellow beside this scale it is obviously not quite so light as the space No. 8, but not far below. Its position might be numbered 7 or 7 plus. Compared with Cadmium Yellow, the Blue pigments are dark colours. Pure cobalt Blue gives no

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more light than a tone slightly below the middle space numbered 4 on the scale. To describe a note of colour completely this number must be added to the sign of hue and intensity. So, to give the complete notation-sign of a colour, that, for example, of a rope orange, one would make the sign of its hue \searrow , then mark by a cross stroke the approximate strength of its intensity in proportion to the radius line already drawn, and finally add the number giving its pitch according to the scale of the pitch, as follows: \searrow .

A colourless tone is best noted by the sign of a small circle and the number of the pitch of the tone, thus: \odot

By practice, this notation can be made and written swiftly and without conscious effort. By familiarity with the use of the three scales one reads one's own notation readily and accurately. Moreover by means of the notation it is possible to make a very useful analysis of transient colour-effects which otherwise could not be recorded. Such notes are a valuable aid to memory as well as a resource for purposes of study and composition.

EDINBURGH SYSTEM

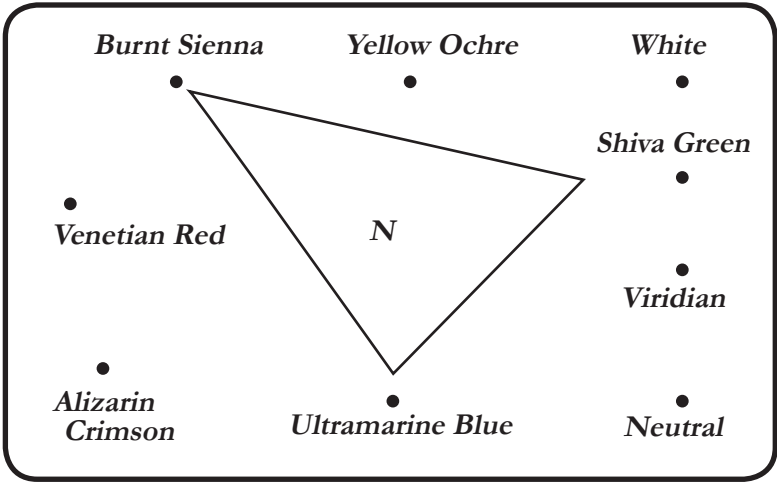
The following are a few examples of colour notation:

COLOUR	SIGN
Ivory	6 $\frac{1}{2}$
Sapphire.	3 $\frac{1}{2}$
Coral	x $\frac{5}{5}$
Lemon.	7 $\frac{6}{6}$
Jade	4 $\frac{1}{4}$
Lilac.	7 $\frac{6}{6}$
Olive Leaf.	4 $\frac{5}{5+}$
Coffee.	3 $\frac{1}{2}$

The examples given are made from a general recollection of their characteristic colour under simple lighting.

In recording the colour of objects seen under actual conditions of light, and in comparison with surrounding tones and colour, the notation may become very exact—especially in estimating comparative relationships of pitch.

ORANGE KEY



PALETTE

