CHAPTER 15

Colour-mixing – by layering

Introductory

This long chapter deals with the practical problems and opportunities that arise when coats or washes of one pigment colour are layered or otherwise superimposed on coats or washes of other pigment colours. In particular it is about how outcomes are influenced by the degree of translucency or opacity of the pigments involved. An important conclusion is that many of the same factors that are at play in colour mixing by layering are also at play in colour mixing by stirring.

The chapter starts by using the example of oil paints to illustrate general principles that apply to all colour mixing. It progresses to an analysis of ways in which colour superimpositions play out in the cases of watercolour, gouache, acrylic and dry pastel. The chapter finishes with some supplementary remarks on the use of scumbling and glazing in oil paints and acrylics.

Entering the picture surface

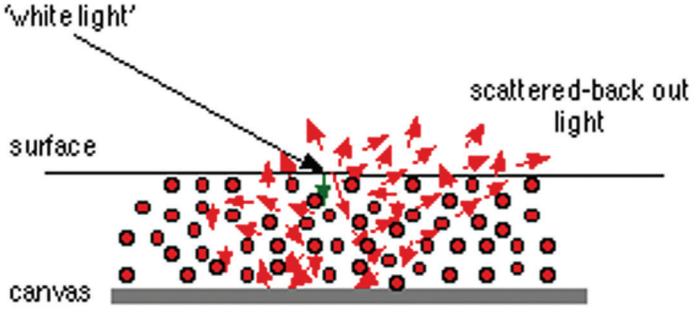

Figure 1 : Light entering the surface with some being absorbed and some being scattered back out

Figure 1 is a modified version of a diagram that should by now be familiar to readers. The difference with the earlier version lies in the absence of the reflected-light component.[1] This diagram shows only the part of the white light that enters the picture-surface. Upon doing so, a proportion of its wavelengths are absorbed by the pigments found inside and a proportion of them are not. These latter ricochet about within the surface before being scattered-back out. It is the wavelength combination of this *scattered-back-out light* that tells the eye/brain about *body colour* (the red of the tomatoes or the green of leaves).

The composition of paint

Before proceeding any further, it is worth recalling that all paints comprise four components, namely, *pigment, medium, spreader* and *glue*, with the latter three often contained in one substance (for example, the *oil* used in oil-paint or the *acrylic medium* used in acrylic-paint). In addition, there are supplementary *mediums* and *spreaders*, which can be used to give added possibilities for artists. Examples of supplementary mediums (which also act as spreaders) are the various *oils* and *glazing mediums* used for oil painting. Examples of spreaders are *turpentine* and *water*.

Another factor that should be kept in mind while considering the properties of the different paint-types, is that information supplied in the context of one paint type often sheds light in the context of other paint types. This applies particularly to the first section which, while targeting oil paint, deals with basic information of relevance for all the other paint types.

OIL PAINTS

Oil paint consists of a *pigment* mixed into a *paste* with an *oil*. In artists colours, the amount and type of oil is determined largely by the chemical requirements of the pigment concerned. The situation could not be better summed up than by Ralph Mayer:[2]

> "*In order to grind dry pigments to a usable consistency, an amount of oil beyond that what is needed to bind and hold the pigment to the painting surface is required. This amount varies markedly with each*

1 Which is central to the ideas presented in *Part 1* and *Part 2*

2 Ralph Mayer, 1991, The Artist's Handbook of Materials and Techniques: Fifth Edition, London : Faber & Faber.

pigment, and there is also considerable variation between the different grades of the same pigment. The grade of oil used is also a factor.

He goes to say:

"The normal amount of oil required by each colour includes what it absorbs plus an extra, which is needed, not only to give the right plasticity but also to produce the kind of film that will correctly lock in and protect the pigment particles."

He also gives an important warning:

"Because oil in excess of the normal required amount is one of the major causes of yellowing of oil paint the careful painter attempts to keep the amount of oil down to a minimum."

Mayer's remarks suggest an additional observation. Paint manufacturers evidently do a roaring trade in *refined linseed oil* for which they sell special receptacles that can be conveniently clipped onto palettes, thereby encouraging badly constructed, yellowing paintings. Why they do so is a complete mystery. In view of the number of *relatively-non-yellowing* varnishes and media now available, the use of extra linseed oil seems to be completely without sense. The mystery is even greater if we ask why the manufacturers themselves favour relatively-non-yellowing oils, such as poppy seed oil, for artists' quality paints which contain translucent pigments. Presumably they do so to minimize the yellowing problem.

Translucency and opacity

In order to understand what happens when pigment-colours are mixed together, it is necessary to have some idea about the subject of the *opacity/translucency* continuum. In a high-class artist's paint shop there is likely to be a shelf on which can be seen a number of jars of pure pigment (schematically presented in *Figure 2*). Some people may be surprised to find on reading the labels that the names written on them are more familiar than the colours. For example, Alizarin Crimson pigment will look very different from Alizarin Crimson oil paint as appears when squeezed from a tube of oil paint, as will French Ultramarine. This considerable difference is due to the fact that *mixing a pigment into a medium can change its colour considerably*, as illustrated in *Figure 3*. The explanation for this transformation relates to what is taught in physics lessons at school, namely that light is bent when it passes from a rarer medium, such as air, to a denser one, such as water or oil.

Figure 2 : six pots of pure pigment

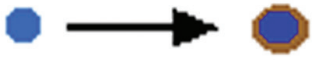

Figure 3 : A particle of pigment transformed in colour when bounded by a coat of medium

Figure 4 gives an idea of this. It shows light being bent (refracted) considerably upon entering the relatively much denser glass from the relatively rarer air. In contrast, *Figure 5* shows it being bent hardly at all when it enters the glass from the roughly equally dense water.

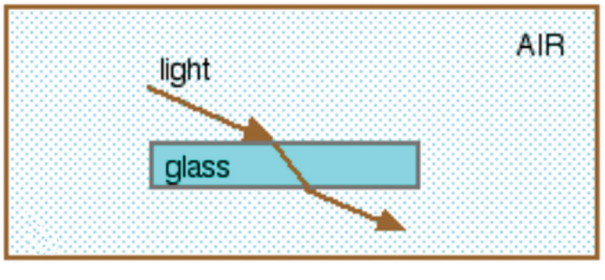

Figure 4 : Light being refracted by glass which is surrounded by air.

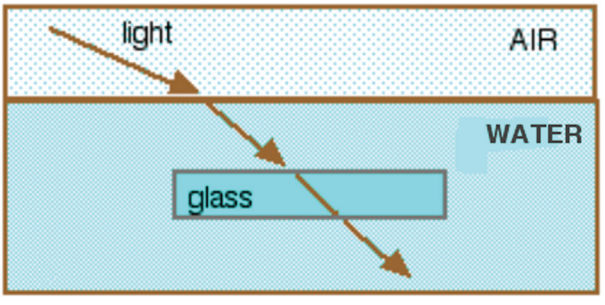

Figure 5 : Light being refracted much less when it is surrounded by water

Much the same sort of thing happens when the dry pigment is placed in a translucent medium. The main difference between the case of the glass and the pigments is that the latter tend to bend the light more sharply (some of them a great deal more so). *Figure 6* illustrates a hypothetical selection of different medium-encased pigments bending the light by different amounts. The totally opaque and totally translucent examples never actually occur. In reality, no pigment is totally either the one or the other. Rather they represent the two limiting cases and, as such, as we shall see, provide us with very useful conceptual tools.

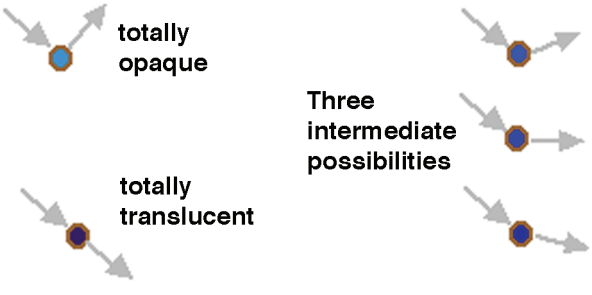

Figure 6 : Light being bent different amounts by different pigments in their casing of medium

Figure 7 gives an idea of the outcome in relation to actual tube colours. It illustrates schematically that every one of them is to be found at a different place in-between the two extremes. Amongst other things, the diagram gives a flavour of the reality that lies behind the neat division of artists colours into opaque and translucent found in the catalogues of artists' paint manufacturers. This should never be taken as anything more than what they are meant to be, namely a rough

guide to a very complex situation.[3] As practical artists what we really want to know is whether and how these different degrees of opacity and translucency affect the appearance of paint-mixtures.

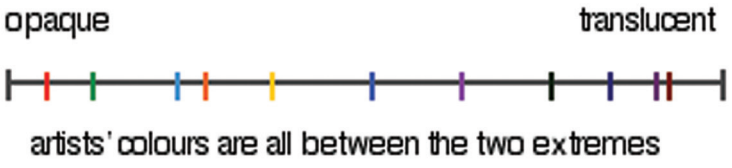

Figure 7: a schematic representation of the gamut of degrees of opacity and translucency.

The remainder of this chapter is dedicated to illustrating this last statement.

TRANSLUCENT MIXTURES

As just hinted, if we wish to clarify the issues relating to degrees of transparency, it helps to use the two hypothetical limiting cases for the *thought-experiments* that follow. Even though they do not exist, having a clear idea of what would happen at the extremes, makes it possible to interpret effects produced by the actual colours that exist in between.

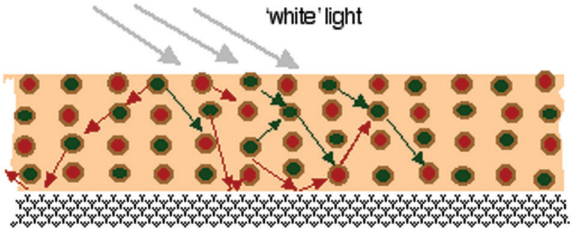

Figure 8: translucent 'green' and 'red' paint particles

Figure 8 gives a schematic representation of the inside of a coat of paint that had been applied on a white canvas. White light has entered the paint surface and is interacting with the red and green particles it encounters. Because these particles are at the translucent extreme of the opaque/translucent gamut, the light passes very nearly straight through them. However, in accordance with classical colour theory:

3 Another level of complexity is added as a result of the translucency of the mediums and, in particular, their effect on mixtures containing opaque pigments.

- If the particle is *green*, the *red part of the white light* is absorbed.
- If the particle is red, the green part of the white light is absorbed.

Accordingly, it is either red light or green light that penetrates deeper into the paint layer, possibly reaching the white canvas, from which it will be reflected back in the direction of the surface. However, what happens if the red light encounters a green particle or the green light meets up with a red one?

Figure 9 showing two filters made of coloured glass, a 'red' filter and a 'green' filter

Figure 9 provides the answer. In the interests of clarity, it simplifies the situation. Instead of using two complementary paint-particles to illustrate the process of absorption, it uses of *two pieces of coloured glass*. In this case, one is coloured red and the other is coloured green, as indicated by the colour used in the diagram. Because the red filter absorbs green and the green filter absorbs red, they are characterised as the "*minus-green*" and "*minus-red*" filters.

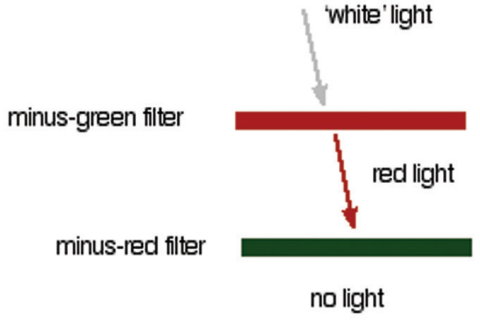

Figure 10: "white" light trying unsuccessfully to penetrate two complementary filters

Figure 10 shows what happens if white light passes first through a red filter, which absorbs the green light leaving only red light (*white minus green*), and then this red light arrives at a green filter, which absorbs red light (*red minus red*). The result is very simple mathematics for, as everyone knows, anything minus itself equals *nothing*. Thus, there will be no light emerging on the other side of the second filter and, when there is nothing to stimulate the eye, what we see is *black*.

If we now look back at *Figure 8* and follow the arrows, we will readily see that in many cases an arrow, after passing through one colour, strikes its complementary. From the above illustration it is clear that whenever a red arrow hits a green pigment-particle or a green arrow hits a red pigment-particle, all the incident light will be absorbed. From this we can make the rule that:

A mixture of any two translucent complementary colours will tend to make black.

OPAQUE MIXTURES

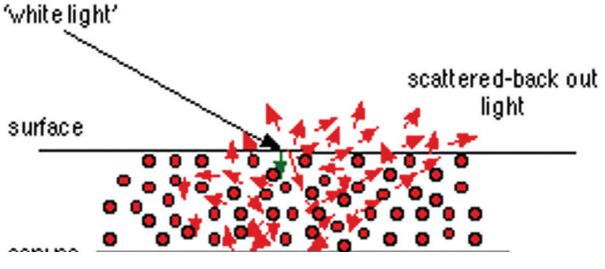

Figure 11: a coat of oil paint containing a mixture of opaque 'green' and 'red' paint particles

Figure 11 is the same as *Figure 8*, except with respect to the properties of the paint particles, which are now *opaque* (represented in the diagram by their brighter appearance). The result is that, instead of penetrating deeply into the surface, the light is directly scattered-back from it. This radically changes appearances for, instead of absence of light, a lot of light is returning from the surface and coming into our eyes.

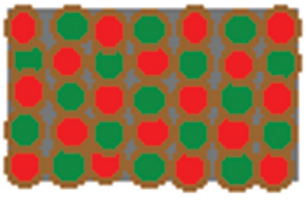

Figure 12 a highly magnified version of a paint surface made with a mixture of opaque colours and medium

Figure 12 illustrates a small portion the surface magnified and looked at from above, from where it would appear as a mosaic of alternating points of red and green particles in a context of a relatively colourless medium. The question is, "*What colour would this surface be*?" For the answer, it is only necessary to recall the theory upon which Seurat and Signac based their *Chromo Luminarist* ideas. What they learnt from the scientists was that, whether mixed by means of a fast-rotating disc or by the optical fusion:

A mixture of red plus green makes yellow.

As explained earlier, adding parent colours when mixing beams of light always results in a light-colour of an increased intensity. However, the yellow created by a mosaic of red and green pigment particles would not be a pure bright prismatic colour of the kind that would be produced by combining beams of light. It would be a relative dull colour because the pigment-particles (each of which takes up its own space) absorb a considerable proportion of the light that strikes them. Thus the red pigment, which occupies nearly half the space, absorbs green wavelengths and the green pigment, which takes up most of the other half, absorbs red wavelengths. Accordingly, the red and the green pigment between them absorb a large proportion of the white light that illuminates them (approaching a half of it). Also to be taken into account is the absorption of light by the medium which binds the pigment-particles and the penetration of the light into the spaces between the pigment particles. From all these considerations, it follows that the light which is scattered-back from the surface must be less intense than the light striking it in the first place. Accordingly, the outcome is not a bright yellow but a dull one. And, the name normally given to dull-yellow is "*ochre*" or "*brown*".

Although in theory, the hypothetical mixture of red and green opaque paints should produce of a brownish yellow. In practice since, as has been emphasised, no two pigments are either exact complementaries or completely opaque, the precise

appearance of mixtures is unpredictable. However the theory does give a rough idea. Readers can test the outcome for *Figure 12* by standing back beyond fusion distance. In this case it will appear to be more like a *dull orange* or *lightish brown*.

Summing up using a colour-sphere

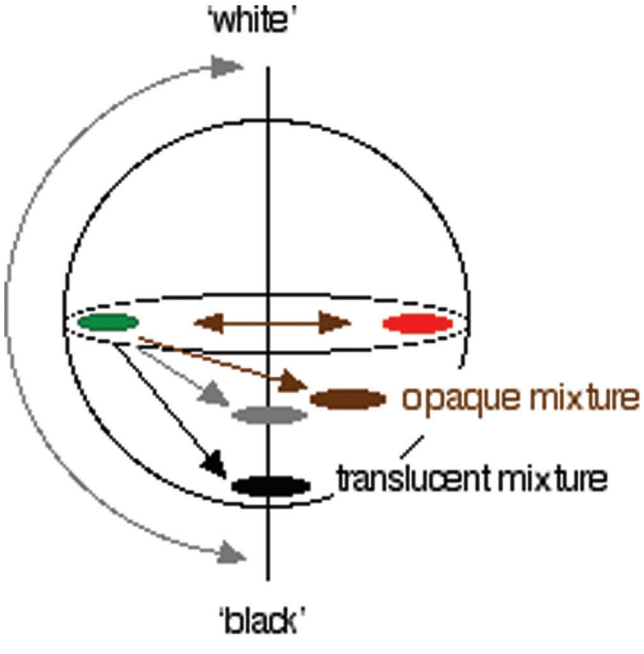

Figure 13 : A Colour Sphere

Figure 13 uses a *colour sphere* to sum up the differences between opaque and translucent mixtures. Thus:

- A mixture of equal quantities of two complementary *translucent* colours will tend towards black.
- A mixture of equal quantities of two complementary *opaque* colours would tend towards a brown or grey.
- All mixtures of translucent colours tend to be darker than all mixtures of opaque colours.[4]

4 However, mixtures of opaque colours are never lighter than the parent colours.

WATERCOLOUR

The watercolour paints as found in tubes made by artists' paint-manufacturers consist of *pigment* in *gum arabic*. As gum arabic is denser than the oil used for making oil paint, the difference in density between the pigment and the medium is less and, as a result, watercolours tend to be rather more translucent than oil paints. However too much should not be made of this point, for the effect is marginal. Certainly very dense pigments, such as the cadmium colours, remain very opaque.

There are obvious reasons why watercolour paints are not suitable for being laid on thick in the manner of oil or acrylic colours. As its name suggests, the essence of the medium resides in the kind of effects that can only be obtained when the paint is diluted with water and laid on in washes. These leave the particles of pigment spread sparsely over the paper on which the painting is being produced. When the first wash is laid down it will be surprising if the whiteness of the paper is not to some extent visible between these particles. Accordingly, the most important explanation for the high degree of translucency typically found in watercolour lies in its method of application.[5] When painted in equally thin coats both oils (mixed with plenty of turpentine) and acrylics (mixed with lots of water) exhibit a similar degree of translucency.

How many washes?

The purpose of this book is to discuss subjects upon which new light can be shed or ones that tend to be neglected. The technique of laying on watercolour washes is certainly not one of these. If readers want to know how to do it, their best bet would be to find an experienced watercolourist to demonstrate the required skills. If they cannot find anyone that suits, they can consult a good book on the subject.[6]

In contrast there is a particular issue upon which it would seem many books and teachers give misleading information. This concerns the question as to how many washes can be laid on top of one another before the painting is spoilt. As we shall see, the answer has very important consequences in terms of what can be achieved.

5 When painted in equally thin coats both oils (mixed with plenty of turpentine) and acrylics (mixed with lots of water) exhibit a similar degree of translucency.

6 The best I know is: Leslie Worth, 1987, Laying a Watercolour Wash, Search Press.

Many students come to my school with a hard and fast rule about the number of washes that they are allowed to use. They tell me either that their teacher or that a book has told them never to paint more than a specific, rather small number of them (Almost invariably, it is either three or five.) The explanation they give for this restriction is that the addition of any more layers would cause the painting concerned to loose either or both of two important qualities, namely those of "*freshness*" and "*luminosity*". Both claims are mischievous nonsense. Here are three reasons why:

- Certain desirable watercolour effects need more than five washes, most notably the creation of *rich dark colours, but also many of the most subtle effects*.
- Freshness and luminosity are not correlated so much with the number of coats of paint as with *the pigment and pigment combinations used* and, very importantly, with the *organisation of whole-field colour relations*.
- Slavishly followed rule-bound limitations *discourage an open-ended exploration* of the possibilities of the medium. They underpin the *blind academicism* against which the *Impressionists* and many other artists rightly rebelled.

The remainder of this section on watercolour is dedicated to elaborating upon these three bald statements.

Rich, dark colours

Artists often need to produce rich, dark colours in their paintings, whether for their own qualities or as means of setting off other colours on the picture surface. For example, they may be seeking to match a dark colour in nature or to create a brighter-looking colour by setting it off against a dark background. As mentioned earlier, Edgar Degas, apparently thinking of Rembrandt, used to say that, "*A true colourist is someone who can make an earth-red look like a vermilion by putting it in the right context*".[7] In Rembrandt's case, this meant the use of rich, dark contexts, typical of the chiaroscuro tradition. It is difficult to imagine how the miracle in question could be achieved in any other manner, whatever the medium being used. People who limit themselves to only three (or five) washes will be hard pressed to obtain either the rich dark colours or effects due to contrasts with them. The reason that it is more difficult for watercolourists than for

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artists using oil paints relates, not only to the characteristics of the medium but also to the properties, just described, of opaque and translucent colours.

For my explanation of why this is so let me start at the beginning. As with the case of oil colours, let us consider the different outcomes when using opaque and translucent pigment-colours, this time starting with the former.

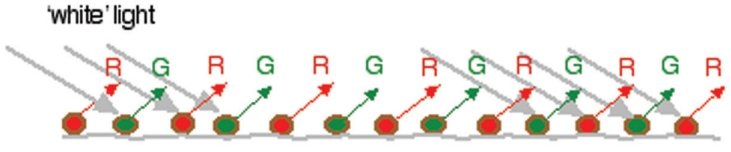

Figure 14: Opaque pigment

Figure 14 shows that, although the paint layer is much thinner, the pattern of reflection is exactly the same as for mixtures of red and green opaque oil colour, as illustrated in *Figure 11*. Accordingly, the colour we see is a *dirty yellow* or a *lightish brown*.

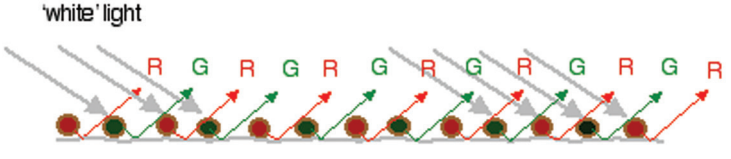

Figure 15 : Translucent pigment

Figure 15 shows what happens when the pigment is translucent. The light, once it has passed through the pigment particles (with some of its wavelengths being absorbed), strikes the white paper and is *reflected back from it*. The outcome is that the pattern of reflection is *the same as if the colours used had been opaque*. In the case illustrated, the mixture being between red and green, the resulting colour will be the same as with the mixture of opaque pigments, namely a *dirty yellow* or a *lightish brown*, an outcome contrasts dramatically with the situation illustrated in *Figure 8*, where the mixture of translucent oil colours produces a *black*.

How then do watercolourists produce the rich blacks and near-black colours achieved by the great masters of watercolour? The only practicable answer is that it has to be achieved either by mixing in a lot of black paint or by laying down a succession of washes. Each wash adds another quantity of pigment and sooner or later some of it will pile up on the colour beneath in the manner illustrated in *Figure 16*.

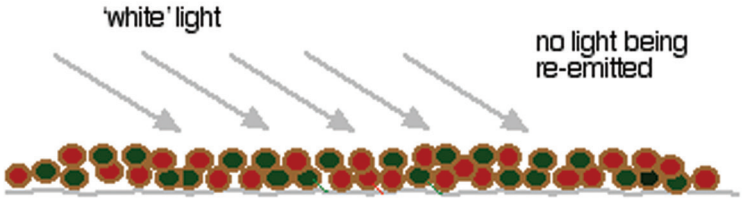

Figure 16 : watercolour pigment piled up in such a way as to block the re-emission of light almost totally

Even to achieve this doubling up of pigment particles may take several washes. In fact, *Figure 16* is a bit misleading for it suggests that two coats properly applied might achieve the level of darkness required. In practice, this is very unlikely. More probably, many layers (washes) will be needed.[8] This being the case, the question arises as to what should be done if, having completed the small number of washes allowed by the rules given by the teacher or the book, the desired depth or richness of colour has not been achieved. To be consistent, the teacher would have to say, "*Give up and start again*.", which is exactly what students following these rules say they need to do.

However, this would be an unnecessary counsel of despair. There is no valid reason for having a restrictive rule at all. If highly skilful, practising watercolourists, like Leslie Worth[9] or Derek Dalton,[10] have rules of thumb about permitted numbers of washes, they are certainly on the generous side of five. *Figure 17*, which is from one of Leslie's publications, shows that at least one watercolourist of great distinction certainly contemplates at least six layers, while an examination his and of other artists' work provides many examples of a much greater range of deep, dark colours than are displayed here. Leslie told me he regularly uses up to ten and when I asked him about the rule of three or five burst out explosively "WHAT? HAVE THEY NEVER HEARD OF TURNER". It was the only time I ever heard him raise his voice.

8 It is true that by loading the brush with a high proportion of pigment relative to water, it is theoretically possible to arrive at deep rich colours more rapidly, but laying watercolour on thick in this way has other important disadvantages.

9 A past president of the *Royal Watercolour Society* who, when I asked him his views on numbers of washes, was appalled at the idea that anybody would impose restrictions. "*Have they never heard of Turner*?", he vehemently expostulated.

10 A technically brilliant watercolourist who has come to *Montmiral* on my "*Invited Artist*" scheme.

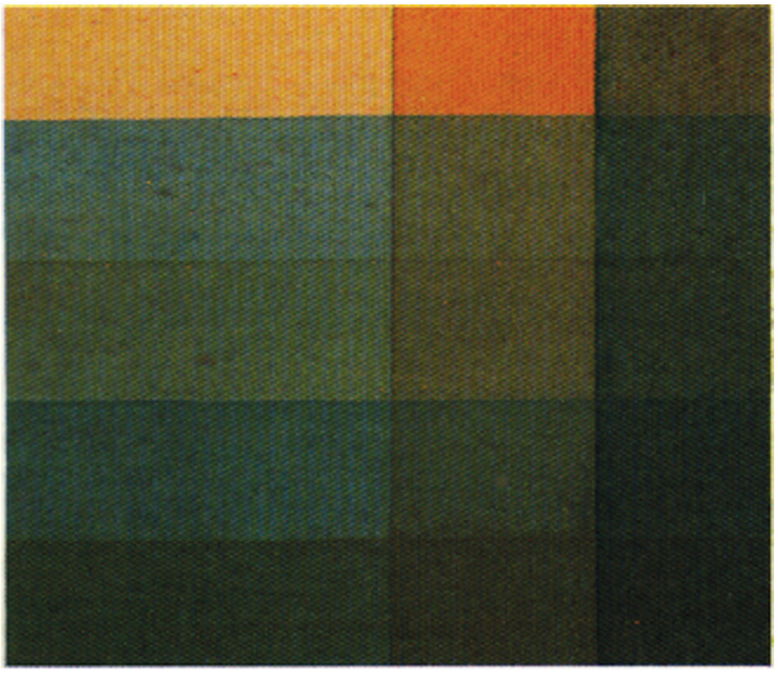

Figure 17: Diagram from Leslie Worth's book showing a beautiful colour produced using six layers

That there is actually *no theoretical limit* to the thickness of a watercolour layer can be easily demonstrated by looking at the pans of colour in a paint box. These are still "*pure*" and "*beautiful*" even though their depth corresponds to an unimaginably large number of layers. However, the question remains as to whether there is a practical limit in terms of numbers of washes beyond which watercolourists cannot go without spoiling their work. If there is, it will have to do with one or other of three factors.

- The solubility the gum arabic which glues the pigment particles both to the paper and to each other.
- The belief that good watercolour practice requires that light, having first penetrated the pigment layer, should always be reflecting back through it from the white paper beneath.
- The colour relativities on the picture-surface as a whole.

All these points are worth elaboration.

The solubility of gum arabic

Gum arabic provides the best of both worlds for the watercolourist by combining the property of drying sufficiently hard, on the one hand, to resist being dissolved by water and on the other never becoming impermeable to it.

This makes watercolour suitable both for laying on washes and for creating effects by lifting off paint, whether with a brush, with a wet sponge or by any other method. However, this versatility is bought at the price of a need to be careful when laying on washes. A blend of common sense and decisiveness is required. Thus, it is important to:

- Ensure that each wash that is laid on is thoroughly dry before applying another on top of it.
- Avoid prolonged re-wetting of previously dried layers while covering them anew.

Tube versus pan

In this context, it is worth mentioning a difference between tube colours and pan colours. When tube colours are squeezed out and left exposed to the atmosphere, they will go hard, so much so that it will be something of an effort to soften them enough to pick colour up from them. The same would apply to pan colours if nothing were to be done to prevent them hardening. This is why the manufacturers add a small quantity of glycerine or other substance which renders the paint in the pans that little bit more permeable to water. As a consequence, when starting from dry in the box, they are easier to pick up. The disadvantage of the glycerine is that it also renders the paint that has been applied to the picture surface more permeable to water and, therefore, more likely to be disturbed by the process of adding further washes. For this reason, it is worth taking into consideration that tube colours are better constituted for laying on washes and pan colours are more appropriate for nuancing.

The role of the reflectivity of the paper

It would seem that the majority of watercolourists would agree with the following quotation from Ralph Mayer:

> *"Watercolour is based on the transparent or glaze system of pigmentation… it utilises the brilliant white of the paper for its whites and its pale tints…"*

In other words, according to him, if the light is blocked from reaching the paper, the *raison d'être* of the enterprise is compromised.

Is he right? In my view the answer is not clear cut for, although history has repeatedly demonstrated the fruitfulness of exploiting the reflecting power of the paper, this does not mean that making use of it in all parts of every painting is either necessary or desirable. Indeed, a very limited use or virtually no use at all may be the best way of achieving certain effects. Rich and exciting colours can be produced even when the role of the paper as a reflecting-board is minimised.

Figure 18 : Nolde - Friesland Farm with red clouds

While it may be true that paintings, in which too much of the light reflected back from the white paper is blocked, do not look like some people's idea of traditional watercolours, that is no reason for refusing to explore the different kind of effects that can be produced. Perhaps the main intrinsic fault of thick-painted watercolours is that they assault preconceptions. Accordingly, however good they are, time may be needed to overcome these. One way of helping this process might be to look at the rich dark colours of Turner, Paul Klee or Leslie Worth. It is particularly relevant to see how they set off the more lightly painted passages in their paintings. The painting by Emile Nolde in *Figure 18* is a good example of the power of effects that can be produced in this way. The dark blues and blacks are necessary for creating the powerfully glowing reds.

Minimizing the blockage of light

None of this is by any means the same as saying that the reflective powers of the paper cannot be used to good effec. Clearly, any such suggestion would be absurd: The small patches of vivid reds and green in the Nolde painting are testimony to this.

Accordingly, watercolourists would do well to consider ways of minimising the blockage of light in those parts where doing so fits their needs. The most obvious tactic is to limit the number of layers. In other words, to apply the logic of the "*no more than five washes*" teachers to limited regions of the picture surface.

However, the logic needs to be nuanced, due to other considerations which effect the number of layers that can be used without losing translucency. Particularly important is the degree of opacity of the colours used, since the more opaque they are, the more the light will be blocked by them, whether on its journey to the paper or back from it. This applies both to pure tube colours and to mixtures between them. From the explanations provided at the start of this chapter relating to mixtures of translucent pigments in oil colours, it should be clear that the danger of blocking the penetration of light must be increased whenever washes contain near-complementary colours. For this reason, keeping in contact with the paper when a large numbers of washes are to be applied may depend on the parsimonious use of complementaries. More about this below.

Anecdotal evidence

I have many students coming to me in despair, assuring me that they have "*ruined*" a watercolour, for which they had great hopes. They have no doubt at all as to the explanation of their discomfiture. It is clear to them and to the teachers who advocate the rule of five that the reason is that they have applied too many washes, with the result that "*all the light and life has gone out of the painting*." However, they are surprised at my reaction for I am equally confident in taking a more optimistic viewpoint. Time and time again, it has been possible to demonstrate that what seemed to them an irretrievable situation can be rescued by ***adding*** more colour. It has always surprised my students that I have so far never failed to solve their problem by ***increasing*** *the number of layers* (which must always mean decreasing the visibility of the white paper). The only two requirements for performing this seeming miracle are those specified by the dogmas of Professor Bohusz-Szyszko:

- There must be no repetition.
- The added colour must be complex, containing some proportion of near-complementary colours.

It also helps to remember the lessons from the previous chapter, namely to:

- Start with a large numbers of parent-colours.
- Keep moving the colour, by using progressive mixing and by remembering to avoid starting afresh in the middle of any painting from mixtures of parent colours that have been used before.

A main reason why these procedures can have such a powerful effect is because the rule that forbids repetition ensures that *whole-field colour relations* are taken into account. Another intimately related one is that limiting the number of washes almost always means an absence of the *deep dark colours* that enabled Rembrandt and other chiaroscuro artists to fill their paintings with light.

Whole-field colour relations

As the importance of *whole-field colour relations* is emphasised in my books on every possible occasion, as is its corollary, that colour is a *context-dependent phenomenon*. We should ever forget that *every single colour on a picture-surface has an effect, however small, on the appearance of each and every other colour on it*.

This interdependence of colours perceived on the same flat picture surface is a perceptual reality of inescapable relevance for artists. Also, in conjunction with the dogmas of Professor Bohusz-Szyszko, detailed in *Chapter 1,* it provides an explanation as to why limiting the number of parent-colours in mixtures leads inevitably to repetition and the destruction of "*light and life*" in paintings. It applies particularly to repetitions of *deep, dark colours* because the darker the colour, the less sensitive our eyes are to differences in lightness. As a consequence, when including them in paintings, it is more difficult to avoid repetitions.

In these circumstances, it helps enormously to remember the rule that *the more complex the mixture, the more difficult it is to repeat a colour*. As explained previous chapter, the way of creating the necessary complexity is by progressive mixing between colours on different sides of the *Colour Circle*. And don't forget that doing so ensures that all the colours used will contain some proportion, however small, of complementary colour.

An alternative explanation

The factors outlined above support two complementary explanations as to why I am regularly able to bring light and illusory pictorial space into the paintings that my students insist that they have "*ruined*" for ever.

- The evidence produced in this book makes it clear that, within reason, the more parent colours used, the easier it is to avoid the repetitions that interfere with perceptions of *space light and harmony* in paintings.
- The strong lightness/darkness contrasts required by the *chiaroscuro* method of introducing effects of light into paintings requires the use of dark colours. It is difficult to create these in watercolour paintings without using more than five washes.

Maintaining translucency

The fact that teachers erroneously blame the lack-lustre look of their students' paintings on the application of too many washes does not mean that their explanation has no validity at all. Far from it. Much sought-after effects (such as the patches of luminosity obtained by Nolde in *Figure 18*) can, indeed, be dependent on the light being able to penetrate the paint layer as far as the white paper beneath. Nor can there be any argument that the more opaque the pigment or pigments used in the washes, the more likely that the benefits of using the white of the paper as a reflective surface will be lost. Accordingly, if what we are trying to achieve in our painting requires the maintenance of translucency, at least in some regions of the picture surface, it will be necessary to proceed with caution.

If we wish to maintain translucency over a large number of washes, it is worth keeping in mind that, if the colour being used is *translucent* and if it has been taken *unadulterated* from the tube or pan, it is actually quite a challenge to lay on sufficient washes to prevent light penetrating to the paper. Accordingly we can approach the application of many additional layers with confidence.

If, on the other hand, as so often recommended in this book, the colour being laid on is *not pure* because it is a mixture containing a proportion of near-complementary pigments, the cumulative effect of laying on washes can only be in the direction of light-impeding, "*dirty*" colours. When, as in the case being discussed, this outcome is not welcome, the remedy is to limit the number of washes containing the *near-complementary component*. In theory, only one coat containing near-complementaries, whether it be the first, the last or an intermedi-

ate one, will be sufficient for keeping the desired element of complexity. As long as this is either in place or planned, extra washes of unadulterated pigment will actually push the resulting colour in the painting nearer and nearer to the edge of colour-space. Indeed it is a form of the "*progressive mixing*", as described in the last chapter, with all its advantages. The process will move the colour concerned towards purity and ever increasing transparency, while always maintaining the degree of complexity necessary for creating an array of unique colours that combine to create effects of light and pictorial depth.

Loss of vitality in the mark-making

As implied in the second of the three assertions made at the beginning of this section on "*watercolour"*, all the above discussion may seem beside the point to some readers, because they have been taught a completely different reason for not putting on more than a very limited number of washes. This concerns the *loss of vitality in the mark-making*.

When students bring forth this argument, my response is to suggest that, though in practice, the use of a large number of washes often does seem to coincide with a falling off in the quality in question, it is not necessarily the number of layers that is to blame. I propose that the students should consider an alternative explanation. It is that *the problem lies with the state of mind* that accompanies the later additions.

In general, the quality of mark-making reflects the feelings and thoughts of the person concerned. If the marks are made with purpose, they are likely to give vitality to the painting. If they are produced without commitment, the outcome is likely to be lifeless. It is thus, not surprising that the mark-making in the earlier stages of producing a painting from observation often reflects the early struggles, excitements, optimism and, in general, a high level of involvement, all of which are likely to result in the paint being laid down in a dynamic manner.

Nor is it surprising that later on, *indecision* creeps in as the artist is faced with *a sequence of hurdles*. Typically these may include:

- Putting in what they consider to be the less-interesting bits.
- Preconceptions as to what a finished work should look like.
- Making value-judgements.

When someone is less interested, what they are doing loses dynamism. When they

feel the need to finish but don't know how to do it, they lose heart. When they are not sure as to what is *good* or *bad,* they loose confidence and become unhappy with what they are doing. They feel the need to change something but, because they neither know what has gone wrong nor what to do about it, they are in no state to make purposeful changes. The no-win choice that faces them is between:

- Dithering on aimlessly,
- Tarting things up according to preconceived rules relating to what makes a painting look good.
- Leaving it well alone.

The lesson that many people draw from bitter experience is that, of these three choices, *inaction* usually works best. Since it is often the case that the parts of the painting that were laid in during the early stages, which were characterised by struggle, excitement, optimism and high level of involvement, have a quality to them that seems well worth holding onto (as they so often do). If this is the case, no wonder that some artists, often encouraged by their teachers, want to stop while the going is good.

The question that needs to be asked at this juncture is not whether what has been achieved so far you might be spoilt, but whether the painting has reached its potential. In my experience too many students are too much concerned with the risk of loosing something and not enough with the possibility of building on what they have so far achieved. This fear can occur while making any kind of painting or drawing, but is particularly likely to arise when making watercolours, if the artist is either worrying about putting on too many layers or fearful of not being able to hide mistakes, due to the translucency of the medium.

The history of oil painting is full of artists who have built up their paintings layer upon layer, sometimes over years, without losing the vitality of the whole (Titian, Rembrandt, Delacroix, Manet, Monet, Cézanne, Bonnard, etc. etc.). Their trick was to make each mark for a positive reason. Watercolourists can perfectly well do the same when laying on wash after wash as did Turner, Emile Nolde, Paul Klee or Leslie Worth. With them *every mark was put on with purpose* right up to the last one, and this purposiveness shows.

If it is the state of mind that kills the freshness of mark-making, rather than the addition of more paint, it is evident that what is required is *a change in attitude*. The need is to work out what qualities must be exemplified in a painting if it is to realise its potential. This will never be easy because, if it is to provide

the required *vitality*, each painting will need to have its own unique and hitherto untried solution. As it progresses, what is emerging on the picture-surface begins to suggest possibilities and these lead to questions. What if I do this? What if I do that? A good deal of time can be profitably spent mulling over possible answers, but in the end the value of these can only be revealed by experiment on the painting itself. A dynamic moment is set up. The *experimental mark* will reflect the *uncertainty* the *adventure* and the *excitement* of the situation and, accordingly, will be made with a mixture of *trepidation, curiosity* and *decision*. If it is, the artist is unlikely to feel disappointed in terms of the mark-making qualities of the work, no matter how many layers or washes are involved.

Lifting off paint

One great advantage of watercolour hardly mentioned so far is the ease with which the paint can be lifted off, whether with a wet brush, a wet sponge or some other suitable tool. Some people seem to perceive this as little more than a useful method for getting rid of mistakes. If so, they may be lucky or disappointed according to the nature of the pigment being used, since some pigment-colours stain irremovably into the paper. In which case, no matter how hard they try, they will not be able to remove all traces of the colour in question. However, hiding mistakes is not the only reason for sponging off. More experienced watercolourists know that some of the best watercolour effects can be achieved by a combination of wetting and taking off paint in various ways. Turner was the champion of exploration in this domain. Some artists systematically wash or scrape off their first attempt and use the ghostly remains as a guide to a second.[11] Others, use water, sponge and brush to create specific effects. In short, sponging off is a very useful tool for watercolour painters.

Finally before leaving the subject of water colour, a warning is necessary. It relates to the quality of paper being used. If it is not robust enough, sponging off can destroy its surface and, as a result, can lead to a great deal of frustration. Accordingly, it is important to choose good quality paper of a sufficient thickness: At least 200 grams is recommended. Also worth giving consideration is the nature of its surface: Rough surfaces are best for some projects and smooth ones are more suited to others. What is good for you can only be found out by experiment.

11 This idea is reminiscent of Edouard Manet's approach to portraiture in oils. After every sitting and, sometimes, in the middle of a sitting he would scrape as much paint off his canvas as possible and start again. His idea was to avoid at all costs losing the spontaneity of his brush marks.

GOUACHE

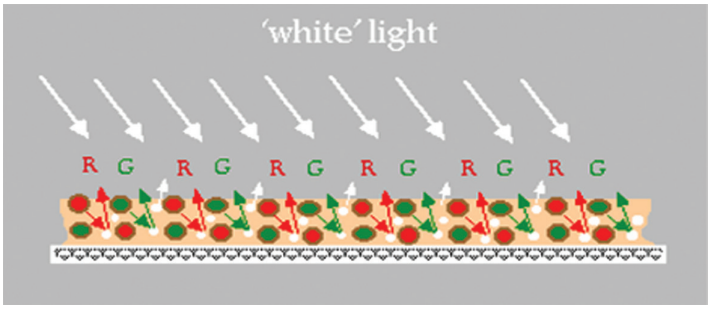

Figure 19 : Gouache, showing chalk particles acting as reflecting-boards

The traditional product going under the name of "gouache" is exactly the same as watercolour, except in one respect, namely that a quantity of white "*filler*" is added in with the normal pigment colours. *Figure 19* illustrates how this creates innumerable tiny "*reflecting-boards*", the presence of which means that translucent colours are reflected back out into the eyes of viewers in somewhat the same way as opaque colours. Accordingly, mixtures of red and green translucent gouache colours, tend to move more in the direction of browns and ochres than that of greys or blacks. It is for this reason that, in general, it is more difficult to create deep rich colours from mixtures made from gouache colours as compared with watercolour ones.

A concusion to be drawn from this is that, since the gauche and watercolour are virtually identical in their composition, an obvious step is to mix the two mediums, whenever the properties unique to one of them can help to obtain a result unobtainable with the other. This is what Turner and the nineteenth century watercolourists did as a matter of course, although their name for gouache was "*body colour*".

ACRYLIC PAINT

Acrylic paint can be considered as identical to oil colour, except in two very important respects. These are:

- Their *rapid drying time*.
- That the process of drying can bring about a *significant change in colour*.

Each of these subjects is worth a few words.

Rapid drying time

The rapid drying time of acrylic medium has advantages and disadvantages. On the positive side, one coat can be added to another much more rapidly, making it ideal for laying on multiple layers, whether they are applied thickly, to produce impasto effects, or thinly, like watercolour washes. On the negative side, anyone who wants to paint wet into wet or to work with colour mixtures made on the palette, will have to act fast and in many likely-to-arise circumstances this is just not practicable.

The paint manufacturers are aware of these problems and provide products for delaying the drying time. Thus, they offer:

- *Retarders* to mix with the paint when squeezed out of is tubes.
- So called *"wet trays"* made of a layer of absorbent paper (for example, blotting paper) covered by a sheet of tracing paper, onto which the paint can be squeezed out and mixed. The paint on this special form of palette will remain wet for a considerable time. To extend this time even further, the whole can be placed in a box with an airtight covering (for example, made of *cling-film*). Paint laid out on the open wet tray will stay malleable for hours. Covered it can remain usable for days.

Acrylic medium

There is a highly significant effect of the *white colour* of the wet acrylic medium on the appearance of paint made using it. This is similar to that produced by the filler used to make gouache colours. Thus, like them, the acrylic colours as they emerge from the tube tend to be relatively bright and opaque.

Unfortunately, a big problem arises because, upon drying, the formerly-white acrylic medium becomes as transparent as glass. The effect of this transformation can be dramatic, particularly if the pigment in the paint layer is a mixture of complementaries on the translucent end of the opaque/translucent continuum.

Consider the case of a translucent blue, which has come straight from the tube. If it is painted on top of an undercoat of its complementary (orange), in its wet state it can appear as a bright blue and in its dry state as approaching a black.

Similar even if less dramatic changes can occur to any mixture between different colours made using acrylic paint.

Diluted with plenty of water

The situation is significantly different if the acrylic paint is diluted with plenty of water. The effect on the medium is similar to that of diluting white milk. If there is enough water, the whiteness of the milk can almost disappear. The same applies to acrylic medium. Consequently, if the acrylic paint is diluted enough, it becomes very like watercolour in its covering properties. This being the case, it is tempting to use acrylics as a watercolour substitute. As such it has both advantages and disadvantages:

- An advantage is that the shortness of the drying time of acrylic avoids most of the problems associated with laying on multiple washes. Accordingly, little skill is required to apply a virtually unlimited number of them.
- A disadvantage is that artists using acrylics are not able to exploit the opportunities provided by the solubility of gum arabic. None of the watercolour effects that depend on paint being lifted off with a brush or sponge are possible.

Glossy and matt finishes

It is also worth noting that the acrylic medium gives the finished product a much shinier surface than is characteristic of watercolour paintings. The shininess can be enhanced by means of using a *glossy* acrylic medium or reduced, either by using a *matt* medium or by means of *thinning the last coat of paint with water,* so that the pigment particles create a textured surface. However, none of these steps will prevent it being relatively shiny as compared with watercolour, oil paint or pastel. Depending the objectives of the moment, this extra degree of glossiness may be sought after or shunned, according to taste.

Premixing colours

Finally, there is another solution to the acrylic paint colour-change problem which, though extremely time consuming, can be very useful in the context of certain types of abstract painting. This is to premix all colours used and after testing the effect of applying one on top of another, storing them in jars until all

the necessary colours have been accumulated. It is a way of doings things which I myself have exploited a great deal in my own work.[12]

DRY PASTEL

Dry pastels are very similar in composition to gouache, being composed of pigment, a chalk filler and a glue. The pigment and the filler are near enough the same, but the glue is slightly different, being *gum tragacanth* rather than *gum arabic*. As explained earlier, in the case of watercolour the gum arabic not only glues the pigment particles onto the paper, but also changes their degree of translucency and, thereby, their appearance.

In the case of dry pastel, the function of *gum tragacanth* is less obvious (more on this below) and its role as a medium is less evident. The fact that, relatively speaking, there is so little of it means that it has only marginal effect on the appearance of pastel paintings. This is why dry pastels remain opaque and retain the characteristic colourfulness of very nearly pure, unadulterated pigments.

Mixing problems

With these characteristic it is not surprising to find that dry pastels mix according to the rules (explained above) that apply in the cases of *optical mixing* and *opaque oil paints*. For example, a mixture of red and green will produce a dull, yellowish brown.

The fact of being bound by these rules leaves an analogous problem to that we came across with one wash watercolour, namely that of creating deep rich colours. Unfortunately, in the case of dry pastels this cannot be solved by adding washes or layers in the manner that works for watercolour, oil paints or acrylics. The reason why can be explained partly by the difficulty of adding additional coats of dry pastel pigment particles. However, even to the degree this is possible, layering would not help because, as explained above, the process of mixing deeper colours depends on the pigments in the mixture being translucent.

Another difficulty is that pastels cannot easily be mixed together on a palette before being applied to the picture surface, as can other types of paint. Except in rarely applicable circumstances, they have to be mixed on the picture-

12 For example, when making the *Grey Series* and the *Islamic Series* discussed in Chapter 9.

surface itself.

The mixing problem is particularly evident when attempts are made to combine opposites (dark/light or complementary). Thus, it is difficult to produce a smooth area of light blue using dark blues and whites, or of brown, using mixtures of reds and greens. With such contrasting pigment colours a degree of streakiness is difficult to avoid. The only way of removing this is to rub the pigment particles together using a finger or some kind of pad. While this works well on occasion, it seriously restricts the available range of textures and possibilities of mark-making.

Fortunately the manufacturers of dry pastel understand this, which is why they premix a range of colours of different degrees of lightness before moulding them into sticks. In particular, the mixing of white and black with the different pigment colours makes it possible to create ranges of both deep and pale colours. The blending of the pastel sticks in this way means that the problem of mixing smooth-looking colours on the picture-surface is considerably reduced.[13]

A desirable number of colours

A clear implication of all this is that to obtain a satisfactory palette of soft pastels it will be necessary to include a much larger range of colours than for any other type of paint. If we assume that it would be desirable for each pigment colour to be made available at five levels of lightness, a box of pastels containing one hundred colours would ben needed to provide the functional equivalent of a watercolour box containing twenty. From this rough calculation, it is clear that a set of eighteen or, even, thirty six pastels will impose severe limitations on the person using it. My own pastel box contains about one hundred sticks and includes a good range of deep rich and pale colours. Assuming that the lightness range is available, it is difficult to imagine why anyone would *need* a significantly greater number. However, it is well to remember that the general rule is the more the merrier.

Pastel boxes containing hundreds of colours

It might be assumed that it is for the reasons detailed above that pastel manufacturers produce boxes with two hundred or more different colours. However,

13 Significantly, to my knowledge, manufacturers do not seem to have come up with the idea of creating pastel sticks in which complementaries are blended.

this may not be the case. My own doubts on this matter were raised as a result of examining boxes of soft pastels that students have brought to my painting school. To my astonishment, I have found that they were very short on both deep rich colours and pale colours. From the point of view of practical colour-mixing, such boxes are much less functional than my 100 pastel collection.

An anecdote

Various students have shared with me their reasons for buying a box containing hundreds of pastels. These had nothing to do with the arguments just presented. It turned out that their motivation was based on fear of the difficulties of colour-mixing. One of them argued that with so many different shades, they would be able to find all the colours they need in their box. Unfortunately for them, they could hardly have been more wrong.

To understand the enormity of their misconception it is only necessary to recall, first, the incredible range of colours in nature and, then, the *numbers game* we played earlier with the conceptual colour circle. Clearly my students had not pondered the implications of there being millions of colours in nature. Nor were they aware that with the help of mixing there is the possibility of making hundreds of thousands of colours at least. By comparison with these kinds of numbers, a mere two hundred and fifty seems very insignificant. No matter how many colours one has in the box, there will virtually always be a need for making mixtures between them. If artists try to do without, they will certainly end up with many repeated colours and will deprive themselves of mixtures containing complementaries. The result can only be a tendency towards crudely coloured and garish paintings.

Proportion of glue

Different manufacturers have different policies with regard to the amount of glue used in making their pastel sticks. Less glue means purer looking colours and greater ease in laying down the first marks. It also means that pigment particles fall off the picture surface more easily, which is something that tends to be happening to some extent all the time, particularly whenever the attempt is made to lay a colour into or on top of other colours. Since this last phrase describes the main way of mixing pastels, the stability of pigment particles on the picture surface is clearly a factor to be taken seriously. No wonder that many pastel painters of the past have made efforts to ameliorate this situation.

Their efforts have concentrated on devising methods of binding existing layers of colour more firmly to the picture-surface, as a preparation for scumbling more pastel on top of it. Two ways of doing this are widely used:

1. Spray the existing regions of pastel with fixative. Unfortunately this method has two severe disadvantages. They are:
   - If used in a quantity that is sufficient to do the required job, the shiny, hardness of the fixed-surface can make it impossible for pastel to adhere to it. The more layers of fixed pastel used, the more likely this will happen. If it does, the whole object of the exercise will be defeated.
   - Once the pigment is encased in the varnish, it becomes relatively more translucent, a transformation which results in significant changes in appearance (more on this in the next section).[14]
2. Use another medium for the first coat. The most obvious choice being gouache (which, as just explained, is more or less the same thing as pastel except that it contains more glue).[15] A variation on this, which I have used extensively myself, is to add a couple of drops of gum arabic to a half jar of water and use this mixture to paint into the first covering of pastel. Although this process will certainly spoil what has already been done, the resulting surface will provide a good base for scumbling on a whole new layer of pastel.
3. Boil a kettle in the same room with a view to its steam creating a damp atmosphere capable of reactivating the glue in the pastel.[16] This can only be done if the pastel has been painted on a crinkle-proof support, such as cardboard. Because it does not involve any addition of glue, this procedure will not create a surface that is as robust as that produced by the other methods.
4. Use pastels made with a greater glue content.[17] While the presence of more glue slightly dulls the colour and makes applying marks slightly more difficult, on balance, in my experience, the advantages greatly

14 Similar to those that occur when acrylic paint made using translucent pigment is applied in layers.

15 Many Turner watercolours contain are described as "watercolour with 'body colour'". In effect, this means with gouache.

16 A method to be used with care. The source of the steam should be kept well away from the painting.

17 The *Rembrandt* brand is by far the best in this respect that I have come across.

outweigh the disadvantages.[18]

While all these methods work up to a point, my personal experience suggests that the problems of reworking dry pastel surfaces with more dry pastel have been exaggerated. Many of these stem from a misunderstanding of one or other of the colour-mixing considerations elaborated upon earlier. As with all methods, my advice is just get on with trying it out and you will find that problems usually suggest their own solutions. Sometimes these will require mastering traditional techniques. In which case, knowing why you are needing them will help no end.

Using fixative to stabilise the finished work

The combination of a lack of a medium and the limited amount of gum in the pastel stick has implications for the stability of the finished work. Because the adhesion of pastel pigment to the picture surface is not very strong, particles of pastel dust tend to fall off the finished work if it is banged, however gently. Furthermore, a pastel painting is difficult to store in a folder due to the risk of pastel surfaces rubbing off against paper placed against them. For these reasons manufacturers make a "*fixative*" which can be sprayed onto the surface to stabilise the situation. As explained above, this has the properties of a varnish and once the pigment particles are is encased in it, they become relatively more translucent. Dramatic changes in colour appearance can result. These will tend to be particularly severe in any pastel-painting which has been made using mixtures of different pigment-colours. It hardly need adding that such an outcome can be a bitter blow, particularly if precise colour relations are important to the artist.

The only alternative is simple and effective. It is to wait long enough for any dampness in the air to penetrate the pastel layers and, in the process, reactivate the gluing properties of the gum that originally held the pastel stick together. As already mentioned the process can be encouraged by boiling a kettle of water in the same room.

The result will be a permanent surface that will stay put for centuries as long as it is not actually rubbed against. There is still a storage problem, but at least the pastel painting remains as the artist desired it to be.[19]

18 But this is a matter of opinion that is not shared by all pastel painters.

19 I have kept an unprotected pastel in my attic for over thirty years and it looks as good as ever.

SCUMBLING

"Scumbling" is one of those words which, though widely used, retains a certain amount of ambiguity. For many, including myself, it has a connotation of "*scrubbing on the paint*" to produce an irregular surface allowing glimpses of the colour beneath between uneven clusters of pigment particles that are nearer to the surface. Others use the word, even when the top coat is smooth and continuous allowing no direct perception of the colour beneath. However, these are but quibbles. Scumbling always means adding one coat of more or less undiluted paint on top of a previously dried coat in such a way that the underneath colour has an effect on the appearance of the top one.

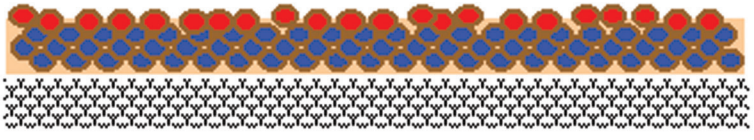

Figure 20 : red scumbled onto blue

Figure 20 shows a thin layer of red paint applied on top of a thick layer of blue paint. In some places, there are holes in the coat of red pigment, allowing the incident white light to illuminate the blue directly. As a result, there will be a certain amount of optical mixing between the red and the blue. Everywhere else, the light must penetrate the red if it is to enter the blue and be scattered back from it. Any light taking this route will cause the red to appear more purplish and slighlty less saturated than if it had been applied to a white canvas. In these ways, it will take on the appearance that is typical of scumbled colour. Words cannot describe what this is, but there tends to be a slightly damped-down, sometimes mysterious look, which some artists favour.

GLAZES

The word "*glaze*" is related to the word "*glass*". In the context of painting, glazes are made using various substances that, when dry, have a glass-like hardness and a glass-like degree of transparency. The idea with glazing, as with scumbling, is to allow the colour underneath to influence the colour on top. However, glazing allows for more nuanced effects.

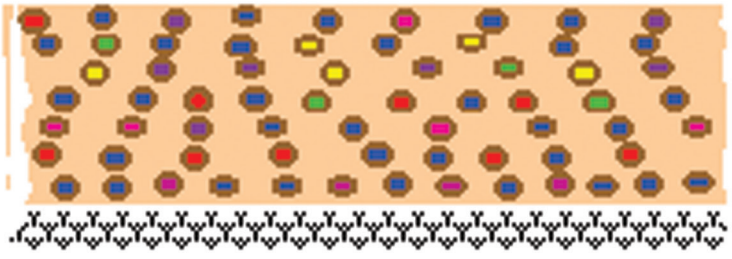

Figure 21 a completed glaze.

Figure 21 is a schematic representation of a very thick layer of paint in which the pigment is sparsely distributed within a large quantity of glazing medium. The advantage of this arrangement is that the virtually transparent medium allows the light to penetrate deep into a paint surface with a minimum interference from pigment particles. If these are varied in colour, the light can interact with different combinations of them. As a result, extremely subtle absorption/ re-emission patterns can be achieved, creating wonderfully delicate nuances of colour.

Practical considerations

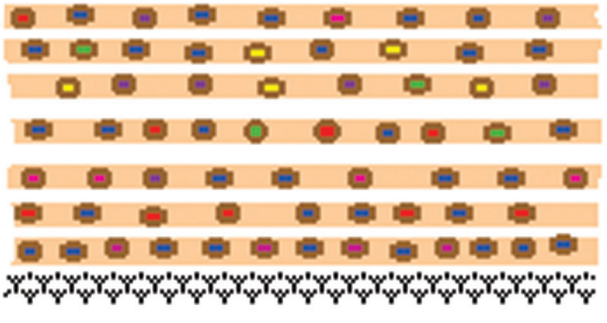

Figure 22: the separate layers of glaze used in figure 21 above

The potential of glazing is very great, but the practice requires a certain amount of organisation. The main problem lies in the impossibility of laying on the necessary depth of glazing medium in one coat. There are a number of strong reasons for this:

- Drying time would be prohibitive (with traditional glazing media it might take years to complete the process of hardening).

- Too much medium in its liquid state would tend to flow off the canvas and, even if prevented from doing so, all the pigment particles would gravitate the bottom, thereby negating the whole purpose of the enterprise.
- The drying process would almost certainly lead to deformation of the paint surface, which would crinkle and/or crack.

The only practicable solution to all these problems is to build up the deep layer of paint progressively, applying one coat at a time with each layer containing a selection of pigment colours. *Figure 22* illustrates this by separating out the individual layers of which *Figure 21* is made.

Breaking up the task in this way both makes the process feasible and gives the artist greater control of the ratio between pigment and glaze: The smaller the amount of pigment relative to glazing medium used in each layer, the more will be the space for the light to move about within the final surface.

It is unlikely that the limit to the number of layers will ever be found. Titian is reputed to have used as many as forty. Whether this is true or not, the fact that it is believable suggests that anyone can lay on as many layers as they want. However, it is difficult to imagine having a good reason to exceed forty.

A Caution

Whether scumbling or glazing, it is particularly important to be sure that each coat is dry before the next coat is applied. This is not much of a problem with acrylics, since acrylic medium dries so quickly. Oil paints are another matter. It is not only that both the oils themselves and the glazing media associated with them take longer to dry but also, and equally importantly, that they contract as they dry. Accordingly, if one coat is still drying when another applied, there will be an enormous centripetal force applied upon it from underneath. Not surprisingly, layers of paint under such pressure will be liable to crack.

From a practical point of view, the situation is further complicated by the fact that there is a big difference between seeming to be dry to both the eye and the touch and actually being so. A thickly applied coat of oil paint containing linseed oil can take months to dry, as can glazes containing various traditional glazing mediums. Anyone who wants to take up the Renaissance way of painting in layers and glazes using oil paints should consult an expert on the subject and even then should proceed with extreme caution.[20]

20 Good books on the subject are: Max Doerner, 1949, The Materials of the Artist, George Har-

THE FINAL PAINT SURFACE

Smoothness and roughness

One last consideration does not relate to the issue of whether pigments are translucent or opaque. Rather it concerns how the degree of smoothness or roughness of the final paint surface determines whether viewers will perceive it as glossy or matt.

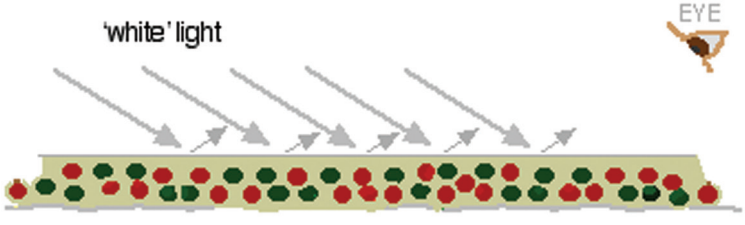

Figure 23 : Gloss surface - pigment particles do not affect the smoothness of the surface profile created by the medium.

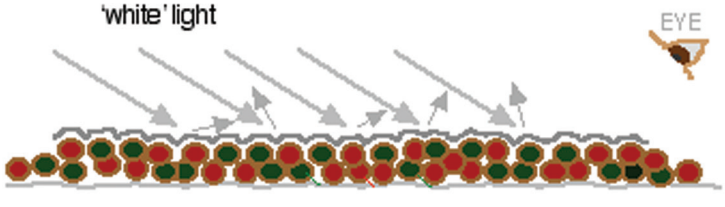

Figure 24 : Matt surface - pigment particles do affect the surface-profile.

Figure 23 illustrates what happens when light strikes a glossy surface and *Figure* 24 what happens if it strikes a matt surface. In both cases, the light obeys the rule of physics that the angle of incidence equals the angle of reflection. In the former, because the surface is smooth, it is reflected back in a regular manner. In the latter, because the surface is irregular, it is scattered back in all directions. This point deserves elaboration.

Glossy surface

In the case of a glossy surface illuminated by a single light source, the re-

rap & Co, London, and Ralph Mayer, 1991, Ibid.

flected-light only bounces off in one direction. Accordingly, it will only enter the eyes of viewers situated in one position, as illustrated in *Figure 23*. From there what the viewers will see is a reflection the light-source, as they would if it were a mirror. If viewers look from any other viewing position, they will see no reflected light. The rule is that if a painting is viewed at an obtuse angle to a main light source the influence of reflected light will be minimised and the body colours in the painting will be clearly perceived.

If there is another light source in another location, image-obscuring mirror-reflections can be caused by this as well. If there are many secondary light sources, there will be a corresponding number of mirror reflections, and these will be of greater or lesser visibility according to their relative strengths and to the relevant angles of viewing. This is why glossy or glazed surfaces are likely it is to suffer from image obscuring reflections.

Matt surface

Matt surfaces can be made, as illustrated in *Figure 24*, by pigment particles breaking up the smoothness of the glass-like medium. A similar effect can be achieved by using a matt medium. This works by mixing glass-like granules in it such that these break up the surface in the same way as the pigment particles. It can also be achieved by roughing up the surface in other ways.

No matter how the matt surfaces are made they are made or how rough they are, there will still be a tendency for the reflected-light to reflect more strongly in the same direction as it would if it were a glossy surface. Accordingly, more white light will enter into an eye looking from the viewpoint illustrated in *Figure 24* than into an eye looking from any other direction. The critical difference is that the matt surface will always scatter light into a multiplicity of directions. For this reason the image of the light source will be blurred and its impact on the eyes reduced. The significant of this is explained in the section on viewing position below.

Before proceeding to that, two final points are well worth making, namely that:

- One way of achieving surface roughness is to mix in with the paint plenty of spreader (water or turpentine). The idea is to thin down the medium with a view to making sure that the pigment particles stand proud of the surface, thereby distorting the surface-profile in the same way as illus-

trated in *Figure 24*.

- There is no point in worrying about gloss versus matt issues except with respect to the last coat of paint. Whether the underneath layers are matt or gloss will have no effect whatsoever on the final appearance.

Viewing position

It is easy to see from these two scenarios that, as explained more fully later in *Chapter 23*, the combination of surface-roughness and viewing position can have a highly significant effect on how a painting will be experienced. Body colours will be seen at their purest when embedded in glossy surfaces illuminated by one main light source and viewed from a position from which it is not reflected into the eyes. To achieve this result, there must be an acute angle between it, the picture surface and the viewer's eye.

Although unwanted distortions caused by multiple reflections can be ameliorated to a limited extent by making the surface of the painting matt, this will not completely solve the problem of reflectivity. The reason is that, because matt surfaces reflect light from all directions, there will be no viewing position that is not affected by the main or, indeed, any of the secondary light sources. This is why the colours in paintings with matt surfaces will always have a slightly desaturated look.

It is important for spectators to realise that, whether a painting is glazed, matt or under glass, unless they adopt a appropriate viewing position in an appropriate viewing context, they will not see either the individual colours or the colour relations as the are meant to be seen.

Implications

This chapter has been about the impact of different degrees of pigment-translucency on the colour appearance of paint mixtures. In the interests of clear explanation a comparison is made between hypothetically totally opaque pigments and hypothetically totally translucent ones. It turns out that they obey significantly different rules. For this reason the degree of translucency is an important factor in predicting the outcomes of mixtures between colours. The most dramatic differences occur for mixtures of complementary colours. The reason is that:

- *The more translucent a pigment-colour, the more it will approach mixing*

as if according to subtractive colour-mixing rules.

- *The more opaque a pigment-colour the more it will approach mixing as if according to additive colour-mixing rules.*

Unfortunately for those who wish for conceptual simplicity, neither the hypothetical completely opaque pigment nor the hypothetical completely translucent one exist in the real world. As explained earlier, the degree of translucency of actual pigments is on a continuum. As none of the pigment colours are in exactly the same place on it, artists have to live with the realisation that no two pairs of pigment-colours fully obey the same mixing rule.

A practical conclusion to be drawn from this confusing sate of affairs is that it is pointless to get stuck in rigid theory. Something more flexible is needed. If we wish to make the best use of colour mixing theory when we are making paintings, we should regard it as no more than a tool used to guide feelings-based journeys of exploration and discovery. This should be no surprise for we have daily evidence that in all domains of creative endeavour this is what our eye/brains are supremely good at.