CHAPTER 13

Volume Two : Drawing with Knowledge

Introductory

The main body of this book concentrates on showing how the rules of linear perspective and anatomy can be used as aids to drawing and painting from observation. This chapter prepares the way by discussing the implications of the phrase "drawing with knowledge". We start with two comparisons. The first is between "Drawing with Feeling" and "Drawing with Knowledge", the two books on drawing in this series. It shows that they have more in common than the difference in their titles might lead people to expect. The reasons for this will be elaborated later, but for the time being they can be summarised in two short statements. Thus:

- *All the drawing strategies described and recommended in both books can be classified as "drawing with knowledge".*
- *The aim of both books is to show how knowledge of rules and laws can facilitate the exploration of appearances.*

The second comparison is between this book and other books on perspective and anatomy. Here the main difference is that the others use these subjects as aids to the construction of images made from imagination. They do so by providing frameworks and measurements that ensure images produced using them will abide by the rules and laws in question. However, too often they are advocated as aids to drawing from observation, a function for which they were never intended, and a usage for which they are ill adapted and one which is strongly discouraged in this book.

Ambiguity

My presentation of the evidence that drawing from observation is always *"drawing with knowledge"*, starts with two well known quotations and a detail of a painting, all of which illustrate the constructive powers of the eye/brain. The

first quotation is from Shakespeare's play "*Hamlet*":

- *Hamlet: "Do you see yonder cloud that's almost in shape of a camel?"*

  Polonius: "By the mass, and 't is like a camel, indeed."

  Hamlet: "Methinks it is like a weasel."

  Polonius: "It is backed like a weasel."

  Hamlet: "Or like a whale?"

  Polonius: "Very like a whale."

And the second is from Leonardo da Vinci:

> *"If you take the trouble to look at any wall that has been disfigured with various stains or is made up made up of a motley rocks of different shapes and textures, you will be able to see in it a resemblance to a variety of landscapes adorned with mountains, rivers, rocks, trees, plains, valleys, and hills. If your need is to imagine a scene for use in a painting, you will also be able to perceive divers combats and figures in quick movement with outlandish costumes and strange expressions on their faces and, indeed, a myriad other things which you can then reduce into separate and well conceived forms."*
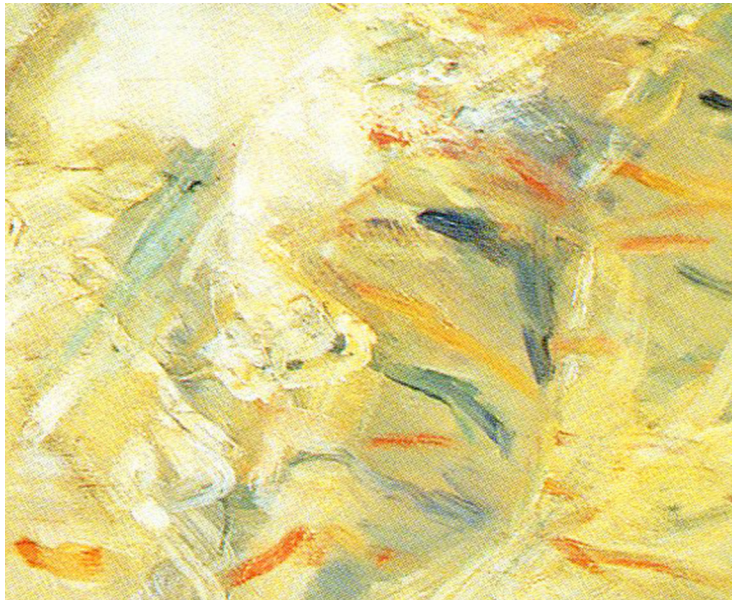

Figure 1 : Detail of painting

The detail of a painting presented in *Figure 1* provides third example of the well known phenomenon to which both quotations refer since anyone who looks at it has a good chance of discovering hidden objects analogous to those to which Shakespeare and Leonardo were calling attention. In my case, I found the right half of a face emerging. It comprises a glimpse hair, an ear, an eye, the outline of a jaw, the beginnings of a neck, a mouth and a nose complete with two nostrils. Less convincingly I found myself identifying a left hand side jaw line and a rather out of place second eye. Perhaps other people's eye/brains would make different constructions. For all I know, the cues in *Figure 1* may be as fruitfully ambiguous as those Hamlet saw in the clouds or Leonardo in the mud stains.

In addition to providing examples of how visual perception can be fraught with ambiguity, both the quotations and the detail of a painting show is that attempts at disambiguation can make use of constructive processes. But we need to go a crucial step further since analyses of eye/brain function shows that construction is not just a possibility but an intrinsic part of all visual perception. This is true even in the case of artists who are making every effort to be as accurate as possible when drawing or painting from observation. The eye/brain is always faced with ambiguity and its first task is always to make sense.

The truth of this last statement can be demonstrated by means of a comparison between tracing a contour and drawing it from observation. As we all know, tracing involves following a given path with the point of a drawing instrument. Clearly, no high level skill is required: It is a simple tracking task that involves neither abstraction nor construction. In contrast, both processes are required when making outline drawings from observation. The first step consists in homing in upon a section of the contour to draw and this involves the selection of two endpoints. Performance levels can depend a great deal on how far apart these are and/or on the complexity of the curvature profile between them. If the chosen endpoints are far apart and contain much complexity, eye/brain systems are faced with two alternatives. It can construct generalisations, using short-term working memory, in which case, they are likely to be very crude. Or it can resort to information residing in long-term memory, in which case the link with actual appearances is broken. Both solutions are common in the drawings of children. But whether the profile of the line joining the chosen end points is based on a generalisation temporarily housed in short-term-working memory or on information stored in long-term memory, the process of putting together the instructions that guide line output is essentially constructivist.

There is a great deal of evidence indicating that the eye/brains of untrained drawers tend to choose larger segments and either make cruder generalisations or resort more evidently to information stored in long-term memory. In contrast experienced artists are likely to choose smaller segments and make generalisations that correspond more closely to external reality. Often they do so to the degree that it is quite possible for people looking at the results to assume that they are drawing what they "see". One reason for the prevalence of this illusion is the fact that experienced artists are more likely to have developed the skill of using their short-term working memory to chain together a number of generalisations based on the least complicated and most easily characterised units of visual perception (the "*visual primitives*"). The outcome is the highest possible levels of correspondence between generalisations and reality. Accordingly the process of chaining elements that are at the same time the simplest and the most familiar gives the best chance of achieving literal accuracy. A second reason will be elaborated in the next section ("*Using long-term memory*").

What some might find difficult to accept is that selection of end points and the making of generalisation are requirements even when the artist concerned is trying to put into practice the instruction to follow the outline "*as if tracing*", as they may be asked to do when making CLAM[1] drawings in a figure drawing class. Extensive records of eye-movements show conclusively that, when engaged in analysing contours the eye is incapable of following them smoothly. Rather, it jumps and glides all over the place.[2] If the gaze is so volatile under these circumstances, it is hardly surprising to find that, it is equally so for all analytic looking tasks relating to drawing from observation. Indeed, studies reveal that it only remains steady when tracking a moving object such as a aeroplane crossing the sky or a pencil tip following a line as when tracing.

All this relates to the discussion of the differences between "*Drawing with knowledge*" and "*Drawing with Feeling*" because putting together instructions for action requires the use of long-term memory the storehouse of all our existing knowledge. Accordingly we must conclude that is no alternative to drawing with knowledge. The many people who make the claim, "*I simply draw what I see*" can only be deluding themselves. In all visual analysis, there is always an element of construction and it is always based on information residing in long-term memory, even if only that instantiated in the visual primitives.

1   An acronym for "*continuously looking at the model", see the *Chapter 5* in *"Drawing with Feeling" which is* dedicated to this technique.

2   Approximately, three rapid jumps (known as "*saccades*") and three slower glides per second.

This being the case, we can be sure that the strategies for drawing from observation described in "*Drawing with Feeling*" are knowledge-driven. In the light of this conclusion we can describe the purpose of that book as being, "*to provide knowledge of ways of looking and doing that enable artists to use drawing as a tool for opening up awareness of aspects of appearances that would otherwise be overlooked.*" Since this same sentence provides a perfectly good way of describing the use to which the rules of perspective and anatomy are put in this volume, the question arises, "*Why the different titles*?" The most important reason is that the word "*Feeling*" in the title of "*Drawing with Feeling*" is used to emphasise a particular form of drawing with knowledge that plays no part in this volume, namely the one that emphasises the benefits of making the fullest possible use of the remarkable powers of feeling-based line-production systems.

Using long-term memory

The above quotation from Leonardo da Vinci shows the artist using images he discovered in the stains or motley of rocks walls as grist to his creative powers. But in a following passage, he makes a very significant addition. In order to make use of such imaginings "*first you must know the components of all those groups of things you wish to represent, such as the members of the animal kingdom, as well as the components of the countryside, such as rocks, plants and similar things........*". In other words he suggests that artists will only be able to make convincing representations of these creations of the imagination if they can draw on appropriate existing knowledge. Thus depictions of faces, bodies of humans or creatures, plants, landscapes, buildings, etc. done from the imagination will require knowledge of physiognomy, anatomy, plant and tree types, rock formations, aerial and linear perspective, etc.". What Leonardo would not have realised and what modern research has shown us is that the list needs to be extended to include knowledge of the visual primitives, an aspect of knowledge that is common to us all (some say "*wired in*").

It is obvious that, when drawings are made of objects and scenes that the artists cannot see, they must be calling upon to long-term memory. However, few people realise the extent to which it is used when drawing from observation, except in certain circumstances. For example, it is widely recognised that long-term memory must play an important role when children produce the typical "*childlike*" drawings.[3] Similarly it is also evident that the childlike tendencies in drawings by so-called "*naive adults*" must be based on long-term memory.

3   Described by experts on child development as "*intellectually realistic*"
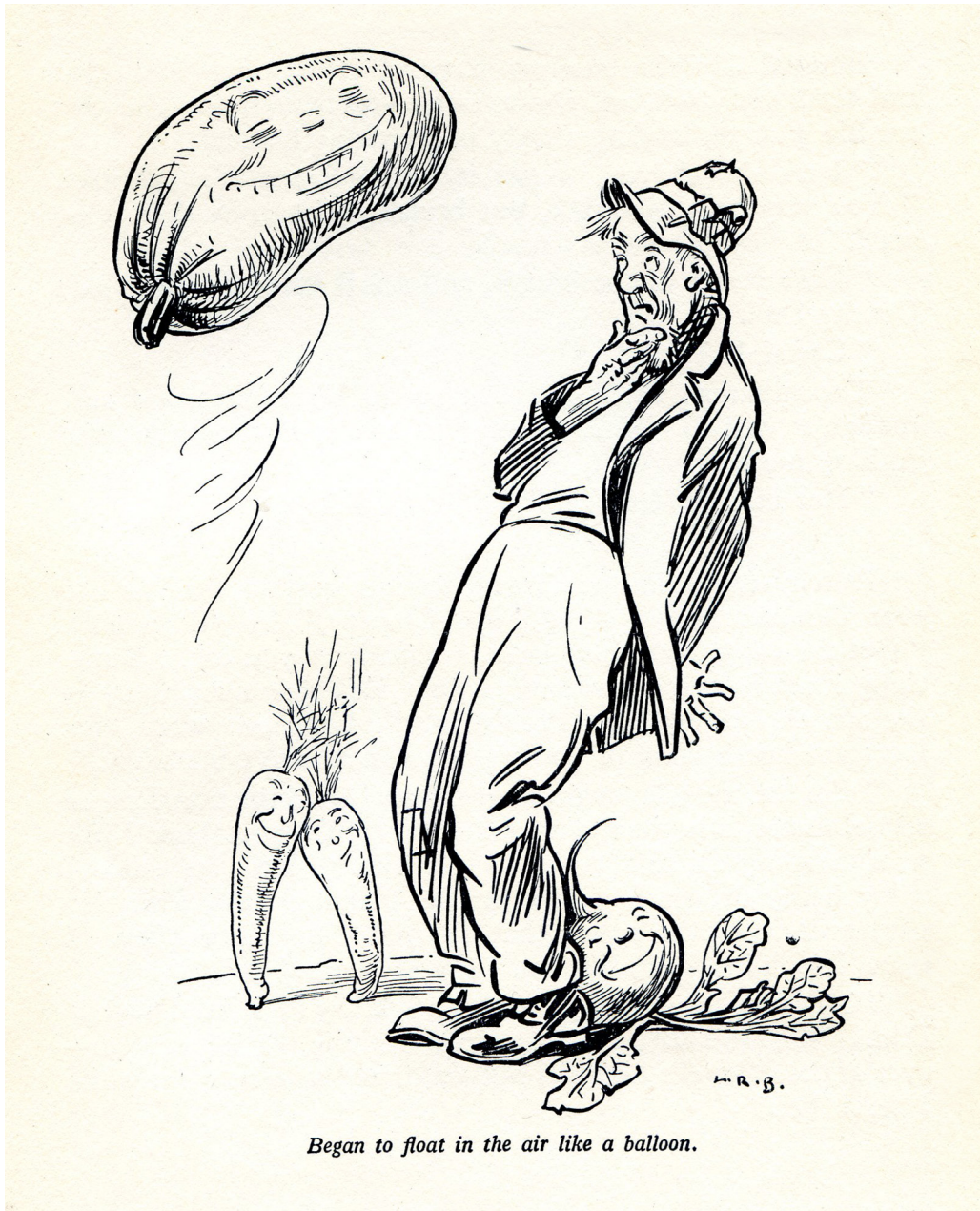
Began to float in the air like a balloon.

Figure 3 : Book illustration by L.R. Brightwell.

However, what about skilled artists? In this case, our analysis of what is go-

ing on is less straightforward, as becomes evident if we consider the case of book illustrators and others who produce realistic looking images without recourse to a real world model. *Figure 2* reminds us that these can look quite as realistic as many drawings done from observation. This being so, the same artist could have made an equally competent drawing of a person standing in front of him, with scarcely a glance at him, as indeed could anyone with a similar level of skill. If a student with such capacities were to draw upon his long-term memory to produce a highly realistic looking rendering of a model in my figure drawing class, I would have the option of offering congratulations on the level of realism or accuse him of a catastrophic degree of overlooking. I would be justified in doing the latter because on the one hand both physics and biology conspire to ensure that all the contours of every model are invariably unique and, on the other, long-term memory cannot store information about uniqueness. I might also quote Degas' saying that "*It is necessary to assume I know nothing for it is the only way to make progress*" and concentrate my students attention on the evidence of what would surely be the many differences, however slight between the model and their rendering of her. To help my student I would try to distinguish between features had been analysed with the help of short-term working memory and those which had been filled in from long-term memory. With skilled figurative artists this is not necessarily an easy task, either for the teacher or for the artist concerned, for whom self-deception is only too easy.

Context

Leonardo, being a man of the Sixteenth century, knew nothing of the new ideas that emerged approximately three centuries later in the wake of the realisation by scientists that the sensation we call colour is not a property of surfaces in the external world but a creation of the eye and the brain. Nor could he have predicted, either the rapid development of this insight into the realisation that all conscious visual experience is generated by the activity of eye/brain systems or that, once this crucial step had been taken, a cornucopia of discoveries would follow which would prove to be of immense interest to both scientists and artists. One of the most important of these was the importance of context.

In addition to providing an example the creativity of eye/brain systems, *Figure 1* can be used to demonstrate how the sense we make of something can be transformed without making any changes in it. When Hamlet was teasing Polonius, transformations in interpretation were wrought by using words that directed

attention differently (equivalent to the well tried teaching method of pointing out errors). An analogous transformation of the arrangement of marks and colours in of *Figure I* can be achieved by restoring it to its rightful place in the image from which it comes, namely a painting by Berthe Morisot (*Figure 3*).
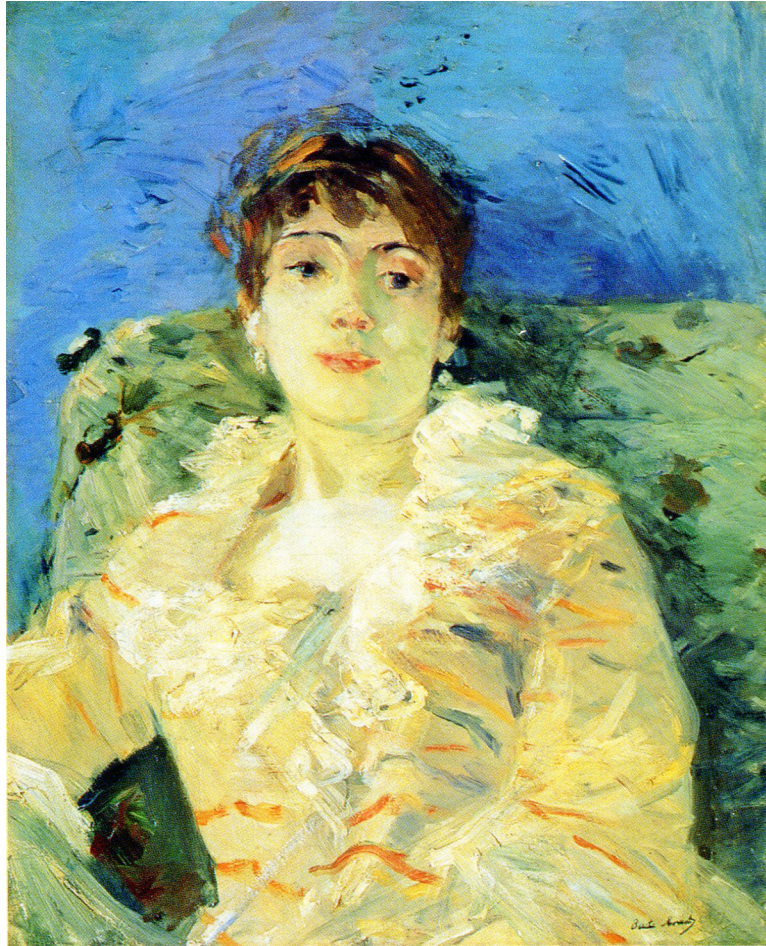
Figure 2 : Berthe Morisot - "Young woman on Divan".

What we discover is that the additional information provided in the completed painting leaves us with only one sustainable interpretation. We now see that our detail has become merely a region of a young woman's dress. It is unlikely that the face would have emerged if we had started off by looking at the whole picture. Similarly, it becomes plausible to suggest that if we had not first seen the detail separately, we might have overlooked the energetic brushwork with all its painterly implications.

This possibility leads us to ask a question that is of great interest to figurative artists wishing to emphasise formal qualities in paintings: "*At what point will contextual information close down or seriously inhibit our awareness of expressive mark-making, textural riches, colour dynamics etc*.?"

Attempts by artists to grapple with this issue played an important role in the history of painting because they pushed forward the move in the direction of pure abstraction foreshadowed in the work of Berthe Morisot and her contemporaries and relentlessly pushed forward by their successors.

Distortion, abstraction and minimal cues

As the above quotation by Leonardo da Vinci shows, what really interested him was the possibility of using the emergent properties of the kind found in clouds and water stains to stimulate the imagination when looking for subject matter for his figurative artwork. However, due to the vestigial nature of knowledge of brain function in his time, he could hardly have more than glimpsed the potential of the form-finding capacities of the eye/brain when confronted by distortion and abstraction.[4] For Leonardo "*making sense*" depended on accuracy. In contrast, the interest of the Modernist painters of the late *Nineteenth Century* (Berthe Morisot, Toulouse Lautrec, Matisse, Bonnard, Picasso, Mondrian, Paul Klee, etc.) lay in exploring the degree of deviation from literal realism that they could achieve without compromising the viewers' capacity to recognise the objects and scenes represented in their paintings. In the process, these pioneers of *Modernism in Painting* and their fellow travellers not only explored distortion and abstraction but also, in their pursuit of their possibilities, delved deep into the question of the minimum information required to push eye/brain systems in the direction of desired interpretations. In this context, the possibility of images emerging from cloud formations suggest that this might be very minimal indeed.

Construction

Finally, we come to certain ideas of the "*Constructivists*" that ran parallel to the feeling amongst scientists that the discovery of subatomic particles brought the most basic building blocks of matter within their grasp. For their part the artists saw great opportunities in making painting from the basic building blocks of visual perception (points, lines, regions, colours, textures, etc.). They were

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4   Just as in the context of contemporary knowledge of engineering, Leonardo could not have done more than glimpse the potential of his idea for constructing a helicopter.

excited by these ideas because they saw in them the possibility of branching out into as yet unexplored worlds of visual experience such as those suggested in *Figure 4*.

Figure 4 : "Fire at the first full moon" by Paul Klee.

Of course, in one sense, painters had always been doing this: they had no alternative but to build their images a bit at a time from such elements. However, up until the outset of the twentieth century, they had conceived every line and every brush mark in terms of a representational function. For them lines delineated the contours of known objects and the colours in their paintboxes were related to colours in nature. Now they could construct nonfigurative images from basic elements.

The question that now faced them was what sort of image would be desirable to create and by what rules they should be governed. These questions preoc-

cupied artists and art teachers in the twentieth century, leading to an explosion in the interest in formal issues in painting. One consequence of this was the emergence of new theories, new rules and new teaching methods. Amongst these are those developed at the Bauhaus by Paul Klee and others, which suggest new laws, rules and procedures for constructing pictures from the imagination. In this sense they parallel the way that the laws of linear perspective and anatomy were first conceived and put to use.

Implications

The purpose of this chapter has been to clear the way for what follows in the remainder of the book, namely an in-depth treatment of linear perspective and anatomy used as tools for expanding awareness of our visual world and of the nature of visual perception. Its focus has been on two questions:

- *"What is meant by the phrase "drawing with knowledge?"*

- *"What distinguished this book from other publications that treat the subjects of linear perspective and anatomy?"*

The answer to the first question is that the phrase "drawing with knowledge", as applied to this book, means using information stored in memory to guide the looking behaviour of artists when drawing from observation. If we include information stored in short term memory, this includes all visual analysis and, therefore, all drawing from observation. If we limit the definition of memory to information stored in long-term memory it means all teachable strategies of looking including those recommended in "Drawing with Feeling".

The answer to the second question is that the main and the most substantial difference between this book and other publications dedicated to linear perspective and/or anatomy is that while this book advocates using rules for guiding looking strategies, the other publications offer them as means of constructing images from the imagination. In other words both use the same knowledge-base but for a completely different purposes.

If artists wish to use the rules as developed and perfected by the artists of the Italian Renaissance in the manner for which they were intended, they will not be let down. Their efficacy has been being tested for hundreds of years and there is little if anything that needs adding to them.

Unfortunately, there are many situations in which the rules are difficult to apply. Realising this, many authors have looked for ways of simplifying them.

What they found was that they could only do so either by restricting the application of the laws to scenes that avoid complications or by missing out key aspects of them. It would have been wonderful if their suggestions had been without flaws, but the first of the alternatives proved to be catastrophically restrictive and the second sows confusion. Worse still, the emasculation of the rules renders them distinctly less interesting. It is a highly unsatisfactory situation that needs rectifying. Making a contribution to doing so is a secondary purposes of this book.

Also pointed out in this chapter is that the rules of linear perspective and anatomy are not the only ones used by artists for constructive purposes. In the early years of the twentieth century, influenced by the scientists search for basic building block of matter, certain progressive artists sought to create images from the basic building blocks of picture making. As with treatises on linear perspective and anatomy, the early works on this new subject covered it comprehensively. Of particular thoroughness were the writings of Paul Klee, which offered a combination of constructive principles and ideas about pictorial dynamics. Whether or not these are as reliable as the rules of linear perspective and anatomy may be open to question, but they certainly succeeded in suggesting abundant openings for new possibilities for drawing and painting.

Since these first efforts, there have been advances in the understanding of visual phenomena, particularly with regard to optical effects and the influence of viewing conditions on colour. However neither of these subjects has much to do with line drawing and for this reason are not dealt with in this book.[5]

To conclude we return to the primary purpose of this book, namely to provide an in-depth understanding of the principles that underpin the laws of linear perspective and anatomy with a view to maximising their usefulness as guides to analytic looking. As we shall see, using them in this way takes us into totally new territory. In it we find ourselves grappling in fascinating ways with the eye/brain's continuous manipulation of appearances and its consequences. One reward is a great improvement in levels of accuracy but, more importantly, we find ourselves to seeing our visual world in an abundance of new ways.

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5   They do have something to do with painting and have an important part to play in "*Painting with Colou*r",