CHAPTER 27

Shading and surface form

Introductory

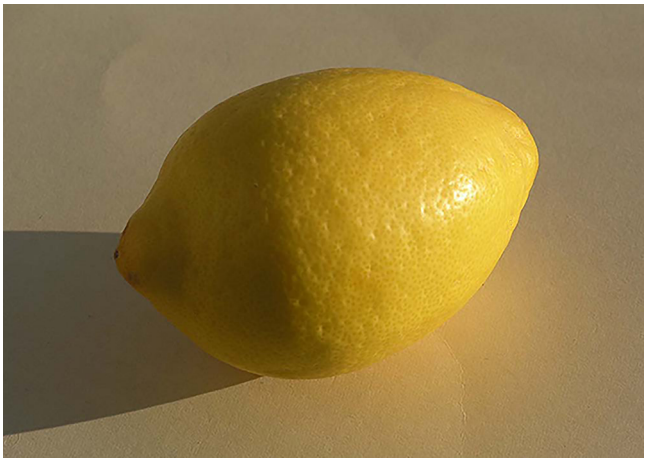

Figure 1 : A lemon, illuminated by sunlight from the right casting a shadow on the surface below

*Figure 1 shows lemon, illuminated by sunlight from the right, casting a shadow to the left on the surface that is supporting the lemon. On the surface of the lemon to the right can be seen a small highlight in a brightly illuminated region of yellow that takes up nearly two third of its surface. To the far left is a region in dark shadow and, in between, a region of graduated transition. To distinguish between the shadow cast on the flat surface and the shaded region of the lemon, it is useful to describe them as "**cast shadows**" and "**object shadows**". What both types of these have in common is that they are illuminated by secondary light sources that both render them graduated and provide information to the eye/brain about **surface solidity, surface-form**, **in front/behind relations*** and ***texture***.

In the last chapter and in the "Introduction to the Science" at the beginning of this book, it was explained how the eye/brain classifies the sudden dips in the intensity of reflected-light at the borders of cast shadows, as the borders of regions of a body-colour that it classifies as being a body-colour in the direction of black. Interestingly, it does the same with the gradations in intensity of reflected-light that occur across surfaces. The reason why is that the smallest sizes of receptive field found in the retina compute smooth gradations in the reflected light profile, as small steps. Although much smaller than the steps at the edges of cast shadows, these mini-jumps are also perceived as subtle changes in body-colour in the direction of a black.

As with cast shadows, the underlying body-colour of the graduated surface remains constant. This perceptual independence of the underlying body-colour explains why the Renaissance Colourists and their successors, working before the arrival of the Seurat and the Modernist Painters, conceived shading in terms of achromatic gradations of black or grey and painted them accordingly. It could never have occurred to them to add in complementary hues because they had no access to the as yet unformulated theory that underpinned the ideas of Seurat and his successors.

Shading and cast shadows

Figures 2,3,4, 5 and *6* provide examples of studies made by celebrated artists that illustrate how shading has been used over the centuries to indicate *surface-form*. From the eye/brain's point of view the defining difference between *cast-shadows* and *shading* is that the former fall on surfaces that are outside the bounds of the shadow-casting object while the latter are contained within it.

In the Leonardo drawing, there are cast shadows under the nose and under the chin and shading almost everywhere else. Intermediate between the two are the form-giving object-shadows under the eyes, between the lips and under the bottom lip.

In the Gustave Moreau drawing, a large part of the face is darkened by the cast shadows of the headdress and high collar, while the graduating object-shadows are evident in the treatment of the cheeks, the nose and the mouth. In all five works the wide range of lightnesses are critical for achieving the sense of pictorial depth, and all the artists have found ways of using texture not only to create subtlety but also to imbue their productions with individuality, character and feeling.

Figure 2 - Drawing by Leonardo da Vinci

Figure 3 - Drawing by Rembrandt

Figure 4 - Drawing by Gustave Moreau

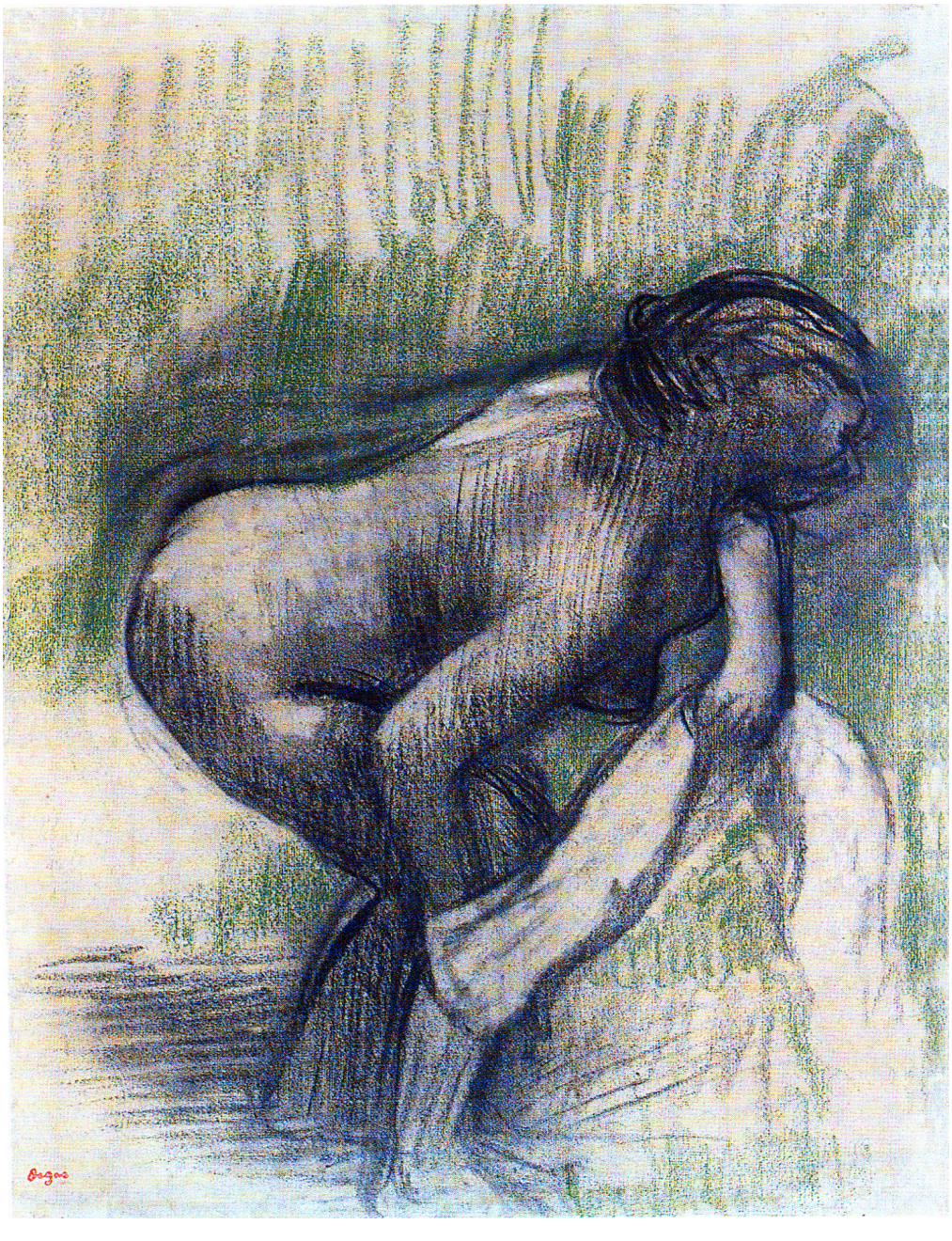

Figure 5 - Drawing by Degas

Figure 6 : Drawing by Bonnard

The importance of texture as a variable

The importance of ***texture*** as a variable can hardly be exaggerated. To illustrate why, take a soft pencil (or any other drawing tool) and test out how many steps it is possible to make between the darkest and the lightest mark that you can produce. I think that you will find yourself hard pressed to achieve more than 10. This number is tiny compared to the number required to match natural variations in lightness to which the eyes are sensitive.[1] It is also very small compared with the number of lightness variations that can be achieved with the aid of texture.[2]

The reason why texture can provide so many extra levels of lightness is explained in the *Introduction to the Science*.[3] At the core of the argument is the fact that the eye/brain does not take information from points but from regions and that it does so by exploiting the classification potential of the mosaics of different sizes of overlapping receptive-fields in the retina and by using ***lateral inhibition*** to average lightness variations within them.

The reason why variations in texture enable artists to achieve the subtlest gradations is that the different receptive-field sizes can, and often do, provide different averages for the same region.

One way of illustrating this is by reference to the *Pointillist* method developed by Seurat and others in the 1880s. As pointed out in earlier,[4] it is virtually impossible for an artist working manually to fill two regions of the same size with mosaics of dots such that, when optically mixed, average out as being of the same lightness. No matter how carefully the work is done, it is impossible to regularise sufficiently any of the three variables of ***dot-size***, ***inter-dot spacing*** and ***dot-density***. Even the smallest amount of variation within any of these three independently varying variables will ensure an artists failure to realise the goal of two regions of identical lightness. It hardly needs mentioning that the difficulty would be compounded if the independently varying dimensions of hue was to be added, particularly if the juxtaposed dots were to be of colours, such as the complementary used by Seurat, that vary with differentially viewing conditions.[5]

1 Said to be several hundreds of steps.

2 An unknown number but certainly well in access of 100.

3 And in greater detail in "*What Scientists can Learn from Artists*", particularly *Chapters 14* and *17*.

4 *Chapter Eight, PART 1: Painting with Light*

5 It is worth noticing that a close look at dots and their distribution in Seurat's *Pointillist* paintings will reveal an unevenness of paint application in relation to all four variables. This explains why, whether it was his intention or not, it is impossible to find lightness or for that matter colour

In short, it is well neigh impossible to repeat the average lightness of regions of texture in paintings on purpose and not so easy to do it by mistake, which must be good news for artists wishing to avoid repetitions in their drawings. As a result, the subtlety that can be achieved is astonishing as can be seen, despite the limitations of photographic reproductions, in all the works illustrated in this chapter, most notably in the charcoal drawing by Sarah Elliott (*Figure 6)*.

Luckily for artists, there are a huge variety of ways of creating texture. A tiny sample of these can be found in *Figures 1, 2, 3, 4, 5 and 6*. Just compare the Leonardo (Figure 1) with either the Degas (figure 4) or the Bonnard (Figure 5). Likewise compare the Rembrandt (Figure 2) with the Gustave Moreau (Figure 3). Leonardo proceeds carefully, using texture in an almost pointillist manner. Moreau also uses a highly controlled approach exploiting cross-hatching as a way of producing variety. In contrast Rembrandt, Degas and Bonnard use a much greater variety of mark-making: Rembrandt in his rush to sketch in the main relationships, Degas, as always in his studies, giving priority to knowledge-acquisition over other considerations, Bonnard in his ever sensitive search for giving a different feeling-character to each of the regions and Elliott showing amazing control over whole-field lightness relationships.

Illusory pictorial space

The drawings by Leonardo (*Figure 1)*, Degas (*Figure 4*), Bonnard (*Figure 5)* and Elliott (*Figure 6*) all give a priority to perceptions of illusory pictorial space. The Leonardo, the Degas and the Elliott use shading as a principle method of achieving it. Bonnard relies importantly on the use of linear perspective in the depiction of the railings. All four also use a wide range of whole-field lightness relations buttressed by subtle uses of texture and overlap cues, as do Rembrandt (*Figure 2*) and Moreau (*Figure 3*).

We will return to the subject of texture-supported variety in the next chapter. Meanwhile notice how the different drawings evoke different pictorial depths. The Rembrandt minimizes it, as would the Bonnard without the railings. Leonardo, Degas and Moreau use heavy shading to emphasise the three dimensional nature of the subject matter but minimize it in the remaining parts of the picture-surface. The difference is in the range of lightness and the use of texture in the backgrounds. No doubt partly because the drawing by Elliott's is a finished work (the works by the other five artists being studies) it provides the most complete

repetitions in Seurat's paintings.

example of how control over whole-field lightness relations can give a coherent sense of light filled depth to illusory pictorial space.

Figure 7 : Drawing by Sarah Elliott

Feeling

Matisse famously said that for him "*expression*" resides in the arrangement of the entirety of the elements on the picture-surface. Our six illustrations coming from the work of six different artists provide us with examples of a range of ways of responding to subject matter. If we compare them, we find that each reflects different interests and feelings and thereby gives support to Matisse's claim. Could any one of these artists have produced a work similar to that of any of the others? Luckily the answer is, "*No*". Each uses ***mark making*** and ***texture*** as a means of giving expression to a different range of feelings.

Implications for PART 9

From what has been written above and in the previous two chapters, it is

clear that the consequences of lightness-contrast and other induced-colour phenomena, leave artists in a quandary. They are faced with the having to decide between attempting to:

1. *Paint what they "see".*
2. *Paint what they "know".*
3. *Paint the relativities they can seek out by means of comparative looking.*
4. *Make compromises between the above three alternatives.*

If they take the first option and subject themselves to the push-pull of experienced reality, the lightness-range and balance in their painting will be distorted. If they take the second, they will be confronted with their own unavoidable ignorance in the face of the uniqueness of appearances. If they take the third, they will be up against the shifting sands of appearance. If they take the fourth, they will be faced by the necessity of making arbitrary decisions. It is no wonder that Cézanne, even when an established "master" in his 60s, described painting as, "So damned difficult". He might equally well have called it "so damn fascinating" as he made clear when he associated his cry from the heart, with which many artists may empathise, with a declaration of his lifetime of commitment to his chosen means of expression. Even though almost unbearably frustrated with his inability to achieve his goals, with his next breath he added, "I want to die painting".However, whatever choices and whatever the difficulties, one thing is certain. Whether we are aware of it or not, the lightness range within a painting is, and will always be, one of the most important factors in determining how we experience paintings. Upon it hangs so many issues of relevance to all artists, no matter what medium they use, whether they are seeking veridicality, like Leonardo da Vinci, equal lightness colour effects of the kind that Michael Kidner wanted his students to explore or, indeed, any one of the many compromise positions in between. It is to these we turn in the next chapter.