The Psychology of Perspective and Renaissance Art

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Chapter 10

The psychology of egocenters

> . . . The fact that things overlap or are hidden not enter into their definition, and expresses only my incomprehensible solidarity with one of them — my body.
>
> Maurice Merleau-Ponty, from "Eye and mind" (1964, p. 173)

I have mentioned several times the idea that, when we perceive a picture drawn in perspective from a vantage point other than the center of projection, our perceptual system infers the location of the center of projection and we feel that we are looking at the depicted scene from the vantage point implied by the center of projection. To explain the meaning of such a suggestion, I must first introduce the concept of *egocenter*. I will then discuss the question of a movable egocenter.

The notion of a spatially localized, visual egocenter that does not coincide with either eye is due to W. C. Wells (1792, cited by Ono, 1981), who was the first to devise a way of locating what came later to be called the "cyclopean eye." One simple method is this: Hold your head still while a friend stands a few feet away and points a stick at you. Have the friend change the position of the stick until you feel it pointing at you perfectly. Record the exact orientation of the stick. Now without moving your head ask your friend to stand somewhere else in the room, to the right or left of where he or she stood before, and adjust the orientation of the stick until it is pointing at you. If you do this several times, and you prolong the lines defined by the various positions of the stick when it is pointed at you, you will find that they all intersect approximately at one point inside your head just behind the midpoint of the line connecting your two eyes. This is the position of what is sometimes called the *sighting egocenter* (Howard, 1982, pp. 283–91).

In his philosophical essay "Where am I?", which may be the most amusing science-fiction story ever written, Daniel Dennett (1980) proposes a thought experiment: Imagine a surgical procedure that extirpates your brain from your head and connects radio transmitters to the stumps of the nerve cells that carry information from the brain to the rest of the body and radio receivers tuned to the same frequency on the complementary segments of these nerve cells in the body; similarly, this procedure connects radio transmitters to the stumps of the nerve cells that carry information from the body to the brain and appropriately tuned receivers of the sensory nerve cells in the brain. This is no more than, as one of the characters in Dennett's story puts it, "stretching the nerves."[1] After the operation, as soon as he is strong enough to be taken to see his brain, the hero of the story asks himself why he feels that he is outside the vat looking at his brain, rather than inside his brain being looked at by his eyes. After all, he argues, mental events arc instantiated in the brain, so why does he not feel that he is where his mental events

[1] There is, to be sure, considerably more involved in performing such a technological feat, such as ensuring that the blood that flows through the extirpated brain has exactly the same composition as the blood coursing through the brainless body, because could never get drunk, suffer from premenstrual tension, or become sexually aroused.

are instantiated? Although we should not take the "results" of Dennett's thought experiment, however plausible, too seriously, it is tempting to infer from them that the reason we feel that we are inside our heads or our bodies is not because all the important bodily or mental processes occur inside our body's skin; the experiment suggests that the spatial location of the machinery that makes mental events possible is irrelevant to our feeling of location. But if the location of the brain does not determine where we feel ourselves to be, what does? Perhaps it is the physical

boundaries of our body that determine v, here w r feel ;v c are. Perhaps we feel that we arc inside ourselves because our skin is where the outside ends. This simple answer can only be part of the truth. For where does our body end and the world begin? If you are walking in the dark feeling your way about with a cane, you are unaware of the pressure of the cane on the palm of your hand; all your attention is focused on the nature of the obstacles revealed by the of the cane. Under these circumstances, if you had to classify the cane as part of the world or part of your body, you would most likely say that it was part of your body. This is true of all tools. It is also true of vehicles. Most of the time when you drive an automobile, you are not aware of your points of contact with the inside of the automobile; it is as if you had grown a shell around you that you now inhabit and that your points of contact with the environment now coincide with the body of the automobile. Thus it is the external boundaries of your auto body and not the spaciousness of the car's interior that determine your feeling of how big a car you are in. In short, the boundary between the world and ourselves is extremely flexible.

Just how flexible this boundary is becomes clear when we consider the readiness with which we adopt virtual viewpoints in a movie theater. When the camera pans (see Figure 10.1), we feel ourselves turning to scan the environment; when the camera tilts, we feel ourselves tilting our heads to look upward or downward; when the camera engages in a tracking or traveling shot (e.g., when the camera is set on wheels or tracks), we feel ourselves traveling forward or backward with the camera. And yet we know all along that we are sitting in a movie theater.

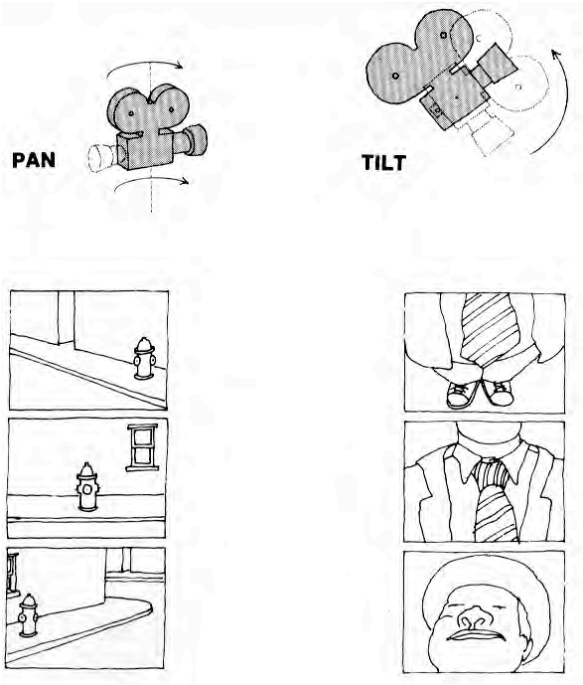

Figure 10.1: Definitions of two elementary camera movements: pan and tilt

In fact, as Michael Roemer clearly shows, the use of virtual points of view can make the difference between an effective but relatively shallow image and one that endures:

> Audiences can be "played" by a skillful movie-maker with a fair amount of predictability, so that even discriminating audiences are easily taken in. At the beginning of Bergman's *Wild Strawberries* Professor Berg dreams that he is on a deserted street with all its doors and windows shuttered tight. He looks up at a clock that has no hands and pulls out his own watch only to find that its hands are missing also. A man appears on the corner with his head averted; when he turns, he has no face and his body dissolves into a pool on the sidewalk. A glass hearse comes down the street

and spills a coffin that opens. Berg approaches and discovers his own body in the coffin. The corpse comes to life and tries to pull him in.

The nightmare quality in this sequence is derivative. The deserted, shuttered street, the clock and watch without hands, the glass hearse, the faceless man are all conventions familiar to surrealist painting and literature. Bergman uses them skillfully and with conviction to produce an effect in the audience, but they are not true film images, derived from life and rendered in concrete, physical terms.

There is a similar nightmare in Dreyer's *Vampire*. A young man dreams that he has entered a room with an open coffin in it. He approaches and discovers that he himself is the corpse. The camera now assumes the point-of-view of the dead man: we look up at the ceiling. Voices approach and two carpenters appear in our field of vision. They close the coffin with a lid but we continue to look out through a small glass window. Talking indistinctly, they nail down the lid and plane the edges of the wood. The shavings fall onto the window. One of them has put a candle down on the glass and wax drips onto it. Then the coffin is lifted up and we pass close under the ceiling, through the doorway, beneath the sunlit roofs and the church steeple of o small town — out into the open sky.

Here the detail is concrete: an experience is rendered, not cited; she situation is objective and out of it emerges, very powerfully, the feeling that Dreyer is after: a farewell to life, a last confined look at the earth before the coffin is lowered into the grave. (1966, pp. 259–60)

According to David N. Lee (Lee and Aronson, 1974; Lee and Lishman, 1975), the optic array (such as what we are in a movie theater) contains two sorts of information: information about the layout of objects in the environment, which is called *exteroceptive*[2] information, and information about the location of our body and its parts in the environment, which is called *exproprioceptive*[3] information. Although the exproprioceptive information we receive is usually consistent, in a movie theater we receive contradictory exproprioceptive information from two sources: Our eyes tell us that we are moving with the camera while the pressure receptors in our skin tell us that we are sitting quietly in our seats. Whether we undergo both experiences at once or whether they alternate we do not know. It seems that in a movie theater our experiences are mostly due to the visual input; the visual source that tells us we are moving overrides the source that tells us we are sitting.

A similar type of visual dominance can be observed in the preservation of equilibrium, which is served by the semicircular canals in our inner ears, the sensors of pressure in our feet, and the visual sense. Without disturbing the semicircular canals or moving the feet, it is possible to cause a standing person to sway and on occasion to fall in an effort to compensate for the movement of the walls of a "swinging room" such as depicted in Figure 10.2.

Have someone trace a *b* or a *d* on your forehead and try to identify which of the two letters was traced. You will most likely feel somewhat uncomfortable carrying out this task, because you weren't told whose point of view to adopt: the writer's or your own. Now have the person trace one of these letters on the back of your head. You will probably not hesitate and report the letter as seen from behind your head. Now why is there some question regarding the correct point of view to adopt when a letter is traced on your forehead and no question regarding which point of view to adopt when the letter is traced on the back of your head? After all, if you are "reading" the letter from within your head, the same ambiguity should arise when the letter is written on the back of your head: to read from within looking backward or to read from outside looking forward. There is one way of making sense of this dilemma: Suppose we do not mind moving our vantage point in or out of our heads, but we try to avoid two things: turning

[2]From the Latin *exterus* = exterior + *receptor* = receiver.

[3]From Latin *ex* = out + *proprius* = one's own + *receptor* = receiver.

Figure 10.2: The moving room of Lee and Aronson (1974). It had three vertical sides and a ceiling, made of polystyrene foam stretched over a steel frame, but no floor. It was suspended so that it could swing noiselessly along an almost perfect horizontal path.

our vantage point backward and "reading" through the skull. In the case of writing on the forehead, we cannot avoid doing one of the things we wish to avoid; in the case of writing on the back of the head, we can simply move our vantage point behind the head and "read" the letter from there.

To find out why we resist turning our vantage point backward compared to our avoidance of reading through the skull, we must refine our technique somewhat. Instead of simply asking people to report which letter was traced on the head, we can assign a vantage point to them and tell them to adopt one of four vantage points.

Rear vantage point. Wherever a letter is traced on the head, it should be interpreted from a vantage point behind the head looking forward. If the letter is traced on the forehead, it should be read as if the head were transparent and the letter was written in opaque ink.

Front vantage point. Wherever a letter is traced on the head, it should be interpreted from a vantage point in front of the head looking backward. Letters traced on the back of the head should be read as if the head were transparent.

Internal vantage point. Wherever a letter is traced on the head, it should be interpreted from a vantage point inside the head looking radially outward through the transparent skull. Thus the vantage point faces forward to read a letter traced on the forehead and backward to read a letter traced on the back of the head.

External vantage point. Wherever a letter is traced on the head, it should be interpreted from a vantage point outside the head looking radially inward at the skull. Thus the vantage point faces forward to read a letter traced on the back of the head and backward to read a letter traced on the forehead.

Now suppose we measured the amount of time it took to read letters traced on the forehead and on the back of the head for each of the four vantage points. We could then find out whether the correct interpretation of the traced letter is slowed down more by having to read through the skull or by having to turn one's vantage point (see Figure 10.3). To clarify this figure, let us discuss the predictions for the rear and front vantage points under the two hypotheses. If of the two obstacles to reading, turning the vantage point is a greater hindrance than reading through the skull, then the letters should be read rapidly regardless of whether they are traced on the forehead or the back of the head; if, on the other hand, reading through the skull is the greater obstacle, then letters traced on the back of the head should be read more quickly than letters traced on the forehead. Considering now the front vantage point, if facing backward is a greater hindrance than reading through the skull, then the letters should be read slowly wherever they are traced; if, on the other hand, reading through the skull is the difficulty, then letters traced on the forehead should be read more quickly than those traced

on the back of the head. Similarly, this reasoning applies to the remaining two vantage points.

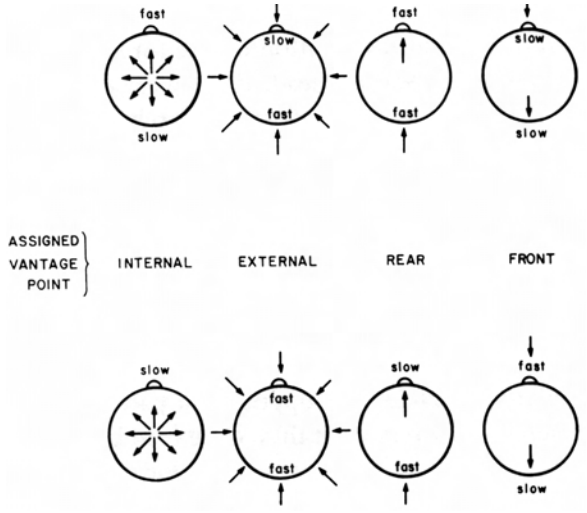

Figure 10.3: Predictions for speed of "reading" letters traced on the head for four assigned vantage points. Top panel: under assumption that reading is mostly hindered by turning vantage point backward. Bottom panel: under assumption that reading is mostly hindered by having to read through skull.

In an experiment begun with Janice Marcus (a graduate student at Yale) and concluded with David Turock and Thomas Best (graduate students at Rutgers) (Kubovy et al., unpub.), instead of having letters traced on just one position on the forehead and one position on the back of the head, there were eight positions, three of which we consider to be on the back of the head. The results were unequivocal in their support of our first hypothesis, namely, that it is harder for us to turn our vantage point than to read through the skull.

If turning the vantage point is difficult and reading through the skull is easy, then there is a hypothesis that can account for all our data, which we called the *disembodied-eye hypothesis*. Suppose that patterns traced on the skin are interpreted as if they were read by a disembodied eye that has a preferred position behind the head looking forward. It would take us too far afield to discuss the pros and cons of this hypothesis; suffice is to say, that although it has some drawbacks, this hypothesis served us well as an aid to thinking about the perception of patterns traced on the skin and has not been successfully challenged by any alternative. The main attraction of the hypothesis in the contest of the present analysis of perspective is that it gives some content to the idea of projecting one's egocenter to locations in space outside one's body. Furthermore, the fact that subjects in our experiments are able to adopt a variety of vantage points when instructed to do so suggests that the egocenter (or disembodied eye) is flexible and need not to remain in one position. We are still far from a true understanding of this fascinating problem of vantage points in art and in perception in general, but, given the sorts of evidence we now have, the notion of a movable egocenter cannot be treated any more as frivolous fancy.

We have reached the point where the fifth purpose of perspective, mentioned in the introduction, can be summarized. I claim that, for viewers familiar with perspective, powerful effects can be achieved by creating discrepancies between the natural direction of the viewer's line of sight and the line of sight implicit in the perspective of the painting (as was the case with Mantegna's *Saint James Led to Execution*, Figure 9.7), or by locating the center of projection high above the viewer's eye level (as in Leonardo's *Last Supper*, Figure 9.9). These effects achieve the goal of divorcing the viewer's felt point of view in relation to the scene represented in the painting from the viewer's felt position in relation to the room in which he or she is standing. We cannot do more, in our present state of knowledge, than to speculate on the effect of such discrepancies, which I believe induce a feeling of spirituality, perhaps one conducive to a religious experience: a separation of the mind's eye from the bodily eye. Such effects were very much in accord with the aims of the Renaissance painters, who wished to convey a religious experience through their art. For, as Paul Oskar Kristeller points out in his discussion of paganism and Christianity in Renaissance thought,

> if an age where the nonreligious concerns that had been growing for centuries attained

> a kind of equilibrium with religious and theological thought, or even began to surpass it in vitality and appeal, must be called pagan, the Renaissance was pagan, at least in certain places and phases. Yet since the religious convictions of Christianity were either retained or transformed, but never really challenged, it seems more appropriate to call the Renaissance a fundamentally Christian age. (1961, p. 73)

Furthermore, the divorce of the mind's eye from the bodily very much in the spirit of Renaissance Platonism. Plato's thought and Neoplatonism, which had been eclipsed during medieval times, were revived by Marsilio Ficino (see 1). Kristeller writes as follows about Ficino's theory of contemplation:

> In the face of ordinary daily experiences, the mind finds itself in a state of continuous unrest and dissatisfaction, but it is capable of turning away from the body and the external world and of concentrating upon its own inner substance. (1967, p. 198)

Now I do not mean to equate Ficino's concept of contemplation with the use of perspective to separate the mind's eye from the bodily eye. Nevertheless, I do wish to suggest that such a use of perspective is in keeping with the spiritual concerns of intellectuals in the late fifteenth and early sixteenth centuries.

The lack of contemporary analyses of this issue is per- haps puzzling at first blush. However, when we recall how little was written about perspective in general during the fifteenth and early sixteenth centuries, one's surprise wanes somewhat. Furthermore, when we look back at the ground we have covered up to this point in this book, it becomes apparent that our understanding of optics, geometry, and perception is far more advanced than it was half a millennium ago. It is not surprising, therefore, that Renaissance artists had to proceed more by intuition and rule of thumb than by analysis and deduction; whatever discoveries they made were most likely in the form of tacit knowledge, which is notoriously difficult to understand and analyze. Furthermore, this is not the only time in the history of art that subtle and complex procedures were developed to achieve perceptual and spiritual effects, for which little or no documentary evidence remains, the Parthenon (see Figure 10.4) being a prime example. Just as the Renaissance artists deviated from the geometric dictates of perspective, the Parthenon deviates from mathematical regularity in several ways. One of these is illustrated in Figure 10.5. To this very day, several theories concerning the purpose of these so-called refinements compete for the favor of scholars (Carpenter, 1970; Pollitt, 1972).

Figure 10.4: The Parthenon, from northwest (447–432 BCE)

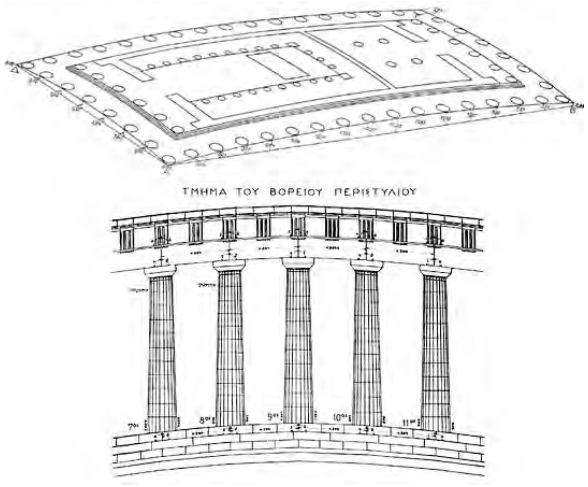

Figure 10.5: Diagram in exaggerated proportion of horizontal curvature of Parthenon