

CHAPTER 6

The perception of illusory pictorial space

Introductory

The phenomenon of colour-constancy was briefly referred to in the previous chapter. It is mediated by a number of low-level visual systems that play a particularly important role in this book. However, it is not colour constancy itself that is important in this chapter on illusory pictorial space. Rather, it is a by-product of the neural computations that enable it. What these do is separate out information coming from the body of surfaces ('body-colour') and from the light being reflected from the surfaces themselves. It is this 'reflected-light' that provides the eye/brain with the information that enables or encourages perceptions of 'surface-solidity', 'surface-form', 'in front/behind relations' and 'ambient illumination'. Traditionally, artists interested in reproducing these qualities in their paintings have relied on such perceptual cues as 'gradations of lightness', 'overlap', 'relative size', 'chiaroscuro' etc. Since Seurat had the idea of what he described as painting with light" by juxtaposing dots of complimentary colours in every part of the picture surface, certain of them realised they could produce light filled paintings by covering their picture surface with paint mixtures containing some proportion, however small of complementary colours. A second rule, associated with Cézanne, came from the realisation that there is only one thing that never changes about appearances in nature and that is that no one surface or region of surface is the same colour as any other surface or region of surface. What we now know is that the formulation enables artists to produce an illusory pictorial space that shares the sense of seamlessness we experience when looking at real world scenes.

The special nature of “seeing” with respect to drawings and paintings

J.J. Gibson, the author of “*The Ecological Approach to Visual Perception*”¹, derided the study of the perception of paintings. According to him, the processes

1 Gibson, J.J., 1979, Houghton Mifflin, Boston: .

involved are utterly different from those required for the everyday perception of the visual world around us. Later,² it will be argued that he was wrong. The possibility does not seem to have occurred to him that both paintings and the artistic practices required to produce them provide a paradigm example of the need for the *selective use of multiple visual systems*. Thus, artists over the centuries have found that inhibiting of one set of visual systems forces others to take over and, in doing so, provide a new gamut of perceptual outcomes. What Gibson failed to realise was that strategic use of different combinations of visual systems is a fundamental aspect of everyday visual perception.

Context dependent use of visual systems

When we analyse the essential nature of these different visual systems, we find that each of them has evolved in such a way that it can operate independently upon different aspects of input. Normally many visual systems (and systems taking input from the other senses) operate simultaneously either giving support to the conclusions of the others or, on occasion, contradicting them. The advantage of this multiplicity is that, if one visual system is rendered inoperative by lack of suitable input, there is likely to be another available to take over.³

This being the case, it is not surprising to find that experiences influenced by contradicting visual cues have a part to play in visual perception. The same is true of the potentially supportive or contradictory nature of information coming from visual and/or non-visual cues. An example would be the potential support or conflict produced the different auditory cues given by the words and music of a song. The two can mutually support giving extra nuance or intensity to the meaning of the words and the associated feelings. However, they can also conflict. The words may be repellant and, accordingly, interfere with the music. More interestingly in the present context, even the most attractive words interfere, as is shown by the fact that it is easier to concentrate on the sound as itself if the song is sung in a unknown foreign language.

A parallel comparison would be between figurative and abstract painting. Many artists eradicate images from their paintings because they interfere with the experiences provided by abstract arrangements of colour, line and texture. But even without images, arrangements of colour painted onto a rectangular flat

2 *Chapters 9 and 11*

3 For example, as systems that operate on the basis of information generated by movement through the environment are rendered inoperative by standing still.

surface provoke ambiguous responses. As already indicated, some visual systems can only interpret them as rectangular objects with flat surfaces. Others, can generate a sense of an independently illuminated illusory pictorial space. As a consequence, ambiguity is an essential characteristic of easel painting.

Ambiguity in painting

The visual dynamics of this ambiguity were a matter of primary interest to the early *Modernist Painters*. They actually perceived it as giving them a moral advantage over photographers, whom they saw as *deceiving the eye* by eliminating real-surface cues. Their contention was that, deprived of these, viewers would be in danger of erroneously perceiving the illusory space in their photographs as being real.⁴ It is no coincidence that it was at about this same time that progressive artists revised their attitude to the phrase “*trompe d’oeil*”. Rather than being a fulsome compliment when applied to a painting, it became a damning put-down.

However, despite taking their moral stand against deception, the *Modernist Painters* did not seek to get rid of it altogether. For the time being at least, they preferred a compromise position, persuading themselves that deceiving the eye was acceptable as long as *the fact of the deception was made clear*. This rationalisation was a main justification for abandoning the smooth, featureless and, as far as possible, invisible picture-surfaces favoured by the academic tradition and, instead, exploring ways of emphasising their physicality.

It would be a gross oversimplification to suggest that this was the only reason for the widespread appearance in the last decades of the nineteenth century of separately visible brush marks and impasto surfaces, for these developments also suited other agendas.⁵ However, it was certainly a major one, and the inevitable outcome was an accentuation of *ambiguity*, with *real-picture-surface* cues and *illusory-pictorial-space* cues vying with one another for ascendancy.

Artists were not slow to realise that this vying for ascendancy had both dynamic and disruptive potential and they were soon looking for ways of using ambiguity to advantage. In the process, they were embarking on what was to be one of the major themes of *Modernism in painting*.

4 I presume that their moral stance had something to do with the biblical ban on the worship of graven images and the related Christian rule that images of figures of Christ, the Virgin Mary and other significant biblical figures should never be made to be sufficiently realistic that they would be mistaken for the real thing.

5 For example, separate brush marks were widely valued for their expressive potential.

Repetition of colour on the picture surface

Whether or not artists want to explore the dynamics of *ambiguity*, they will be well advised to take into account conflicts that arise between the interpretations of visual input suggested by the different visual system. Whether they are created intentionally or by oversight such ambiguities will exist and their existence will, to some extent and in some respect, effect the way that drawings and paintings are experienced.

Nor is it necessarily easy to identify the existence of ambiguity. Artists may be aware of its consequences without realising their cause. For example, not a single student arriving on one of my courses has been aware of the rules proposed by Professor Bohusz-Szyszko that require that all regions of colour should be mixtures containing some proportion of complementary and that none of them should be the same as any other colour on the picture surface.

The explanation why the rules work is that where there are two (or more) regions of identical pigmentation⁶ situated on a flat picture-surface, all the visual systems will compute them as lying on that surface rather than on the surfaces of depicted objects. However, wherever regions of colours are different from all the other regions of colours on the picture surface and created from mixtures containing complementaries, the situation is different. All but one of the visual systems will read them as before, that is to say as being on the same surface. However, the one exception frees them to take their place on the surfaces of depicted objects in illusory pictorial space and thereby provides the eye/brain with an alternative and incompatible interpretation. The repeated colours will be perceived as staying on the picture-surface⁷ while the remainder will take their place in an illusory pictorial space.⁸ The result will be visual tension. The disruptive effect can be considerable because different visual systems are providing the eye/brain with a vicious circle of contradictory cues that it can never resolve.

Examples of the repetition of colours in paintings and drawings that work against the artists' evident intentions are widespread and by no means only in the productions of amateurs. Particularly prevalent are repetitions in shaded pencil or charcoal drawings.⁹ This is partly due to the limited tonal range of the medium,

6 Including repeating whites, blacks and greys found in monochromatic drawings.

7 Or, if they are blacks, they may be perceived as holes in it. See Chapter 14.

8 See *Chapter 14*.

9 See *Chapter 14* for why a rule based on colour applies to achromatic shaded drawings. The explanation depends on an in-depth characterization of the principles upon which the of the visual systems concerned function.

which means that avoiding repetition can be extremely difficult, and partly due to the common practice of leaving regions of white untouched. The consequent repetitions will always work against the sense of pictorial-depth (whether in terms of the volume of objects or the sense of receding in space) and can be the source of unending frustration for those who do not attribute their dissatisfaction to them.

Even if the artists concerned are not aware of the existence of a problem, they are likely to be pleurably surprised if the repeated colours are modified so that there are no longer any repetitions. I have demonstrated this to students of all levels of attainment over 25 years and I cannot remember a single one that has not been astonished and delighted at the transformation with respect both to the illusion of pictorial space and to the sense of harmony. They are also amazed by the subtlety of the changes that can bring about this outcome. Indeed both the theory proposed in later chapters and demonstrations to students indicate that they can actually be below the ‘sensitivity-threshold’ of the analytic looking system. In other words they can be imperceptible.

The point being emphasised here is that all repeated colours (including whites, blacks and greys), whether in drawings or paintings, when in the context of cues suggesting illusory space, will provoke the same ambiguity with the same potentially either disruptive or stimulating effect. Likewise converting them to nonrecurring regions or modulations will always have the effect of liberating the pictorial content, whether figurative or abstract, from the picture surface, allowing it to take its place in illusory pictorial space.¹⁰

Traditional ways of depicting illusory space

Although the absence of repetition and the presence of complementaries frees colours to go into their place in illusory pictorial space, it does not influence where they will be situated within it. This is determined by other factors, ones that have been well known to artists over the centuries. Below is a list of them. It will be noted that the first four on the list do not concern colour at all. All except the last of them would be described by psychologist of perception as “*cognitive cues*”.

1. *Linear perspective.*
2. *Overlap cues* (that is to say anything which is in front of something overlaps it, such that it obscures anything that is behind).
3. *Surface-form from shading* (for example, shading used in drawings of

¹⁰ Exceptions are very small and very large paintings.

- the human figure which encourages the perception of them as having volume).
4. *Other cognitive cues* (for example, the knowledge that a human figure and, indeed, virtually all objects have volume) .
 5. *Aerial Perspective* (based on the observation that landscapes appear as becoming bluer, greyer and less contrasted with increases of viewing distance distances).
 6. *The idea that blue recedes relative to red, which is perceived as coming forward.*

All of these, except the last, can be relied upon to encourage the perception of depth in paintings. However belief in both of the two colour-based ones has led artists into all sorts of difficulties.

The problem with aerial perspective is not that the science upon which it is based is wrong. Rather, that the atmospheric intervention which forms its basis is only one of many factors which determine the relativities between colours in landscapes. In a large proportion of instances, contrary factors are more powerful. For example, relatively distant white surfaces illuminated by direct sunlight are regularly brighter than relatively near surfaces of a similar white pigmentation when under cloud cover.

An analogous difficulty applies to the idea that *red* tends to be perceived as coming forward and *blue* as going backwards. True it is based on the results of scientific experiment and has an unimpeachable explanation in terms of the different degree of chromatic aberration caused by the different wavelengths of light and their effect on the perceived fuzziness of edges. However the experiments that showed this were done under highly artificial laboratory conditions and it is clear that the formula red nearer and blue further away is not very reliable in the context of either the real world or paintings. The reason is that interpretations relying on these colour based cues can easily to be overwhelmed by alternatives suggested by combinations of the cues just listed.

Implications for Part 1

Knowledge of the constancies, induced-colour phenomena and Professor Bohusz-Szyszko's synthesis, as explained and extended by the findings of our research at the University of Stirling, can help with an extraordinarily high proportion of artist's projects and problems. In my own experience, the resulting

PART 1 - SETTING THE SCENE

cocktail of knowledge has, not only helped me in relation to my own paintings but has also has proved a far-reaching and invaluable teaching aid. Finally and even more relevant to the contents of this book, it was my frustration at not being able to resolve a paradox I found in the Professor's rules that was to kick-start to the scientific investigations which were to lead to the model of perceptual and cognitive processes which provides its climax.

Part 1 is now complete and it is now time to describe my adventure into experimental research.