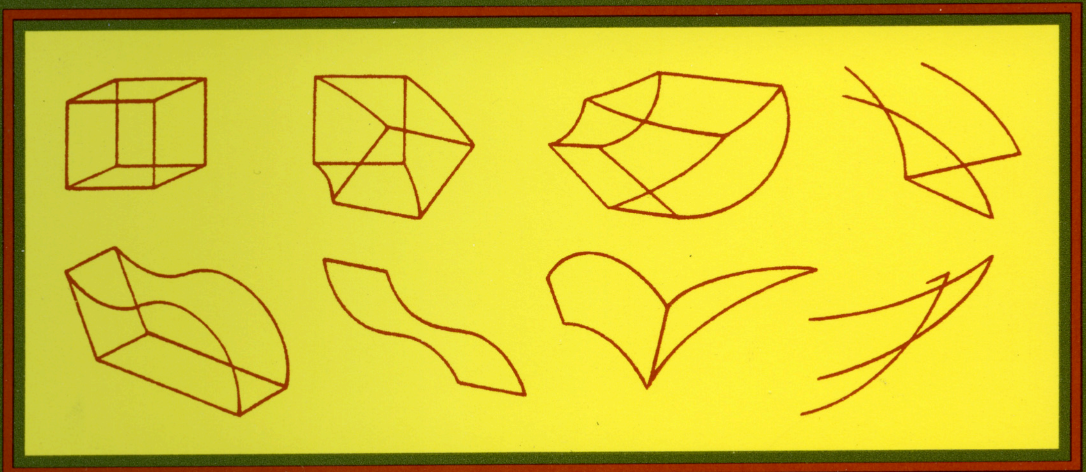
Spatial Ambiguity:

The Element of "Magic" in 3-Dimensional Drawing



Identifying the Primary Source of Illusion and Beauty in the Visual Arts

George Gillson

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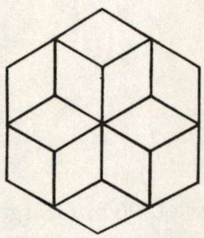

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G.G.

This book is dedicated to
my wife and son

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Introduction

Success in painting and drawing depends, more than anything else, upon the artist's ability to create a powerful effect of 3-dimensional illusion. In a gallery, the pictures that seem to us most convincingly real—where the seated figure or a bowl of apples appears believably round and solid, or the landscape of trees, hills and sky is set in a clear and open depth of space—images, in other words, that seem to be right there before our eyes—these will inevitably have the greatest visual, aesthetic and emotional impact upon us. This is because the artist has succeeded in capturing the most fundamental truth about the way things look—namely, that they are compellingly 3-dimensional.

But achieving this effect can be difficult. Adding on or scratching off tiny bits of paint, erasing and redrawing pencil or charcoal lines, artists work at shaping each line in their picture to a fine tolerance that will enable it to click into place as part of a developing 3-dimensional context. This is precision work—"micrometric" drawing, if you will—in that a hairsbreadth of change, a line coaxed *a hundredth of an inch* one way or the other, can make the difference between a contour that "works"—that is, appears convincingly 3-dimensional—or fails to work.

But what makes one line work while another does not? What does 3-dimensional illusion depend on? And what happens in our eye and mind that makes us think we see it? And—the question the artist must answer—how does one go about creating it?

The reader will learn that artists need not rely solely on guesswork and intuition. Though many aspects of art are certainly mysterious, one can nevertheless demonstrate a surprising number of hard facts about 3-dimensional illusion. By following up on a single, remarkably penetrating insight, the chapters that follow provide answers to all of the questions posed above. They do this by focusing our attention on the perceptual phenomenon of *spatial ambiguity* and revealing it to be *the primary source of 3-dimensional illusion in painting and drawing*.

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Specifically, the term spatial ambiguity means that an artist can set down lines and planes on a canvas or drawing page in such a manner that the resulting configuration *can be seen in two different ways*. This condition of ambiguity raises a challenge to our perception since, in order to "see"—that is, understand—the image, we must choose one of the readings over the other. But since either is valid, the choice is not an easy one, and as we mentally debate the alternatives, a state of *tension* arises within us. And it is precisely this tension which, somewhat miraculously, causes us to perceive the humble, 2-dimensional materials of art—paint on canvas, pencil or charcoal on paper—as an illusion of 3-dimensional forms and space. Put another way, spatial ambiguity structured into an image works the "magic" that brings the picture illusion to life.

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From the rationale of spatial ambiguity, artists derive a special group of basic structures—namely parallels, specific kinds of angles, and curves. These "molecular structures" of drawing (as discussed in close-up detail in Chapters 2, 3 and 5, respectively) comprise the vital alphabet of drawing. Composed for the most part of just one, two or three lines, their construction is spatially ambiguous and therefore, when used in pictures, give dependably 3-dimensional results. These elementary "letters" can then be combined to create more complex structures that will also register as solidly 3-dimensional. In this way, they give concrete and specific meaning to the traditional notion of a "language of form" as it applies to the visual arts.

As the primary source of 3-dimensional illusion, spatial ambiguity plays a profound role in every aspect of illusionistic art. It guides the artist in the handling of the form, space, composition, light and color in pictures (and is no less important in the making of sculpture as well). Thus it functions—to borrow an acronym from the physicists—as a kind of GUT (Grand Unified Theory) of drawing that pulls together and, in a comprehensive way, explains a great number of the mysteries of illusionistic art.

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As the reader begins to appreciate the far-reaching scope and power of spatial ambiguity, he or she will also recognize that some familiar drawing approaches commonly thought to yield 3-dimensional illusion, lack the transformational powers of spatial ambiguity and thus are relatively ineffective for this purpose. Examples are *perspective* drawing wherein the artist systematically reduces the sizes of figures and objects to indicate their further distance; *chiaroscuro*—the shading of forms to suggest roundness; the overlapping of planes to create *figure/ground* effects; and dependence on *careful copying*—that is, the "photographic" rendering and accumulation of details as a means of convincing the viewer that the forms in a picture are real. Though, admittedly, each of these methods has a place in painting and drawing, none can substitute for the transformational "magic" of spatial ambiguity. In Chapter 7, I discuss these "minor methods" and explain why they cannot give us the solid forms and deep space that we desire and which astonish us in those remarkable images we rank as "fine" art.

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Beauty in painting and drawing is often thought to be an enigma—a phenomenon that, for some mysterious reason, lies beyond explanation. Yet the fact that certain artists consistently create beautiful works tells us that their understanding and methods go far beyond guesswork and intuition. Fully aware of what makes beauty happen, they summon it unfailingly from every square inch of their canvas or drawing page. The insight of spatial ambiguity described here allows us to grasp the nature and origin of beauty as we experience it in painting, drawing and sculpture. Though beauty and 3-dimensional illusion are usually thought of as separate artistic goals, they are in fact intimately related. Beauty, like 3-dimensional illusion, finds its roots in spatial ambiguity; so that as the artist works to create and strengthen the effect of 3-dimensional illusion in a picture, he or she is simultaneously setting the stage for the appearance of beauty. Finally, when an artist succeeds in bringing the intensity of 3-dimensional illusion to a very high level, a transcendence takes place and the image takes on the grace of beauty. This insight—that one achieves beauty *by means of* and *along with* the structuring of 3-dimensional illusion—underscores the importance of spatial ambiguity in the visual arts. Not only is it the principal generator of 3-dimensional illusion, it is also the key to the creation of beauty.

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I often think of art as either precious or dispensable. In the past few decades, the trend in art has been to consider drawing unnecessary, to focus on *content* only and to tolerate work that, because it ignores *form* (which only powerful 3-dimensional drawing can accomplish) is visually unattractive, feeble in impact, and often boring. Lacking the indispensable stimulus of form, it fatally undermines its ability to move us. My belief is that in the long run such work will prove to be dispensable; and my hope is that the insights explored in these pages will assist, support and encourage those who, in opposition to this trend, want their paintings, drawings and sculpture to possess the precious qualities of form and beauty—attributes achievable only through mastery of art's most enduring magic—3-dimensional illusion.

Chapter One

Spatial Ambiguity

The challenge of 3-dimensional illusion has engaged artists throughout history. Gazing at the wall of a cave, or the interior of a church, or the flatness of a blank canvas or drawing page, they hoped to bring forth from that 2-dimensional surface the astonishing appearance of lifelike figures, animals, apples, drapery, trees, mountains or whatever, all seemingly round, solid and convincingly "real" and standing at varying depths in a clear and open volume of 3-dimensional space.

Obviously, for this task of creating illusion, artists needed something very much like magic. And, indeed, they solved their problem by following up on one particular drawing effect that seemed to hold an unmistakable quantum of "magic." They noticed that by arranging a group of lines in a certain manner they could create a bona fide illusion—namely, a form that could be seen *in two different ways.*

Such an "ambiguous" or "double-reading" illusion appears in Figure 1 where we see that the front and back planes of the cube can mysteriously switch their positions in space and create a new "reversed" cube. Because this transformation specifically involves the *spatial positions* of the planes of the cube, I call the effect *spatial ambiguity.*

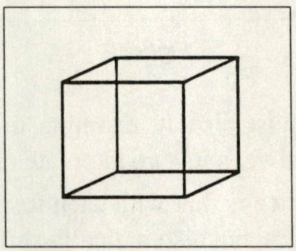

Figure 1

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The cube's ability to reverse its planes is by itself little more than an amusing visual novelty; and were there no other virtue to be found in the condition of spatial ambiguity, there would be little reason for this book. But, as the cube clearly demonstrates, a structure of lines that possesses two readings also creates the convincing appearance of a solid. Somehow the extra reading gives the structure the extra, or I should say, the extraordinary, power to evoke 3-dimensional illusion. Besides the cube, you will see proof of this assertion in every diagram in this book. But how does this transformation come about? What gives a spatially ambiguous image the power to influence our perception in this surprising way?

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Notice that I have described *two* kinds of illusion—*reversibility*, wherein the planes of the cube switch from one position to another, and *3-dimensional illusion,* wherein the group of 2-dimensional lines appears as a 3-dimensional solid. Our plan will be to examine first the simpler effect, that of reversing planes, and thereby prepare ourselves to recognize the perceptual links that connect it to its companion phenomenon, 3-dimensional il-

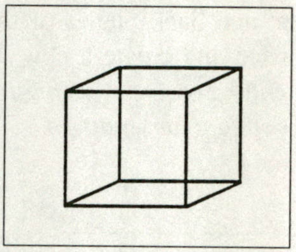

Figure 2

lusion. To do this, we must closely examine the cube in Figure 2 as it switches back and forth between its two alternate readings.

The first thing to notice is that with each reversal the cube not only alters the position of its planes, but also radically shifts its orientation in space; or, put another way, we now see it from a completely different viewpoint.

By deleting certain lines from cube A in Figure 3, we reveal its two possible positions. Cube B seems to be resting on a flat surface and we look *down* at it from above and to the right; cube C, on the other hand, seems to be floating high in the air and we look *up* at it from below and to the left.

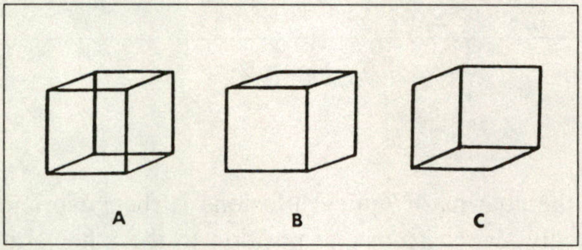

Figure 3

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Its flip-flop action has made the reversing cube a universally familiar diagram. Appearing often in books and magazines as an "optical illusion," it is in fact only one of a family of optical illusions each of whose members can likewise be seen in two different ways. Some examples appear in Figure

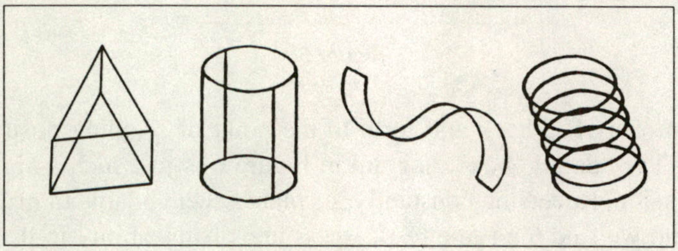

Figure 4

4. Note that each of these "illusions" can both reverse its planes and hold two different positions in space. The flight of stairs in Figure 5 is particularly well known for its surprising and somewhat alarming shift of spatial orientation; when upside down, it creates a truly surreal image.

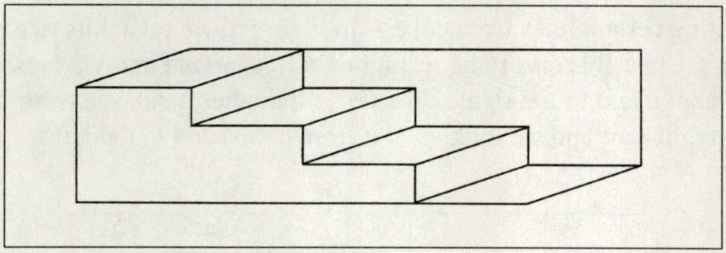

Figure 5

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One of the charms of optical illusions is their capriciousness—they can unexpectedly switch from one position to the other almost as if they had a will of their own. Indeed, some specimens barely pause for breath,

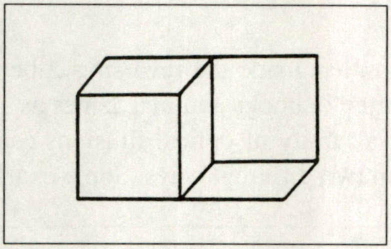


Figure 6

but continuously flip back and forth to the point of seeming positively hyperactive. The "double box" diagram in Figure 6 is just such a high-strung, fidgety illusion. Reversing constantly, its planes seem unable to reach a state of rest. And we find the same restlessness and changeability in the cup, the

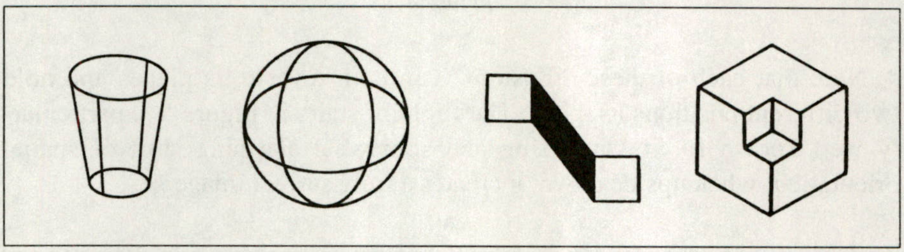
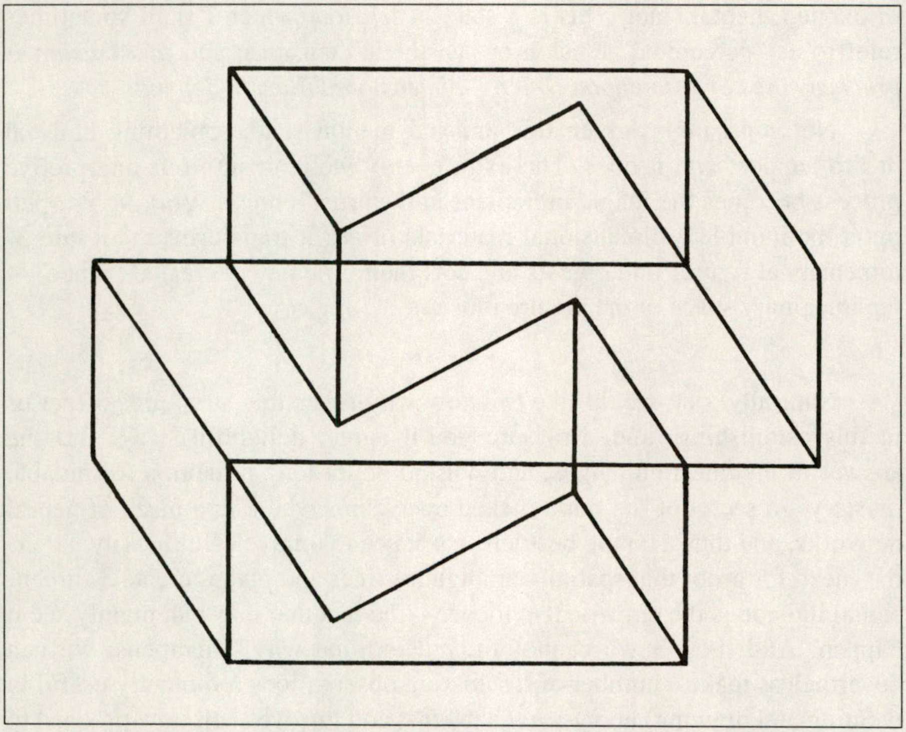


Figure 7

globe, the folded length of tape and the fascinating cube within a cube in Figure 7.

What produces this continuous activity? Quite simply, on a *preconscious* level, our mind is grappling with a rather stubborn "puzzle"—specifically, the dilemma that arises when a structure of lines has two *equally valid* interpretations. Uncertain as to which is the better choice, we test one reading, then the other, then the first again, and so on. But because the construction of the form has been carefully balanced to permit either reading, whichever choice we make will be tentative, and no sooner made than quickly superseded by another reversal. Theoretically, one might oscillate between the two choices forever without resolving this perceptual conundrum because its special construction has made it essentially *unresolvable.*



A continuously shifting, spatially ambiguous structure of lines.

Because a spatially ambiguous image resists being pinned down, our perceptual apparatus must work longer and harder to determine exactly what it is we are seeing. This explains the unmistakable feeling of *uncertainty* and *delay* we sense when we stand in front of a Rubens, a Delacroix or a de Kooning. Our head swims in a way that stamps this visual experience as being quite different from that of looking at real forms in the real world around us. It takes a distinctly discernible split-second longer to "see"—that is, to comprehend—the image on the canvas. Moreover each time we shift our eyes the least bit the image goes slightly haywire, renewing our sense of disorientation and delay; and the work of perception must begin all over again.

But, far from being an annoying chore, this interpretive difficulty turns out to be a blessing. What happens is that, impeded in our attempt to resolve the unresolvable, our efforts increase, thus creating within us a special kind of excited mental state. This is a state of *tension* (which I shall sometimes refer to as "perceptual" tension or "aesthetic" tension); and *this tension is precisely the condition upon which 3-dimensional illusion depends*.

Not suprisingly, given this unusual mental state, something unusual has to happen, and it does. The extra energy we pour into our interpretive process becomes the magic ingredient in the artist's brew. Working its spell upon the humble 2-dimensional materials of art, it transforms them into 3-dimensional figures and objects and sets them in a newly created "place"—the imaginary space of the picture illusion.

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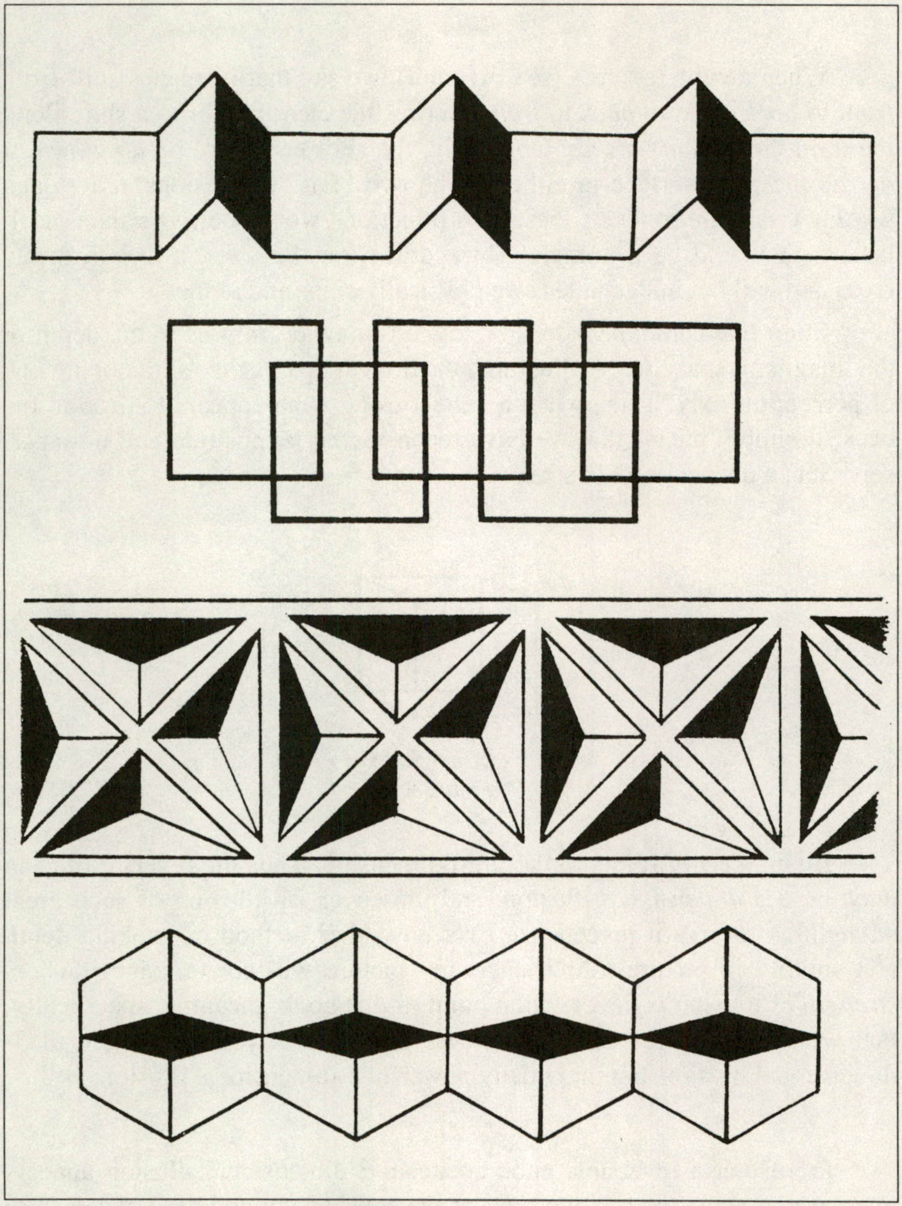
Naturally, one would like to know why reversible structures affect us in this astonishing (and, I'm sure you'll agree, delightful) way. But the answer to the question *why* is, and will no doubt long remain, a formidable mystery—a secret of the mind tucked away somewhere in a maze of neural networks, and thus a tangle best left to science to unravel. But luckily, all artists need for proof that spatially ambiguous lines and planes create 3-dimensional illusion is the emperical evidence—the fact that they can plainly see it happen. And though we cannot fully determine *why* it happens, we can nevertheless make a number of fascinating observations (eminently useful in painting and drawing) about *what* happens; and this we shall now proceed to do.



Four decorative patterns composed of reversible planes.

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When a cube reverses (see Figure 8), we say that its planes shift from *front* to *back* or from *back* to *front*—terms that clearly refer to a shift along the third dimension—*depth.* Obviously, the shift could not be *up, down* or *across* the page surface in either of the two "flat" dimensions, *length* and *width.* A shift in either of these two directions would be more than an illusion—it would be a miracle! Once drawn on the page, a line is firmly fixed and will not budge unless we physically erase and redraw it.

But a line can *appear* to float toward or away from us in the depth of the imaginary space we see "within" the drawing page, the "shift" being one of perception only. Thus, when a cube's front plane appears to drop to the back, it simply means that we have reconsidered its position and now perceive it at a deeper point in space.

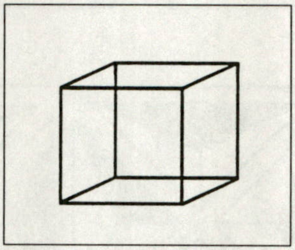

Figure 8

Again, *deeper* refers to the third dimension. Thus the reversal illusion *must* be a *3-dimensional* illusion; and moreover, an illusion of such great strength as to give it precedence over any other method of evoking depth and solidity in pictures. And since any picture will create some illusion, *strength* of illusion is the essential point of this book; meaning, specifically, that we want, and reversible structures give us, not just a smidgen of 3-dimensional illusion, but maximally powerful 3-dimensional illusion.

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Proof that a reversible cube creates a 3-dimensional illusion appears when we compare the relative sizes of the cube's front and back planes. The laws of perspective mandate that an artist draw the back plane of a cube slightly smaller than its front plane to suggest that it lies at a deeper point in space. The viewer then cooperates by making a "size constancy" adjustment to allow for the shrinking effect of distance and perceives the front and back planes as being of equal size.

But in Figure 8, we ignored perspective and drew the cube *isometrically*, that is, with front and back planes *measurably* equal in size. As a consequence, when our mind makes the adjustment for distance, the back plane appears *larger* than expected—larger, in fact, than the front plane! Look carefully and you will detect this disparity in size. The point is that our mind would not have factored in this adjustment for distance, unless we were convinced that the form was 3-dimensional.

This front/back discrepancy in size is subtle, but it becomes much

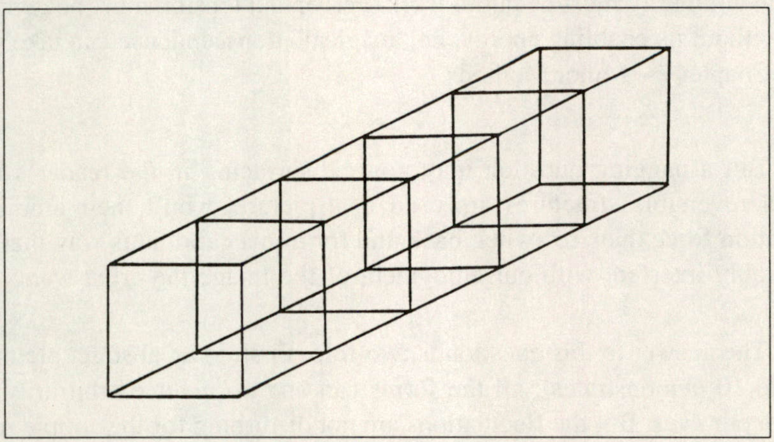

Figure 9

more obvious when we line up six cubes in a row (Figure 9). Again, isometric cubes are used and all the squares are equal in size. Nevertheless, the squares at the "far" end of the row (which could be either end (turn the diagram upside down)) appear plainly larger than the squares at the "near" end. Their expanded size proves that the row of cubes has successfully convinced us that it extends 3-dimensionally back into space.

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The apparently larger back plane of an isometric reversing cube suggests one reason why such a diagram will spontaneously reverse itself. Noticing that the "back" plane appears larger than the "front," our mind begins to suspect that the alternative reading might better accommodate the laws of perspective—at that moment, blink, the cube reverses.

Interestingly, the fact that a reversing cube can appear to be a convincing solid *despite* being isometric and thus violative of the laws of perspective, allows us to conclude that perspective is no more than an optional refinement of the forms in a picture—logical, but by no means essential to the creation of a space illusion. And while a scheme of perspective lines can help an artist *organize* a picture space, perspective by itself cannot effectively *create* that space. For good reason, the deeper, more active principle of spatial ambiguity must be put to work. Perceptual tension must be generated for, without its enabling energy, no "magical" transcendence can take place. (See Chapter 7—Minor Methods.)

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But a nagging question may now be surfacing in the reader's mind. When reversible structures are used in a picture, won't their ambiguous condition force them to switch back and forth in a capricious way that must inevitably interfere with our enjoyment of the image the artist wants us to see?

The answer to this question is two-fold. First, in an abstract picture (as Figure 10 demonstrates), all the forms can and *do* reverse arbitrarily right before our eyes. But the fluctuations are not disturbing for the simple reason that one reading of an abstract form is as good as another.

On the other hand, when a picture has recognizable subject matter, one might logically anticipate some confusion. Imagine, for instance, a painting of a figure in a room, or a table holding many objects, or a group of buildings in a cityscape—if the planes in any such picture were continually reversing themselves, wouldn't we be confused by repeated, absurd distortions of the intended image?

Surprisingly, we find no such chaotic activity. Though our theory

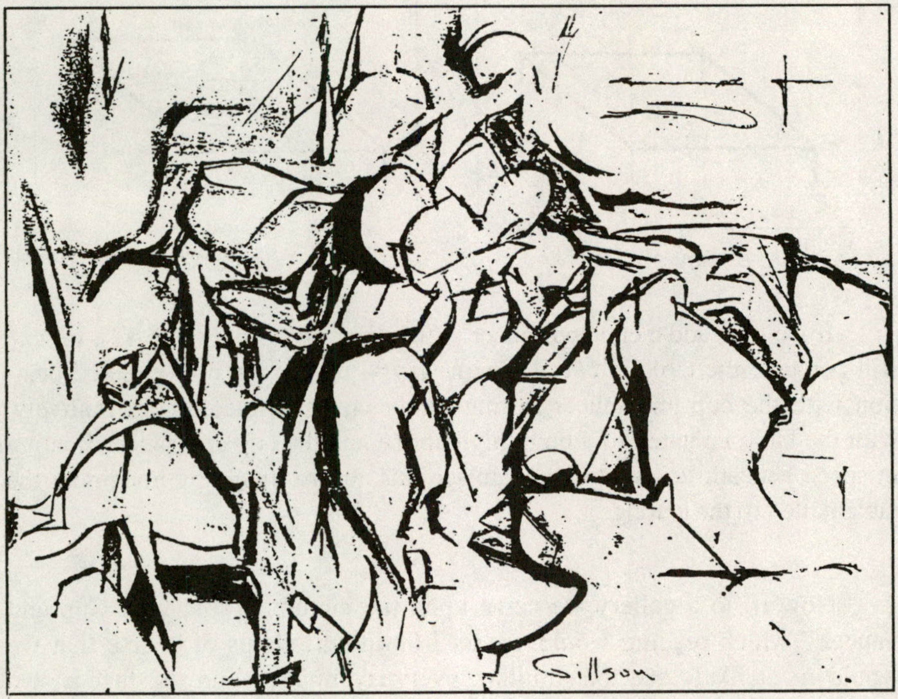

Figure 10

mandates that one compose a picture entirely of reversible parts, in representational art the image's ambiguous elements are strangely quiescent. For some reason, the alternative readings are conveniently hidden away and untroublesome. How come? The following experiment explains this curious state of suspended activity.

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Let's draw just the top part of a reversing cube and use it to represent a table top (Figure 11). Like the cube, the table top can reverse itself. Its front and back legs can readily switch position and, with each switch, the table's orientation in space also changes so that we either look down at its top surface (the normal reading) or up at its underneath side (as though the table were nailed to the ceiling).

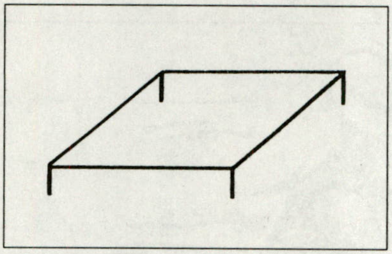

Figure 11

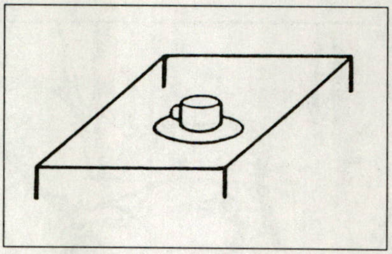

Figure 12

If we now add a cup and saucer to the diagram (as in Figure 12), we can still perceive the table in two different ways—first in the conventional position with the cup and saucer resting safely on its surface, or alternatively, with the table levitated to a point high above and the cup and saucer floating in space beneath it. (Again, one can see this absurd image by imagining the table nailed to the ceiling.)

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Now if, in a gallery we came upon the picture "Table with Cup and Saucer," which reading would we see? Intuition tells us of course that we would most likely see the familiar, everyday image—and the fact is, we would. But what's happened to the absurd alternate reading? Has it somehow been canceled? Does our recognition of the table as such eliminate its ambiguity; and, if so, wouldn't this dissipate the image's perceptual tension and diminish its 3-dimensional impact?

A somewhat differently shaped table answers these questions. In Figure 13, we eliminate the table's back left leg (which would normally be hidden by the tabletop) and, obeying the laws of perspective, shorten the table top's back edge and back right leg. Now the surface of the table is no longer a rhomboid, but is instead a trapezoid; and in light of these changes, we might conjecture that the table's ambiguity has been eliminated and that an alternative reading is now out of the question. However, a close look reveals that the diagram is in fact fully reversible! If we wish, we can readily see the table in a "nailed-to-the-ceiling" position. Thus reversed, it has an odd, new shape—narrower at its front end like an ironing board, and missing its front left leg. But, nevertheless, there it is—the alternate image!

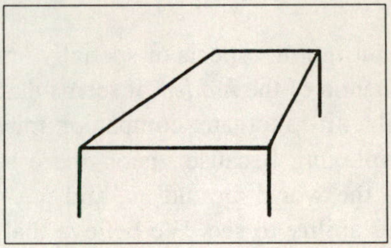

Figure 13

Unquestionably, this levitated, three-legged ironing board is a very strange creature indeed, my point being that, unless we force ourselves to see it, the more conventional image will prevail. Our recognition of the table as such will act as a powerful force holding it down on the floor where it belongs. But, in no way has the ambiguity of the structure been canceled, nor has its charge of perceptual tension been the least bit diminished.

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The principal task of vision is to make sense of what we are looking at, not to play back-and-forth perceptual ping pong. Thus, of the two ways to see a table with a cup and saucer, we automatically settle on the one that is commonsensical. But what about the excluded image? Does it retire meekly, a defeated, useless, inconsequential thought?

Here a fundamental insight emerges. The tension we sense within an ambiguous form does not depend on the *activity* of reversing, but rather on what might be called the "reversing potential" of the form. In other words, even if we do not see the form reverse, its double-reading condition nevertheless creates a constant pressure urging a reversal. Using the example of the table, the repressed "on the ceiling" reading does not meekly surrender; rather, it continues its struggle to gain entrance to consciousness in defiance of our decision to block it out. Though outwardly calm and steady, the image of the table is in fact inwardly seething with the energy of its reversing potential.

• • •

One of the most intriguing aspects of spatially ambiguous painting and drawing is the phenomenon of the *hidden*. It seems that when one image of a reversible form is visible, its alternate, companion image becomes *in*visible. This is somewhat perplexing because vision more than any other of our senses connects us to the world around us, and we therefore rely on and place great faith in our ability to see. We believe that if something is right there before our eyes we will certainly see it.

But spatially ambiguous pictures prove us wrong. A drawing may seem to conceal nothing—every line is visible—yet right there before our eyes are images we cannot see. Fixing on one reading of a form, we become blind to its opposite. Figure 14—the goblet that reverses to become two profiles—illustrates this phenomenon. You can't see both images at the same time.

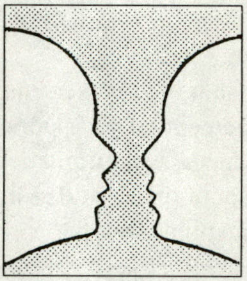

Figure 14

Thus every illusionistic picture necessarily conceals a host of hidden readings. Behind the scenes, so to speak, of any master painting or drawing lies an unsuspected world of alternative images. These may be out of sight, but they are by no means out of mind. Instead, they are actively generating the secret energy that supercharges and makes transcendent the forms we admire on the canvas.

The young art student attempting to copy the simple yet uncannily solid outlines of a Matisse figure groans, "How does he do it?" The student's bafflement is understandable. Every line of the drawing is visible, yet something is mysteriously eluding his or her effort to make a copy of equal power. The catch is that one cannot create (or, in this case, recreate) art simply by slavishly copying what one sees. To achieve a 3-dimensional result, one cannot simply record (as a camera would) the exact positions of contours, and then "model" these to supply the observed intensities of light and shadow—the limited goals of *careful copying*—because something vital will be missed. A conscious effort must also be underway to give each element in the picture a hidden partner—its reversed reading.

To do this, one must first of all acknowledge the urgency of this requirement, and secondly, be prepared to make countless subtle adjustments that push lines and edges a tiny bit this way and that in order to "balance" each form for a double reading. These adjustments might be departures from the "photographic" truth of the figures and/or objects being represented, but the compromise will be more than worth it. With reversibility as an ally, one will catch *better than any photograph* the most important aspect of *resemblance*—namely, the subject matter's compelling 3-dimensional reality. Or, similarly, when copying a work of art like the Matisse drawing, searching for and establishing the ambiguous relationships the artist has built into it will enable one to recreate the full intensity of the figure's solidity and roundness.

• • •

The optical illusions we have seen thus far have been solids, each with front, back, sides, etc. One might, however, fashion simpler structures made up of just one or two planes or even just one or two lines, which will nevertheless be both reversible and 3-dimensional and therefore qualify as full-fledged spatially ambiguous entities.

Breaking up a cube into its various parts (see the figures that follow), we find that each is a spatially ambiguous element in its own right. Figure 15, A, shows us two connected planes that resemble the top and right side of a cube. Together they form a single bent or folded plane that is both reversible and 3-dimensional. The two adjacent diagrams with strategically placed cylinders make the two readings of the folded plane quite obvious. We see B from above and to the right, and C from below and to the left.

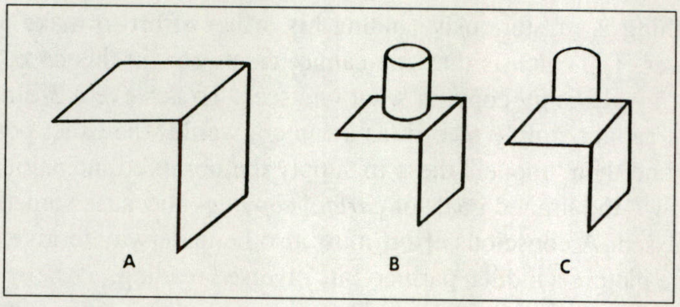

Figure 15

Next, the diagrams *A* through *E* in Figure 16 isolate parts of the cube that are simpler still, and these, too, are reversible and 3-dimensional. At A, we see one side of the cube—a rhomboid—that could be either a cellar window at ground level that we are looking down at or, alternatively, a prison window that we look up at. The rhomboid at B—the top of the cube—might be either a rug lying on the floor or a skylight set in the ceiling. And angle C, made up of just two edges of the rhomboid, nevertheless retains the rhomboid's reversibility and 3-dimensional disposition in space. The parallel lines at D—the two opposite sides of the rhomboid—might be either a pair of skis lying on the snow or two parallel beams running along a ceiling. And finally, the single line, E, could be a stick lying on the ground or, reversed end to end, a pipe fastened to a ceiling.

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The simplicity of these structures suggests how easily they can be adapted to the needs of picture-making. If an element as simple as a single

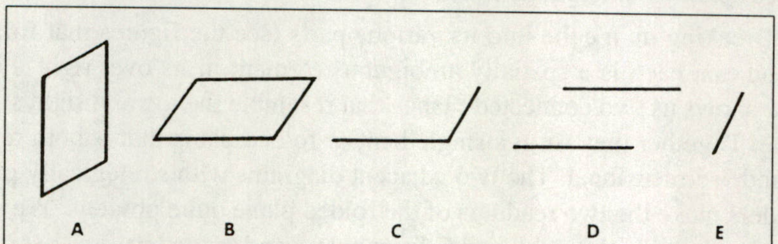

Figure 16

line can be reversible, then by learning how to create lines of this sort, one can inject the magic of reversibility into every corner of a painting or drawing. Further, since an *edge* is the visual equivalent of a line, one might, in the same way, make the edges of every individual area of tone or color reversible and 3-dimensional. But it is important to understand that spatial ambiguity is a highly specific condition, created only by satisfying specific criteria. What these criteria are and how to apply them as one fashions lines, angles, curves, and planes in one's picture, are the topics we shall begin to take up in the very next chapter.

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The preconscious processing of ambiguous forms—that is, the task of debating the choices they offer, results in something quite different from ordinary seeing in that it demands extra effort, and, for this reason, creates tension. But, as we learn from many activities that require concentration —puzzles, card games, chess, and indeed problem-solving in general—mental tension can be a source of great pleasure. So, too, the tension generated in processing ambiguous lines and planes is just such a source of pleasure. As we study a work of art, this pleasure seeps into (or, as the psychologists would say, is "projected" onto) the particular form we are looking at, and as a result, we believe it to be an attribute existing within the form itself. As a result, besides appearing 3-dimensional, the form will seem to possess an eye-pleasing "attractiveness" as well.

To some degree, the simplest ambiguous structure will charm the viewer's eye; but that can be just a starting point. By adding further ambiguous complications, an artist can further heighten the tension within a structure and thereby increase its aesthetic appeal. Consider, for example, the ambiguous angle in Figure 17. It has two readings—that is, either leg could be the near (or far) leg. If we now add a third line at the vertex of the angle (Figure 18), the new configuration can be read in six (!) different ways. Reading from the nearest to the furthest (the reader might want to try visualizing these various positions) we have: ABC, ACB, BAC, BCA, CBA and CAB. These manifold readings give the configuration an increased level of tension, adding not only to its 3-dimensional strength, but to its aesthetic appeal as well.

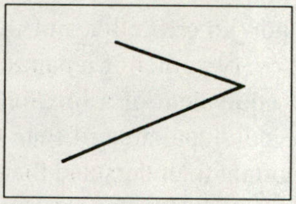

Figure 17

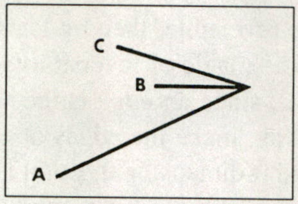

Figure 18

In the next example, involving planes (Figure 19), the aesthetic enhancement becomes much more obvious. The two rhomboids joined along one side (at A) can freely exchange their near/far positions. By adding a third plane (B), we create a new structure with six possible readings. As a result, tension escalates and with it, the attractiveness of the image.

But let's go even further. Curved lines (as discussed in Chapter 5) are more complex and visually challenging than straight lines. Therefore by replacing some of the straight lines with curves (C), we further increase tension. And finally, by hatching some (but not all) of the structure's various areas (D), we create additional perplexity as to which plane stands in front of (or behind) any other. In this way we arrive at an intriguing assemblage of

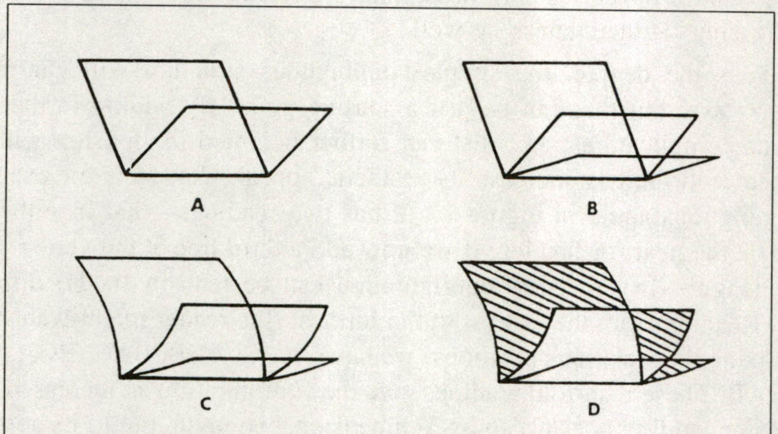

Figure 19

ambiguously interacting planes whose heightened level of perceptual tension results in greater aesthetic appeal. If we now look back at A and compare it to D, we see that D is the far more exciting and eye-catching construction.

• • •

When an artist raises the forms in a picture to a very high level of tension, something extraordinary happens—the picture becomes beautiful. This fact leads us to a definition of beauty as the term applies in the visual arts. *Beauty is the sensation of pleasure that accompanies a very high level of perceptual tension*. Or, put more succinctly, *beauty is tension*. And we can add a corollary: Because of its role as primary generator of perceptual tension, we can say that *spatial ambiguity* is the *root source of beauty*.

• • •

That spatial ambiguity underlies the appearance of beauty became clear to me years ago as I was working on a painting of a young woman asleep on a beach. Frustrated because the planes that made up the features of her face were unacceptably flat, I turned the picture upside down so as to transform the eyes, nose, lips, etc., into unfamiliar abstract forms, the better to evaluate and, where necessary, correct them—or, to be specific, make them reversible. After some work, and satisfied that all the lines and planes were ambiguous, I turned the picture right side up. Surprisingly, besides being 3-dimensionally much stronger, the young woman's face was now quite beautiful. The lesson was clear—the tension of spatial ambiguity sparks *both* 3-dimensionality and beauty.

• • •

Springing as it does from the action of spatial ambiguity, the beauty we enjoy in paintings and drawings (and in sculpture, too (see Chapter 8)), can never diminish, because each time the eye moves away from, and then returns to, an ambiguous image, it must repeat the struggle to select the best reading from among the available choices. In this way, ambiguous images tap an ever-renewing source of tension that makes their beauty inexhaustible. This explains the continuing vitality and freshness of the great works of art that we inherit from the past. Their strength derives from a thoroughgoing ambiguity—the source of their beautiful form and the guarantee that their luster will never fade.

Those who write or lecture about art often refer to a so-called "language of form" derived from the body of beautiful forms found variously in nature, in geometry, in patterns of movement or growth, in the artifacts of machinery, or wherever. The implication is that the forms we might draw or paint will appear beautiful *insofar as they remind us* of one or another of the models of beauty just enumerated.

But such an explanation teaches nothing. One cannot account for the beauty of a form simply by noting its resemblance to some other beautiful form. True, an elegantly curved egg, a gorgeous leaf or a lustrous seashell (or, for some, a gear wheel) may trigger the inspiration to draw or paint; and one must also grant that establishing a resemblance between a picture and its real life counterpart will automatically stir up a bit of excitement since *resemblance* is a species of ambiguity. But beauty in painting and drawing has nothing to do with outside references, but is instead based upon its own unique laws which derive solely from the way we react to and perceive lines and planes as they meet, cross, diverge from or run parallel to each other on the canvas or drawing page. These laws of perception in fact apply to all visual experience so that, underlying the beauty of the egg, the leaf and the seashell, we find the same perceptual dynamics that evoke beauty not only in painting and drawing, but in sculpture, architecture, home furnishings, fashion, cosmetics, the human face and form, and, in short, all things beautiful.

It is a fascinating fact that, when beginning a picture, one need not have any specifically "beautiful" forms in mind. One can begin a canvas with quite ordinary shapes, or even uninteresting abstract markings; but then, aware of what beauty depends on, proceed to carefully adjust lines, edges and planes, and the relationships that pertain among them, and gradually build into the forms an amount of tension that ultimately bestows upon them the blessing of beauty.

Thus an effective language of form *does* exist. Just as in music, where accurately tuned single notes, scales and chords function as the building blocks of composition and become the stepping stones to beauty, picture-making, too, has its basic units. The rationale of spatial ambiguity leads to certain simple, but precise structures all of which are not only dependably 3-dimensional, but contain the seeds of beauty. Made up of just one, two or three lines (parallels, certain angles and curves (see chapters 2, 3 and 5, respectively)) and used over and over again (as are the scales and chords in music), they function as "letters" in what might be called the "alphabet" of drawing. Assembled into more complex structures that also acknowledge the imperative of ambiguity, they result in images of great formal strength and thereby give concrete meaning to the otherwise vague notion of a language of form. Indeed, the two concepts, *spatial ambiguity* and a *language of form*, are but two names for the very same thing.

• • •

Optical illusion diagrams such as the cube, the ribbon, the stairs, etc., provide the best introduction to spatial ambiguity because their simple, quasi-geometrical shapes make the reversing phenomenon perfectly obvious (which, incidentally, is why I have used the simplest possible schematic diagrams and sketches to illustrate the use of spatial ambiguity in drawing). Interestingly, many "how to" books about drawing recommend a so-called "geometrical" approach wherein students are urged to visualize the various parts of the body—head, chest, pelvis, thigh, etc.—as simple block-shaped solids. In a famous quotation, the painter Cezanne suggested that the artist "treat Nature by the cylinder, the sphere and the cone," to which short list we may logically add the cube as well as rectangular and triangular solids of all kinds.

But geometrical drawing is only a *style* and not by itself a method that can be relied on to yield reversible (and therefore 3-dimensional) structures. In fact, in their work, artists need not use blocks or any other shapes suggestive of geometry. Figure 20 makes the point that by stretching, bending, twisting or otherwise mutating the cube (or any part of a cube), one can arrive at forms that more closely resemble those we might see in drawings, with none of the geometrical rigidity of the cube, but *every bit of the cube's reversibility and illusionistic power.*

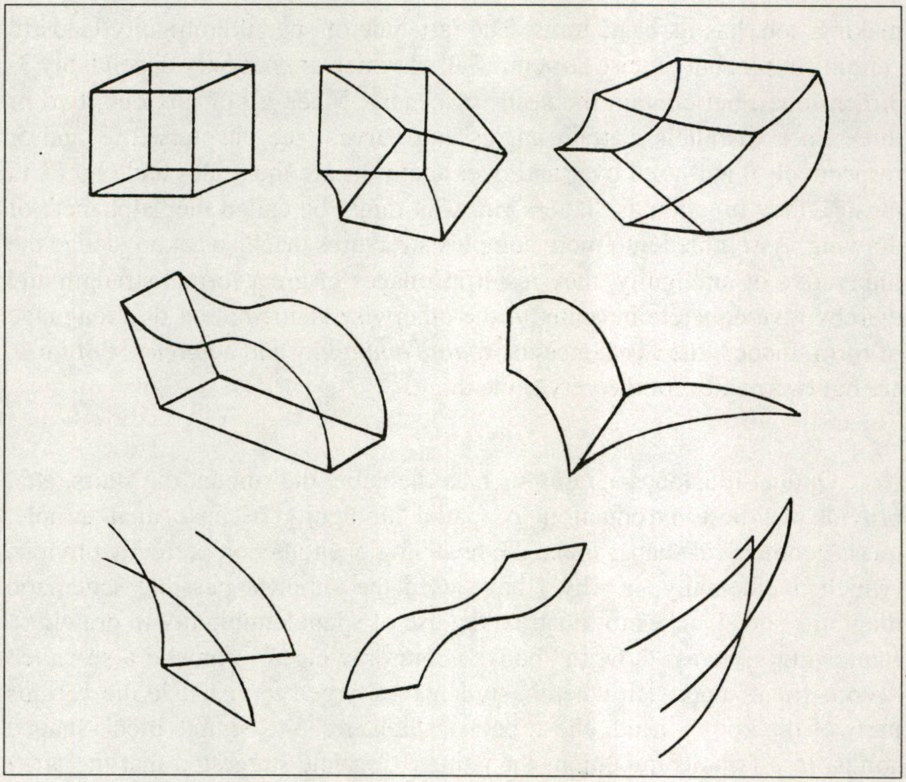

Figure 20

The limited number of examples given here barely hints at the infinite variety of styles that one might use when drawing or painting. Descriptive terms like organic, biomorphic, freehand, curvilinear, brushstroke-y, even scribbly, blotchy and dribbly suggest just some of the ways in which an artist might work and produce thoroughly ambiguous and thoroughly 3-dimensional lines, planes and forms. Style is (in this matter of creating form and beauty) a secondary concern. First comes "micrometrically" controlled drawing that injects the magic of ambiguity into every element in the picture, including every smear, smudge and drip that might misleadingly seem to have been casually or even accidentally produced.

• • •

There may be those who mistakenly believe that no particular care is needed to create spatial ambiguity. Isn't it true (they might say) that *any* line or plane set down upon the drawing page will automatically be reversible? Can't we, if we choose, see either end of *any* line as the near or far end? And similarly, can't we visualize *any* plane tipped first in one direction and then in the other?

These questions focus our attention on an essential fact about drawing (and the primary thesis of this book) which is that reversibility is a highly specific condition exhibited only by lines and planes that have been drawn in a special way. And the corollary—no reversibility, no (or minimum) illusion. Lines and planes that lack reversibility lie flat on the page. As we scan them, our eye seems to skim slickly *across* the picture surface instead of experiencing a sensuous plunge *into, through and around* the substantial forms and inviting depths of a fully realized and convincing picture space.

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When searching out and eliminating problems of flatness in a picture, an artist must be able to do three things: first, discriminate between those structures that are flat and those that are successfully 3-dimensional; second, decide whether or not a line or plane (or any part of a line or plane) is reversible; and third, be able to test the ambiguity of a drawing element by reversing it in the mind at will. Since shifting a line a mere hundredth of an inch can spark it to 3-dimensional life, one needs these tactics to zero in on the need for so minute a change. With reversibility in mind, a sensitive eye can pinpoint the precise part of a line or plane that is 2-dimensionally flat. And time and practice will further sharpen this sensibility. This skill is doubly important because that which does not help a picture, *actively* hinders it. A tiny area of flatness—a minute portion of a line or an edge that does not fit seamlessly into the 3-dimensional picture space—jolts the viewer's eye and like a drop of strychnine becomes lethal to the 3-dimensional effectiveness of the surrounding area in surprising disproportion to its size. Like a song whose notes are sung off-key, a picture with numerous instances of flatness and consequent breakdown of illusion will be irritating, unconvincing and far removed from beauty.

• • •

When I first began to study art, the optical illusion cube with its chameleon-like switching behavior inevitably caught my eye. I liked the idea that you got two cubes for the price of one. But it soon occurred to me that this curious back and forth mutability was the least part of the remarkable nature of reversing structures, and that the cube and the other optical illusions I ran across were all strikingly convincing 3-dimensional illusions.

Experimenting, I found that when a nose I was drawing did not jut out from the face in a 3-dimensionally satisfying way, I could overcome the difficulty by adjusting the individual lines and planes that made up the nose until all were reversible. These adjustments were sometimes tiny, but always crucial. Finally, when all was reversible, the nose sprang forward. In other words, the key to creating a 3-dimensional image was to make each structure in my drawing the equivalent of an "optical illusion."

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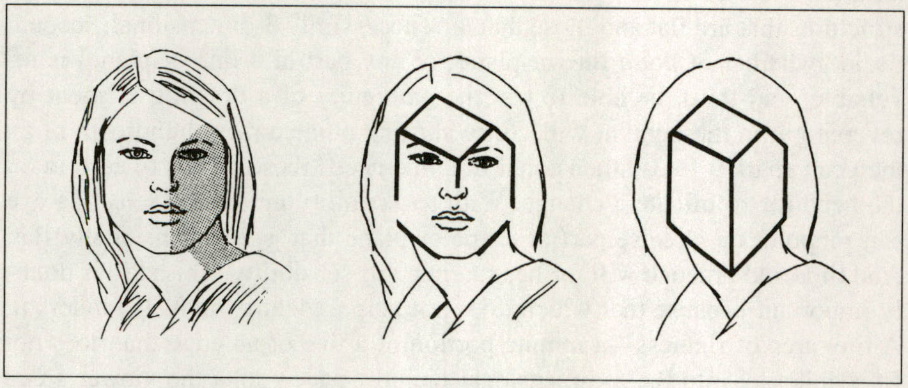

Figure 21

The structure of the head pictured at A in Figure 21 is based more or less on the optical illusion cube. The adjacent diagrams at B and C bring out the underlying planes of the head and help us recognize their reversibility. Notice that the nose—the nearest point of the head—can freely shift its position and become the furthest point in the same way that one half of a hollow rubber ball can be snapped from a convex to a concave position. Granted, a reversed reading of the head results in a peculiar, caved-in face. Nevertheless, this counter-intuitive reading is exactly what the artist must clearly visualize and then deliberately inject into the drawing of the head. Recall that we encountered a similar absurdity earlier when we discussed the table nailed to the ceiling; thus we can be sure that the bizarre concave reading of the face, the unconventional reading, will be conveniently hidden away and pose no threat.

Initially, of course, this approach to portraiture may seem odd, or even ridiculous. But though the *word* ambiguity may carry with it connotations of vagueness and uncertainty, the *method* of ambiguity proposed here gives the very opposite result. A reversible head presents only two choices and one of these will be forcibly repressed and therefore invisible. The single reading that remains will be anything but uncertain—the nose will stand emphatically at the front of the head. In this way, spatial ambiguity enables the artist to position each structure in the 3-dimensional picture space with the highest degree of precision.

Chapter Two

Parallel Lines

When two lines in a picture are parallel, we immediately sense a connection between them. Their parallel positioning seems to be a bit of *organization*, and we wonder about its significance. In everyday experience, two parallels very often turn out to be the opposite sides of a single plane—a blade of grass, perhaps, or a rectangular table top, or a sheet of typing paper. Therefore, parallels strike us as potentially *significant*; and thus, though they often occur in paintings and drawings in ways that are subtle and obscure, parallel lines (or parallel edges, for that matter) *never go unnoticed*.

When set down on a canvas or drawing page, two parallel lines will be reversible and therefore will create a 3-dimensional effect. This is demonstrated by the four pairs of parallel lines in Figure 22. In each case, either parallel can appear as the nearer (or further) line. Their reversibility enables these parallels to break free of the flat page surface and drop back into the diagram space to become 3-dimensional structures.

This ability of parallels to "shake loose" of the page surface suggests an analogy: Imagine two men holding a third man prisoner. Each holds one of the man's arms to prevent his escape. Suddenly, the captive begins to

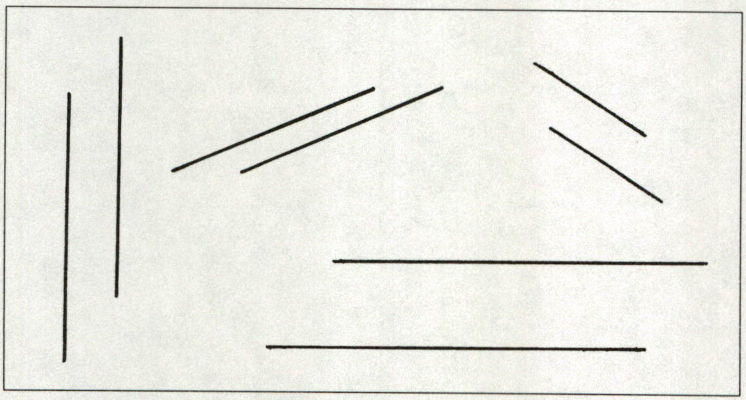

Figure 22

shake himself vigorously, twisting his arms back and forth. His action breaks the grip of his captors and he dashes off to freedom. Similarly, lines drawn on a flat picture surface will be held in "2-dimensional captivity" unless we devise a way to free them. The repeated reversing action of parallels answers that need. Twisting back and forth like the arms of the captive, they wriggle free of the restraints of the picture surface and escape into the magical realm of the picture illusion.

This repeated back and forth twisting is of course the continuous testing of alternative readings that takes place in our mind when we look at an ambiguous grouping of lines. Though this is not a *conscious* process, we can easily verify the activity by noticing the way it affects our focus. For instance, looking carefully at the verticals in Figure 23, you will detect a slight blurring and softening of the double line (at A) as compared to the single line (at B). This is because in our "preconscious" deliberations about which of the two lines at A is the nearer (or further), continuous focusing and refocusing is part of the testing process. As a result, our focus is always *in transition* from one reading to the other, so that we cannot reach a final, crystal clear resolution.

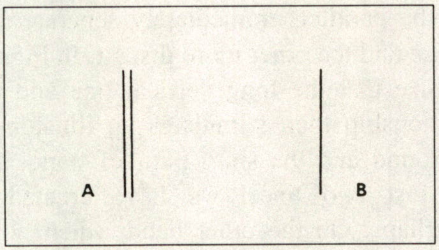

Figure 23

Luckily, the effect is a beneficial one. Delicately blurred, the double line appears softer, misty and more atmospheric—effects which are quite pleasing to the eye. This aesthetic enhancement produced by parallels can be noticed again in Figure 24 where, comparing the vertical *edge* at A to the *edge* with added parallel line at B, we find that, because A lacks ambiguity, it poses no focusing problem and registers sharp and clear; but for this very

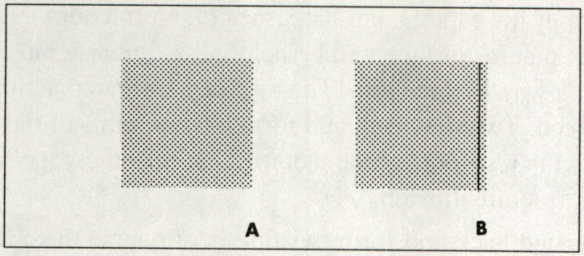

Figure 24

reason it has a raw, unattractive "hard edge" look (like that of a cut out square of cloth). In contrast, the reversing interaction between vertical edge B and its parallel line partner creates a far more pleasing effect (as would a square of cloth with a hemmed edge).

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When we look at a painting or drawing, no parallel structure escapes our notice. Just as an eagle can spot a rabbit from a great height, our eye, no less talented in its own way, can pick out parallels with amazing facility. And once spotted, the parallels immediately separate depthwise, meaning that one appears close and the other more distant. In Figure 25, for example, we instantly recognize that the long vertical line and its tiny partner are parallels. This relationship then stimulates an illusion—the long parallel stands in the foreground and the short parallel stands far in the distance. Amazingly, using just two lines, we have created a "picture"—two telephone poles, perhaps. On the other hand, when we team up the long parallel with a circle (Figure 26) the two elements lack the reversibility and

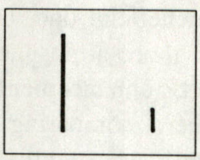

Figure 25

3-dimensional "separation" power of parallels, and as a result the "ball" seems to lie right next to the "pole" rather than appearing far in the distance.

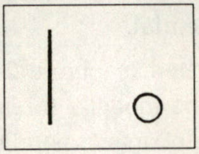

Figure 26

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Since nothing could be simpler than drawing one line parallel to another, parallels can be a wonderfully useful way to create the illusion of depth. For example, when working from a still life or model in a studio, an artist will notice many contour lines and edges that are parallel to each other or to other objects around or behind the subject matter. These should be set down on the drawing page as a means of creating 3-dimensional

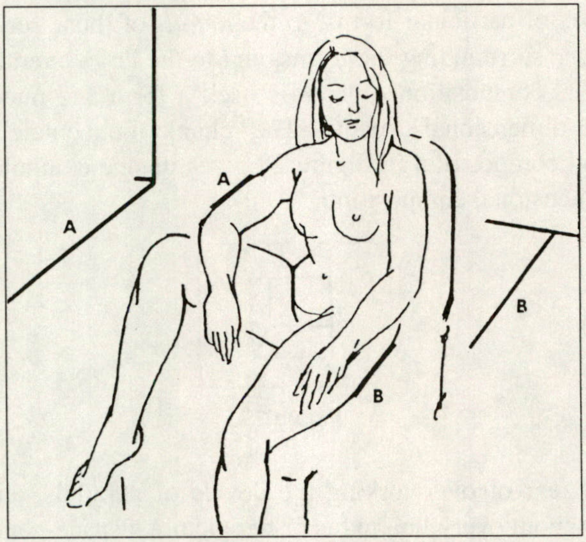

Figure 27

space. Further, in response to what he or she sees, an artist might be about to draw two lines on the page that will be *almost* parallel; But, at that moment, he or she can cleverly elect to draw the lines as *exact* parallels and thereby tap their space-generating potential.

This approach is illustrated in Figure 27 where, supposing that from our viewpoint in the studio the model's forearm and the more distant windowsill (both marked A) did not appear parallel, we have nevertheless made them parallel (thick lines) and thereby created a 3-dimensional jump through space from one to the other.

An artist may also freely invent parallels that do not actually exist in the observed studio setting. For example, we have added the invented line B specifically to interact 3-dimensionally with the line of the model's thigh (also marked B). Lines improvised in this manner may be either heavy and obvious or so faint as to be barely visible, but in either case will effectively build the picture space.

In the many examples that follow, we shall see the way in which parallels can give enormous assistance in developing the *structure* of a picture. This can take place on many levels. They can give 3-dimensional credibility to the *contours* of particular forms, to the *details* of those forms, to the envelope of *space* surrounding the forms, and to the large overall divisions of the picture—its composition—which is itself a form and must also clearly register as a 3-dimensional structure. The "chunk of chocolate" or, reversed, "empty room" composition in Figure 28 gives us one example of a reversible and 3-dimensional composition.

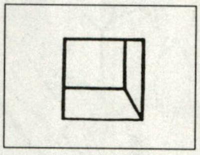

Figure 28

Without fear of overworking the device of parallels, an artist might well give just about every line in his or her picture a space-generating parallel partner. Indeed, I do not in the least overstate the case by saying that *when painting or drawing, the idea of parallel lines is almost never out of an artist's mind.*

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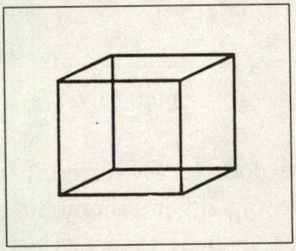

Figure 29

The reversing cube we saw in Chapter One (repeated here in Figure 29) owes much of its 3-dimensional appearance to the fact that its edges form parallel pairs. Of particular interest is the rhomboid representing the right-hand face of the cube whose parallel sides enable it to create the illusion of a square extending 3-dimensionally back into space. Note that a square differs from a rhomboid in that each of its corners is a right angle while a rhomboid's corners are either acute or obtuse. Thus one might say that a rhomboid resembles a square whose sides have been *skewed*, that is, pushed out of right angle alignment. This skewed effect is diagrammed in

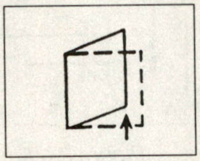

Figure 30

Figure 30 where three sides of the square (dotted lines) have been pushed up the page, distorting the square's right angle alignment and creating a rhomboid (solid lines). But surprisingly, we do not see a rhomboid, we see instead the illusion of a square turned away from the page surface so that it

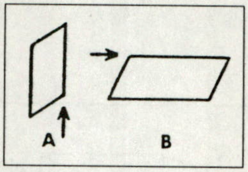

Figure 31

resembles a partly opened door (or, reversed, a partly lifted book cover). And, given the choice of seeing either a rhomboid or the illusion of a square, we prefer to see the latter, even if it means accepting an illusion. Thus, where pressure (indicated by arrows) has skewed the two rectangles in Figure 31 into rhomboid shapes, parallelism and skewing work to evoke illusions not to be denied. Though skewed, the rectangles magically keep their identity as such: A could easily represent a window and B, a table top.

• • •

Extracting a single pair of parallels from a rhomboid, we can create the same convincing 3-dimensional illusion as would a complete rhomboid. The vertical pair at A in Figure 32 could be two fence posts, one standing deeper in space than the other; and the horizontal pair (B) might be two skis, one near and the other more distant.

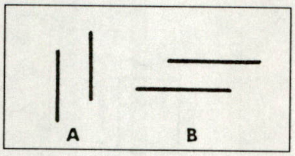

Figure 32

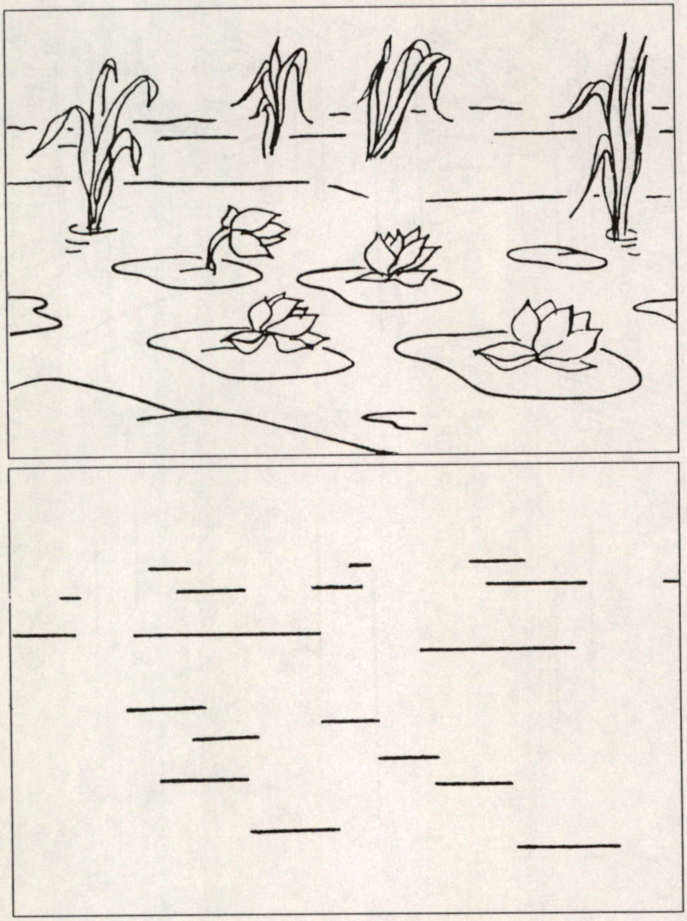

Figure 33

Applying these thoughts to painting and drawing, Figure 33 shows us that, strategically embedded in a picture, skewed *horizontal* parallels will dependably separate themselves 3-dimensionally and help the artist evoke the depth of a landscape. The accompanying schematic diagram showing some of the horizontal parallels, clearly illustrates this fact.

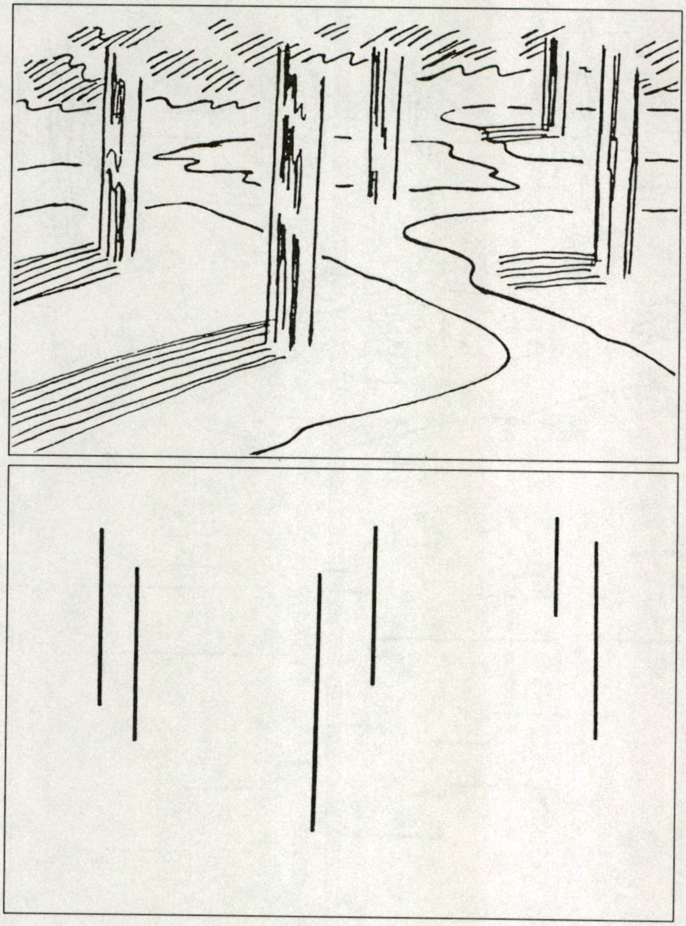

Figure 34

Similarly, Figures 34 and 35 demonstrate that skewed *vertical* and *diagonal* parallels can also build 3-dimensional illusion.

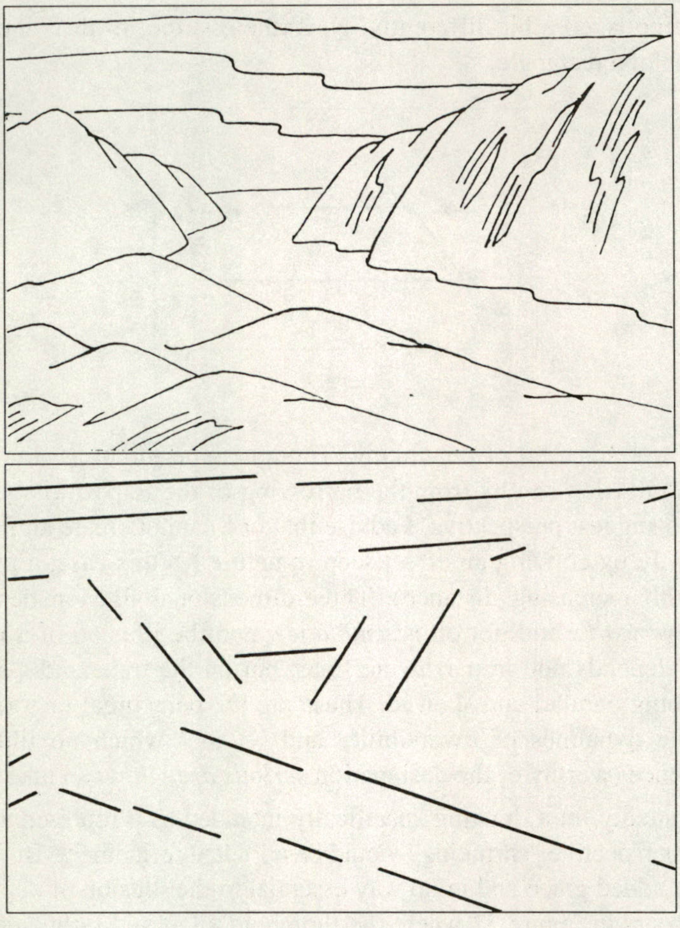

Figure 35

• • •

A *trapezoid*, like a rhomboid, will evoke the 3-dimensional illusion of a table top. The Greeks noticed this long ago and indeed their word for table was *trapeza.* If we examine the bottom and top edges AD and BC of the trapezoid in Figure 36, we find that they are parallel and skewed, although this time, unlike rhomboids (and as the arrows indicate), the skewing has been accomplished a bit differently. Nevertheless, the result is the same—the illusion of a rectangle.

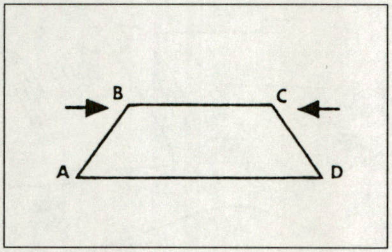

Figure 36

But now for a bit of debunking. Though some might assume that the "table top" illusion results from the narrowing of the trapezoid's sides, AB and CD, to suggest perspective, I advise that one cannot create an illusion of depth merely by copying an effect seen in nature (in this case, a plane narrowing with increasing distance). Three-dimensional illusion depends on *how the eye works* and not on *resemblance*, and the illusion of a rectangle seen here depends not on narrowing lines, but on the trapezoid's sides AD and BC being parallel and skewed. These are the perceptual factors that introduce the dynamics of reversibility and without which no illusionistic transcendence (worthy of the designation *serious drawing*) can take place.

Admittedly, in a drawing specifically intended as a representation of a table top, perspective "shrinking" would be a logical refinement. But it would be only an added grace and in no way essential to the illusion of depth. Proof of this appears in Figure 37 where the rhomboid's left and right sides do *not* converge and yet the illusion of a table top is entirely convincing.

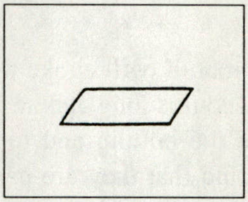

Figure 37

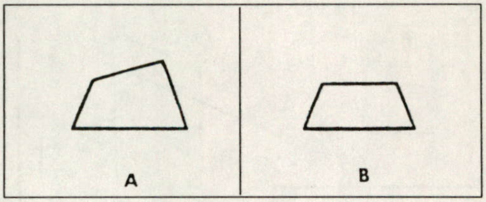

Figure 38

The two quadrilaterals in Figure 38 also point up the limitations of perspective used to create illusion. No two edges of plane A are parallel, and lacking this crucial advantage, and despite perspective convergence of its left and right sides, its right-hand edge seems to rear up in a most illusion-disrupting manner. In contrast, the top and bottom edges of the trapezoid at B are parallel, resulting in a beautifully clear table top illusion. Also (and look carefully for this subtle difference), the space surrounding the plane at B is far more forcefully evoked than the space at A. It is deeper, more unified and more convincing. This welcome bonus—the clear volume of space that always envelops a successfully realized 3-dimensional structure—is another of the many rewards of spatially ambiguous drawing.

• • •

A number of trapezoids varying in size and position appear in Figure 39. In each example, parallel sides and skewing trigger the illusion of a long plane stretching 3-dimensionally back into the diagram space. And note—*all*

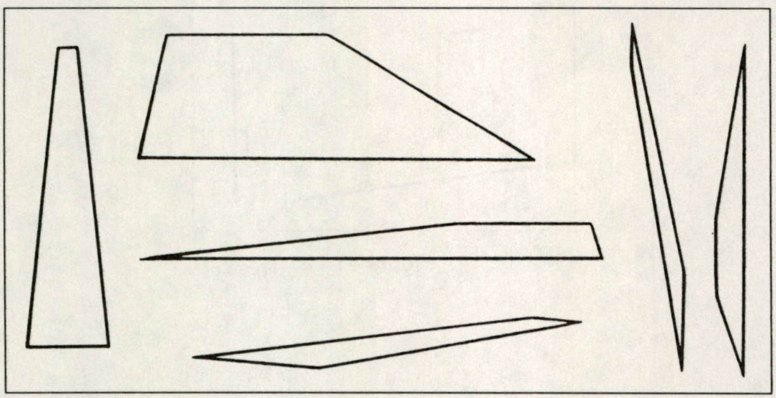

Figure 39

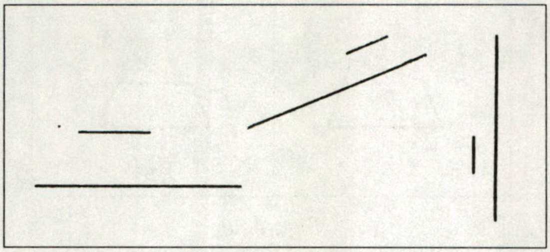

Figure 40

resemble rectangles! Our next step is to recognize that the 3-dimensionally potent parts of a trapezoid are its two parallel sides. And in each of the examples in Figure 40, we see that these sides alone will yield the same illusion of a long rectangular plane (with two sides missing, of course) that we saw in the preceding figure.

Two important facts about "trapezoid-derived" parallels can be noticed in the example in Figure 41. A shows us that the eye will instantly recognize two lines as being parallel and perceive an illusion of depth even when lines are widely separated on the page; and B demonstrates that it can perceive an enormous jump through space even when two parallels are set very close together. Again, both A and B suggest very long *rectangular* planes—A, a banquet hall-size table top, and B, the near and far ends of a long wall viewed from an oblique angle.

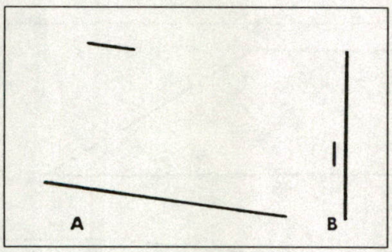

Figure 41

• • •

If we examine the details of master drawings, we discover parallel lines and parallel edges everywhere. But there is a hitch—some parallel constructions are subtle and not easily spotted. One needs familiarity with the many varieties of parallels in order to know what to look for. The following examples introduce the eye to some obvious, and some not so obvious, ways that artists use parallels.

• • •

Sketchy contour lines such as those in Figure 42 at A are often used in drawings. But the individual strokes should not be thought "sketchy" in the sense of having been set down casually. Though close together and giving the impression of a single line, the strokes here form a carefully constructed series of parallels which, by interacting, shake the line loose from the page surface and render it illusionistic.

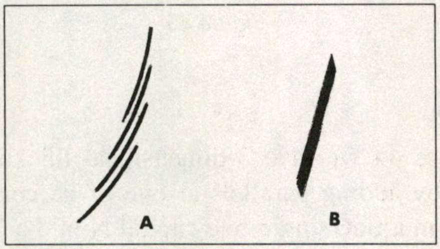

Figure 42

Then B demonstrates that, since an *edge* is the visual equivalent of a line, by carefully making the two edges of a thick line parallel, we render it 3-dimensionally active. (Notice that B is essentially a long, thin rhomboid.)

Parallels link up and influence our perception even when they belong to different structures. Two lines are designated A in Figure 43; these—the figure's shoulder and the window ledge—interact as parallels and create a 3-dimensional jump through space. A similar jump occurs between the two vertical parallels marked B. Lastly, the parallels marked C are of particular interest because whereas the spatial interval between C1, the figure's arm, and C2, the picture frame, is deep and obvious, we see no immediate difference in depth between C1 and C3 (the figure's neck). However, by turning the diagram on its right side, we immediately bring to light a "hidden" 3-dimensional jump back into space between C1 and C3—an interval as obviously deep as any other in the diagram.

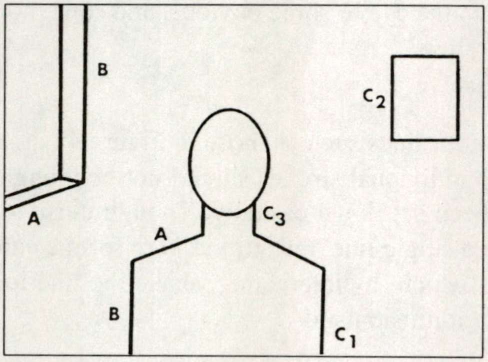

Figure 43

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At A in Figure 44 we give 3-dimensional thickness to a trapezoid-shaped "window" by adding parallels at two of its corners. At B, we use parallels to transform a flat, single-line capital N into a 3-dimensionally extended length of folded tape. And at C, two L-shaped angles create a double set of parallels that suggest the 3-dimensional illusion of one corner of a box.

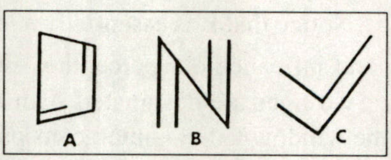

Figure 44

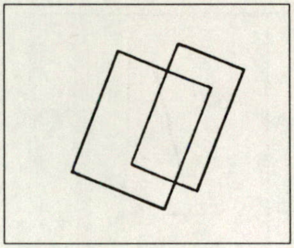

Figure 45

In Figure 45, two overlapping rectangles, their sides aligned as parallels, create a reversible 3-dimensional image wherein either rectangle can be seen floating in front of or in back of the other. Notice that the *overlapping* of the planes creates an appearance of *transparency* (an important effect in picture-making which I explore in Chapter 8).

• • •

As I have suggested, no parallel structure, however subtle, escapes the eye. For instance, the wavy line in Figure 46 seems anything but parallel to the nearby straight line. Yet at five (!) different locations along its winding course (indicated by arrows) portions of the line *do* briefly run parallel to their straight line neighbor opening up an interval of depth between them. The result is a thoroughly 3-dimensional "picture" (perhaps of a river flowing close to a straight stretch of highway lying just beyond).

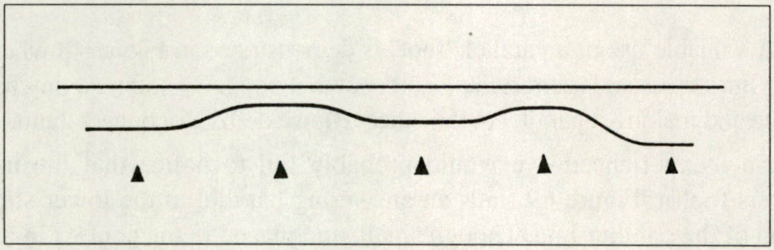

Figure 46

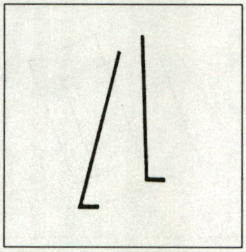

Figure 47

The diagram in Figure 47 suggests the legs and feet of a stick figure. (I always think of a tiny segment of line as a "foot.") However, where 3-dimensional devices are concerned, size means nothing, and we find that a tiny "foot" made parallel to a second line—in this case, the other foot—can effectively separate them depth-wise.

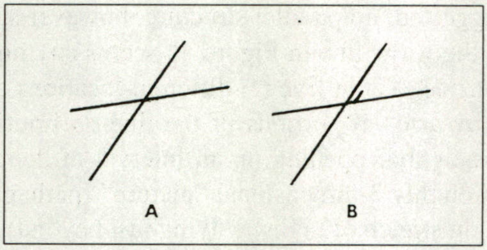

Figure 48

A valuable use of a parallel "foot" is demonstrated in Figure 48 where, at A, two lines cross and seem stuck together at that point. By adding a tiny foot to one line and making it parallel to the other (B), we deftly disconnect them.

An inexperienced eye would probably fail to notice that the inconspicuous foot in Figure 49 finds an answering parallel in the lower straight portion of the contour line. Though small, and placed in the context in a way that does not immediately suggest parallels, the tiny foot works with its partner to heighten the illusionistic impact of the diagram every bit as effectively as would any larger, more obvious parallel.

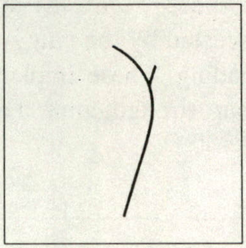

Figure 49

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The following series of diagrams suggest ways parallels may be used when drawing the features of the face and other parts of the human body.

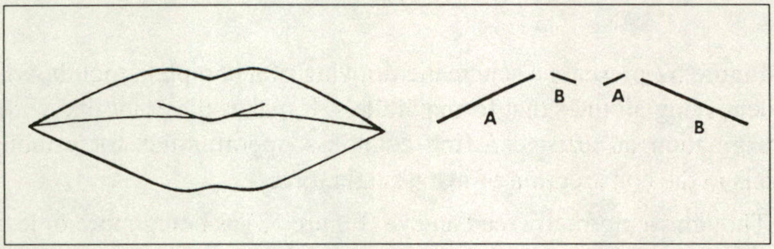

Figure 50

A drawing of lips appears in Figure 50, and next to it, we see the underlying scheme of parallels that guided the shaping of the upper lip contour. Though we tend to perceive a frontal view of lips as stretching more or less flatly across the page, the parallel pairs (AA and BB) secretly energize the drawing with hidden readings of surprisingly long and deep 3-dimensional

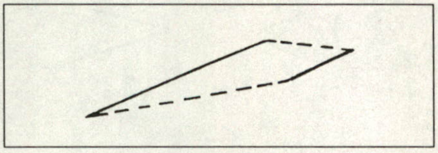

Figure 51

jumps through the diagram space. Figure 51 shows us the long, 3-dimensionally extended plane suggested by the pair AA; and, needless to say, the pair BB offers a similar reading. These implanted "hidden" images build tensions within the lip contour, strengthening it as a 3-dimensional form and bringing it closer to beauty.

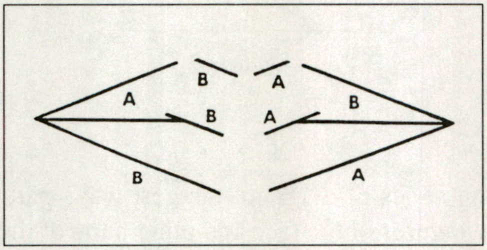

Figure 52

Figure 52 presents a schematic drawing of a complete mouth, with letters identifying all lines that form parallels. It makes the point that with a little imagination an artist can find countless opportunities for establishing parallels in the construction of just a single form.

Though we normally read an eye (Figure 53) as being more or less flatly positioned on the front of the face, here we have shaped it to suggest a rhomboid such as the one pictured at B. This creates the anything-but-flat illusion of a table top. Built into the structure of the eye, this hidden reading increases the 3-dimensional and aesthetic power of the drawing.

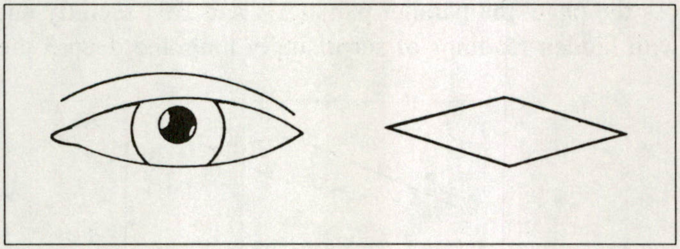

Figure 53

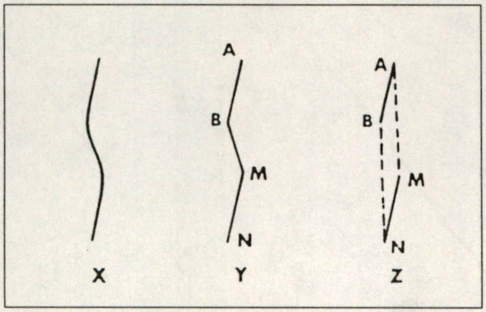

Figure 54

With just one stroke of the pencil, an artist can create a line (X in Figure 54) composed of three distinct parts two of which—the first and the third—will be parallel. For obvious reasons, I call such a line an S-curve. The three-segment line at Y simplifies X to show its parallels clearly. The first and third segments (here labeled AB and MN) give the line reversibility and shake it loose from the page surface. The rhomboid at Z, incorporating segments AB and MN, helps us see not only their reversibility but also the hidden reading of a long spatial jump that can be found in all three structures.

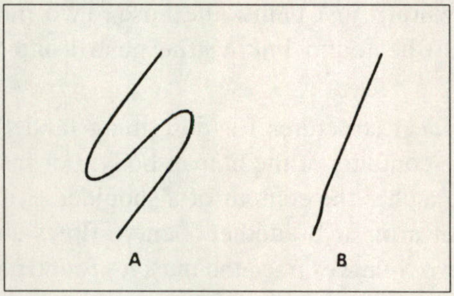

Figure 55

Two quite different kinds of S-curves appear in Figure 55. The first, A, is broadly drawn with quite obvious parallel parts; but B is so subtly curved at its lower end that its parallel structuring almost escapes notice. But again, in these matters size bears no relation to strength, and in both cases the S-curve construction fully 3-dimensionalizes the line.

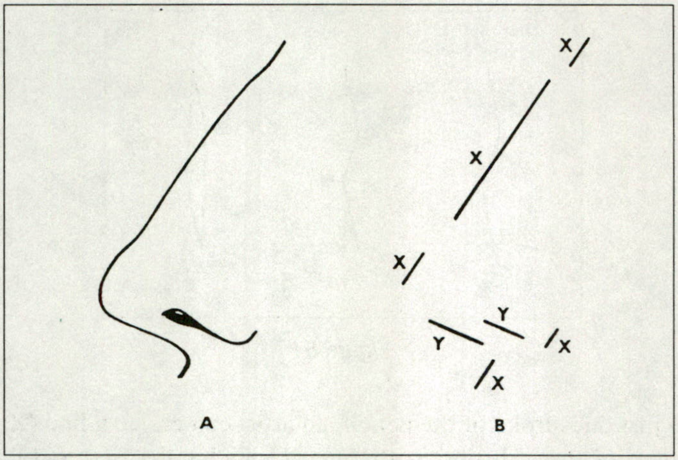

Figure 56

S-curves contribute both illusionistically and aesthetically to the construction of the nose at A in Figure 56. Three parallel segments occur along the contour defining the nose from its bridge to its tip. In schematic diagram B, the letter X identifies these parallel parts. And notice also the additional "X" parallels formed by the short upturn at the right end of the nostril and the downturn just below the nose. Two more parallels (each marked Y) can also be found linking the nostril and the bottom of the nose.

S-curves are ideal structures for describing (and aesthetically supercharging) the subtle contours of the human body. For instance, at A in Figure 57, an S-curve catches the contour of a shoulder as it travels downward to become the upper arm; at B another S-curve flows along the curve of a forearm; and at C two S-curves trace the muscles found along a thigh.

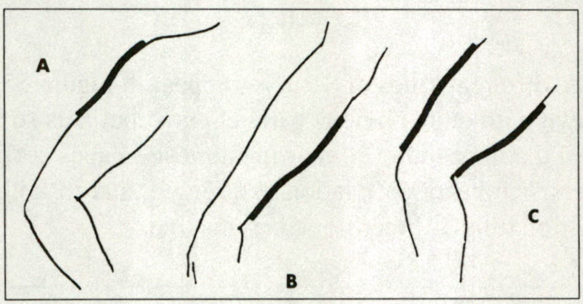

Figure 57

A group of hatched lines creates a series of parallels. Each individual line will then be reversible with both its immediate neighbors and all the other lines. These interactions allow a hatched area, like the one at A in Figure 58, to drop back 3-dimensionally in the picture space. Hatching thus can give valuable assistance to the artist who wishes to open up a 3-dimensional background behind the forms depicted. Worth noticing is the fact that the action of the parallels detaches the cylinder (B) from the "background" hatching where it meets the cylinder's left-hand edge.

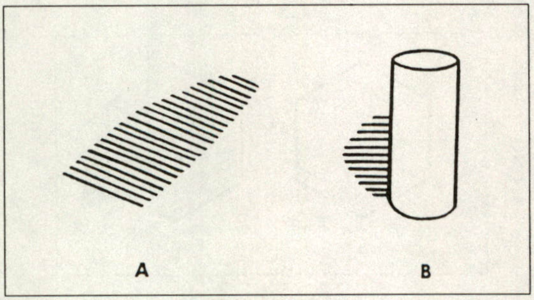

Figure 58

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One act constantly recurring in painting and drawing finds the artist placing a new line somewhere within the contour of a form already established. Ideally, the result should enhance, and not detract from, the form's appearance of roundness. One excellent strategy, therefore, is to make the new line parallel to some part of the surrounding contour. For example,

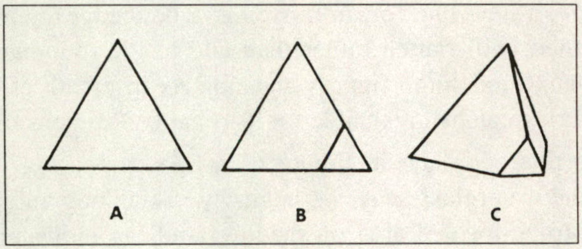

Figure 59

when we place a new line inside the triangle shown at A in Figure 59, we draw it parallel to the triangle's left side (B). This transforms the flat plane figure into a 3-dimensional solid. Rotating the form slightly (C) helps us recognize its new thickness. (And incidentally, a reversed reading of B yields the 3-dimensional illusion of a long, triangular-shaped tunnel.)

Similarly, when adding a new line to the hexagon shown at A in Figure 60, we draw it parallel to two of the sides (as at B) and a strong 3-dimensional image emerges.

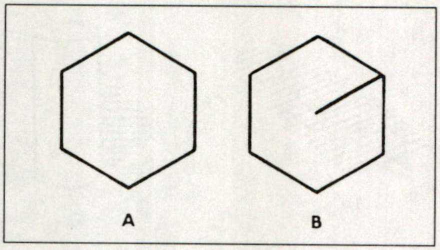

Figure 60

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Darkening one side of a form to create an effect of light (the technique of *chiaroscuro*) should always be thought of as creating not one, but *two* illusions—that of *light* and also that of *3-dimensional roundness*. This caution is necessary because as we *shade* a form, we create an *edge* (where light meets shadow), and, whether formed by hatching, smudging, erasure or whatever, that edge will inevitably be read as a line. And, since *line determines structure*, a new line (or, in this case, a new edge), poorly drawn or poorly positioned, will flatten rather than add to the roundness of a form. Therefore when "modeling" figures and objects to create effects of light, parallel structuring can be invaluable for its reliable 3-dimensionality.

We take this approach in Figure 61 where, preparing to darken the right side of the waterglass at A, we begin by visualizing an optimum edge for the about-to-be-formed area of shadow; and (as indicated by the line added at B) we plan it parallel to the glass's right-hand contour edge. This

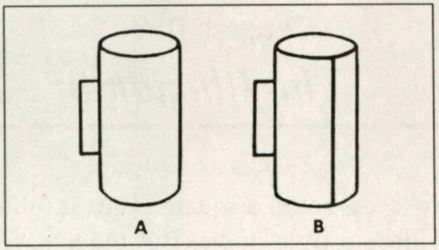

Figure 61

gives the illusion of a 3-dimensionally curving plane. At this point, as far as 3-dimensional solidity is concerned, our work is already done! Whether or not we go on to darken that plane to "model" the form, the new line all by itself gives the glass a thoroughly rounded appearance.

In another example, we want to create the illusion of light falling on the form at A in Figure 62. At B, we darken part of the shape in such a way that the area catching light suggests a rhomboid. Its two pairs of parallels (emphasized at C) give that area reversibility—the predominant reason why our "modeling" has convincingly rounded the form.

Modeling figures and objects to suggest the fall of light is of course a traditional (and wonderful!) technique in painting and drawing. But despite the connotation of sculpting implied by the word "modeling," we cannot consider it a dependable means of creating 3-dimensional illusion. Simply darkening one side of a form without relating the newly created "line" (the edge where light meets shadow) to its contour in a solidly structural (spatially ambiguous) way, will yield a 3-dimensionally weak, or sometimes totally flat, image.

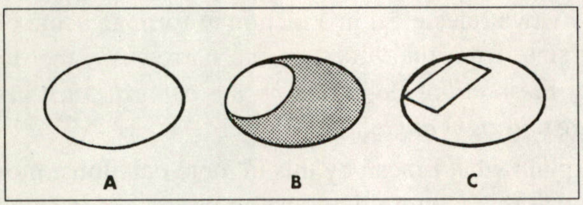

Figure 62

Chapter Three

The Illusion of a Right Angle

A cube has six faces—each a square. Thus it follows that every angle found on a cube will be a right angle. But though we *perceive* all of the angles of the cube in Figure 63 as right angles, in fact only eight have been drawn as true 90 degree angles. The remaining sixteen are either acute or obtuse angles so drawn as to create the impression of a 3-dimensional solid. And the strategy works—every face of the cube appears to be a square and each acute and obtuse angle creates *the illusion of a right angle*.

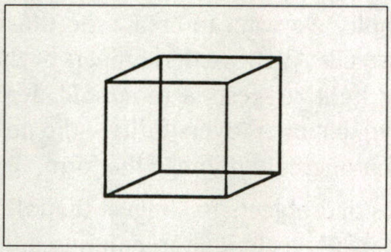

Figure 63

Because we are willing to see acute and obtuse angles as right angles, this illusion becomes of enormous importance in painting and drawing. Pictures are, after all, full of angles of all sizes, and each may potentially be seen as a right angle. Focusing on this possibility, artists exploit it in the following way:

When *any* two lines meet in a picture to form an acute or obtuse angle (of whatever size, from the widest to the narrowest), the drawing of that angle, *besides the reading suggested by the context*, must also include *the hidden reading of a right angle.*

I will explain what I mean by this in more detail in a moment, but first I must stress that this is more than just an option—it is an absolute necessity—a law. Every angle not only can, but *must* contain this illusion. The urgency stems from the requirement that *everything* in a drawing must be spatially ambiguous (meaning, of course, reversible). This would include the relative positions of the legs of each angle; and *the proof that an acute or obtuse angle is reversible is when we can find in it the unmistakably clear illusion of a right angle.*

• • •

Let's clarify what is meant by a *reversible* angle. The angle at A in Figure 64 is reversible because we can see it in either of two positions in space—that is, either leg could be the near or far leg. To make these alternative readings more obvious, the legs of the angle at B have been thickened so that it now resembles a folded length of transparent tape. Then, making each leg in turn opaque, we reveal the two readings—at C, the left leg is nearer and at D, the right leg is nearer. Looking back now at A, it should be clear that the legs of this angle can be seen in either of these two positions or, in other words, is reversible.

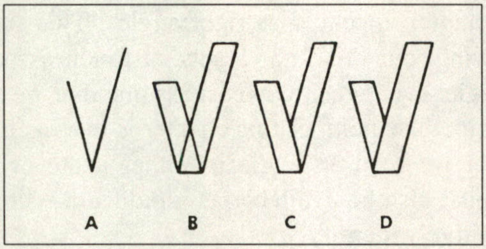

Figure 64

In a picture, the perceived size of any particular angle turns out to be quite flexible. For example, angle ABC in Figure 65 is an acute angle, but its context makes it appear as a fairly wide, obtuse angle. On the other hand, the very wide, obtuse angle CDE collapses in our perception to a 90 degree angle. And BCD and DEA—both acute angles—expand to look like right angles.

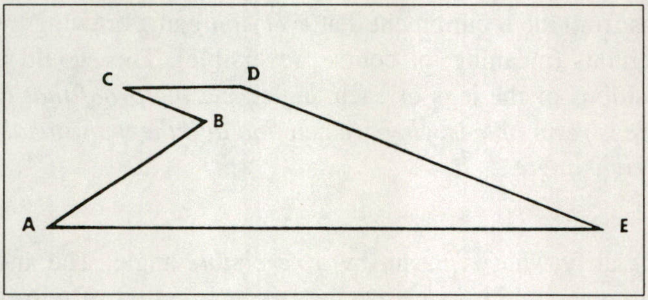

Figure 65

Thus, our perception of the size of an angle depends, not on how we actually draw it, but on its context; and, as we see in this example, the right angle reading often steps forth as an eager candidate.

That we so readily choose the specific reading of a 90 degree angle from among the many (in fact, infinite) possibilities offered by an angle is noteworthy. Recall that when we looked at the cube earlier, all sixteen of its acute and obtuse angles appeared as right angles. This suggests that when we look at a drawing, our mind has a special fondness for interpreting an angle as a right angle, even when we must assume that we are seeing it from an oblique viewpoint. The point of this chapter is that even when the picture context *insists* that we read an angle as either acute or obtuse, *a "right angle"** reading must also be available as a hidden possibility that one can search out and positively identify.

• • •

Each angle in a picture must be reversible so that it can function as a 3-dimensional "letter" in the alphabet of illusionistic drawing. If it is not reversible, it will be flat and therefore unacceptable. But just because two lines come together on the drawing page does not mean that the angle they form will necessarily exhibit reversibility. Some common errors (which I shall discuss presently) can interfere with an angle's reversibility and the artist must prevent these from happening. But how can one be certain that an

* Here and elsewhere, "right angle" (thus in quotes) should be read as *illusion of a* right angle.

angle is (or is not) reversible? That question is answered by subjecting the angle to the *"right angle" test for reversibility*, based on the fact that any angle that contains *the illusion of a right angle* will be reversible. One asks the question—is this angle creating the unmistakable illusion of a right angle? If one finds a *clear* and *flawless* right angle illusion (which may be either the obvious or the hidden reading) all is well—the angle is reversible and, most important, 3-dimensional. On the other hand, if there is *any doubt whatsoever* on this issue, one must conclude that the drawing of that angle is flawed and in need of correction.

At this point the reader may be wondering what is so difficult about drawing two lines to form an angle, even given the condition that it must contain the illusion of a right angle. What can go wrong? If the reader will be patient, I shall answer this question presently, but because applying the right angle test is a subtle matter that requires some mental discipline, we need some instruction on how to spot the right angle illusion in an angle whose context demands that we read it as an acute or obtuse angle.

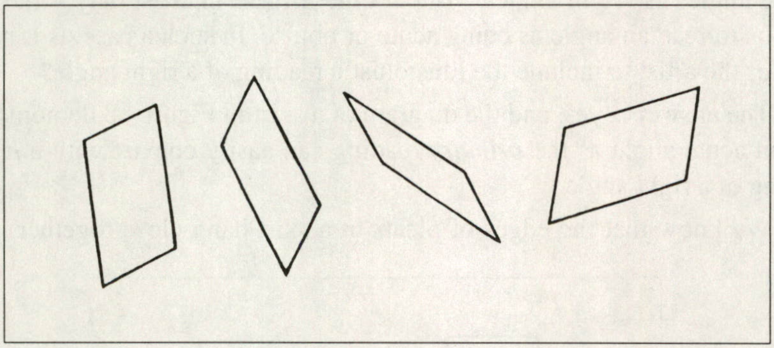

Figure 66

Our task is to ignore the context of an acute or obtuse angle and instead focus specifically on recognizing the "right angle" reading hidden within. The best way to bring this reading forward is to imagine the angle as one corner of a familiar rectangle (for instance, a sheet of typing paper) whose plane is oblique to the plane of the page. In a drawing, such a rectangle would be represented by a rhomboid, similar to the four rhomboids that ap-

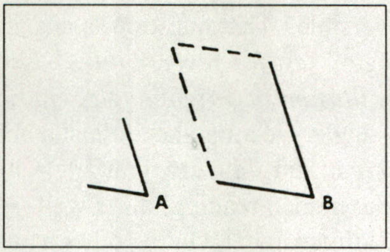

Figure 67

pear in Figure 66, each of which creates the illusion of a rectangle. An angle being tested (such as A in Figure 67) should resemble one of the "right angle" corners (such as B) of this kind of illusionistic rectangle. If it does not, the comparison will disclose the flaw. Finally, I should like to make one more important point, and then I will discuss the nature and appearance of flaws that prevent angles from exhibiting the right angle illusion.

When an artist draws a cube, he or she intends that we see its acute and obtuse angles as "right angles." But at other times, an artist may sometimes want us to read an angle as being acute or obtuse. In such a case, is it necessary for the artist to include the illusionistic reading of a right angle?

The answer is yes, and the diagram of a skirt in Figure 68 demonstrates that an acute angle as the *primary* reading can easily coexist with a *hidden* reading of a right angle.

We know that the edges of pleats in a skirt hang close together. Thus

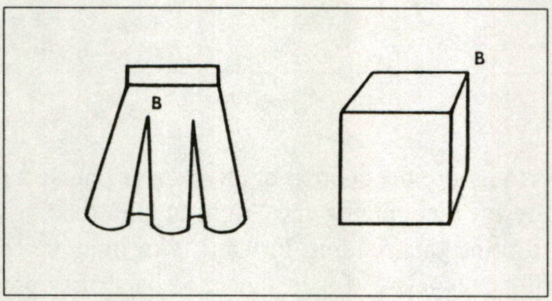

Figure 68

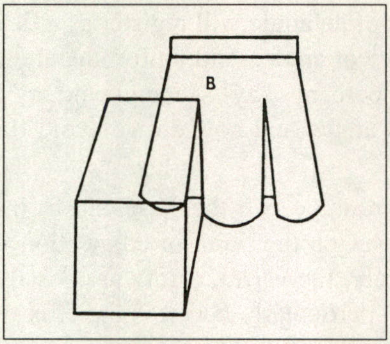

Figure 69

we read the angle B as an acute angle. But B also contains a hidden "right angle" reading similar to the angle B in the adjacent diagram of a box. By combining the skirt and box into a single diagram (Figure 69) we give both readings the opportunity to be the primary or "obvious" choice and we see that neither reading precludes the other.

The angle ABC in Figure 70 presents another example of a "right angle" reading hidden this time within a very wide obtuse angle describing the pages of an open book. But repeated at Y in a different context—the corner of a sheet of paper tilted in space—ABC immediately registers as a right angle.

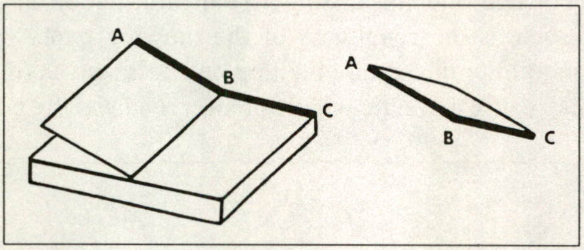

Figure 70

• • •

But now the crucial question: how does one draw an angle that will *unmistakably* evoke the illusion of a right angle? Because the slightest inaccuracy in the drawing of an angle will register as a flaw, even the best of artists may draw a deficient angle. And, unfortunately, there is no such thing as an angle that is 99 percent okay—an angle either "works" or it does not. But, what is a flawed angle, and how do we avoid flaws and, if necessary, correct them?

Having drawn an angle, we then evaluate it by means of the "right angle" test. This focuses on the point of connection where the two legs of the angle meet—namely, the *vertex*, a tiny area easily overlooked, and yet (and the expression is particularly apt) it is the crux of the matter. Here the eye picks up precise bits of visual information—perceptual cues, so to speak—that tell us whether or not an angle is functioning 3-dimensionally. A fundamental fact about drawing is that as our eye follows a straight line, it expects that line to continue along a straight course. (And similarly, it expects a curve to continue along with the same amount of curvature with which it began. I discuss this expectation more explicitly in Chapter Five.) Unforgivingly scrupulous, the eye reacts to the tiniest deviation from a line's anticipated course as a flaw that flattens the illusion of space at that point.

Naturally, where hundredth of an inch precision is required, things can easily go wrong in the fashioning of a tiny structure such as a vertex. Uncertainty in the hand that holds the pencil (or brush), carelessness, hastiness, or a fuzzy, inexact mental image of how the two legs of the angle should meet, can result in botched and misleading visual information at that point. A simple factor such as the roughness of the drawing paper (even when it seems fairly smooth) or the texture built up on one's canvas from previously applied paint can cause a minute wiggle or swerve just at the point where the

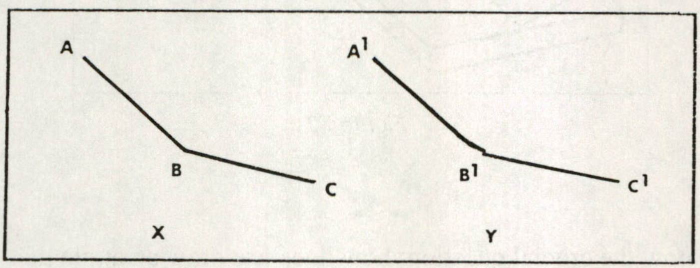

Figure 71

legs of the angle join. Though tiny, such an error will negate the angle's 3-dimensional effectiveness just as surely as would an error of gross size.

Let's compare a correct and a flawed angle. Think of the angle ABC in Figure 71 at X as a simple line that bends at a point B and sets off in a new direction. This vertex "works" because it clearly creates the illusion of a right angle (resembling one corner of a sheet of typing paper). Leg A^1B^1, however, wanders slightly (see Y) just at the point where it angles off to become B^1C^1, and the minute deviation results in a flawed vertex at B^1 which clearly does not resemble the perfect rectangular corner of a sheet of typing paper and, as a result, is 3-dimensionally weakened.

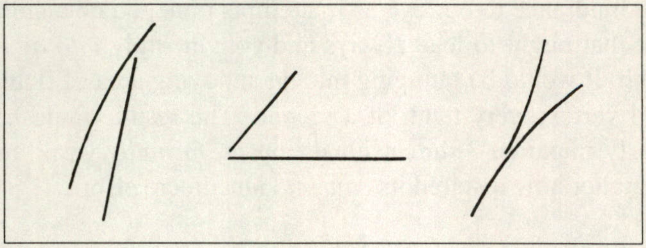

Figure 72

Besides a poor connection at the vertex, a second kind of error may occur wherein the legs of an angle fall just short of connecting. The information at the vertices of the three angles in Figure 72 is, for this reason, inexact, confusing and illusion-destroying. Look carefully—the flaws are subtle

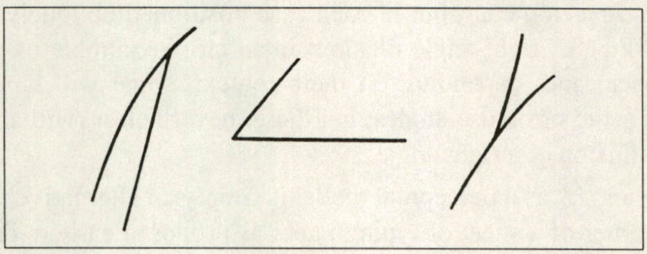

Figure 73

ones. Then compare these with the three corrected vertices in Figure 73 where the connections are complete—each is unmistakably improved and its right angle illusion firmly established.

• • •

As I mentioned earlier, when two lines meet on a drawing page, they do not automatically produce an acceptable illusionistic angle. Now, I must put that a bit differently—they might or they might not. But in a picture, lines meet and cross to form angles everywhere. Therefore, a conscientious artist cannot leave so serious a matter as the condition of perhaps hundreds of vertices to chance. Should fifty percent of the angles in a picture be improperly drawn, their sheer numbers would make them a continuous and bothersome hindrance to our eye as it attempts to negotiate angular changes in direction that ought to lead always and convincingly *into and out of* the picture depth. It would be bumping into an annoying area of flatness caused by a flawed vertex every tenth of a second. The result would be a picture with seriously impaired 3-dimensional impact, *formally* weak, and for this reason, no matter how inspired its *content*, a mediocre effort.

• • •

The letters L and T are each structures made up of two lines that meet at a right angle. This makes them excellent conceptual models with which to compare the vertices of acute and obtuse angles as a means of determining the presence (or absence) of the right angle illusion. In other words, if the vertex of an angle looks like an L or a T *seen from an oblique viewpoint*, then the drawing of that angle is a working illusion.

Thus in Figure 74, we see first (at A) a true 90 degree L angle. Then B, C and D also resemble Ls, but in each case positioned obliquely. One may of course draw "L" right-angle illusions in an infinite number of tilted positions in space; and, depending on their context, some will have primary readings of acute or obtuse angles; but these, nevertheless, will also contain the hidden illusion of a right angle.

Using an "L" as a perceptual model is simply an alternative to using an imagined corner of a sheet of typing paper as proposed earlier. The "T," on the other hand, is the more appropriate model in those instances where one of the legs of the angle continues beyond the vertex. Figure 75 illustrates this situation with a number of Ts drawn as they would appear tilted to various oblique attitudes in space. Though, as drawn on the page, the angle sizes vary, the same illusion of a 90 degree angle can be found in each.

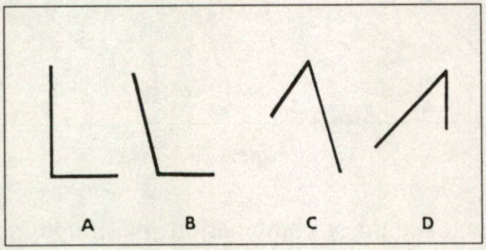

Figure 74

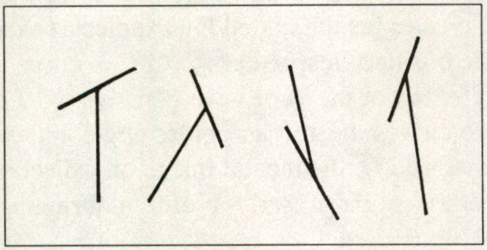

Figure 75

• • •

Drawing has little to do with geometry, but it does borrow certain geometrical terms for their descriptive value. For instance, we say that a painting or drawing contains "angles" and that these angles have "legs." And though one would not ordinarily think of *curved* lines as the legs of angles, it is a visual fact that two curves can meet on a page and form an angle. Remember that when testing an angle, we are only interested in that tiny part where its two legs meet, and in so small an area it makes no difference if the lines are curved or straight; the right angle illusion, the "T" or "L," can nevertheless be present at the vertex.

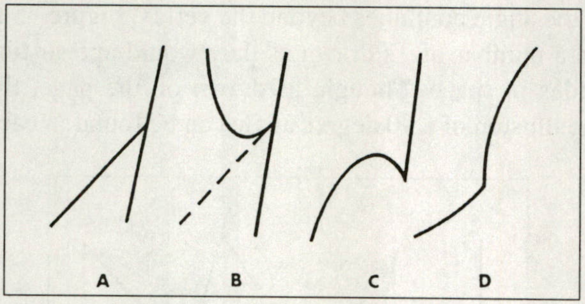

Figure 76

Four vertices made up of combinations of straight and/or curved lines appear in Figure 76. Though it may not be immediately obvious, the vertices at A and B are, for our purposes, identical. At the vertex of A—the joining of two straight lines—we see a "T" reading; then B, the meeting of a straight and a curved line, creates (as the dotted lines indicate) exactly the same "T" in exactly the same position in space as A. At C, a curve and a straight line form an acute angle, but at the vertex we perceive a 90 degree "L" angle. And last, at D, two curves meet at an obtuse angle and create an "L" right angle. In examples C and D, the mental image of a sheet of paper (with one or two *curved* edges) is particularly useful in bringing the right angle "corner" illusion to light.

Two more uses of the "T" model are well worth noting. In the first example (Figure 77 at A), a short straight line meets a *curve* and, at the connection thus formed, we see an unmistakable 90 degree angle "T." Then at B, the line meeting the curve is itself a curve, but since we are only con-

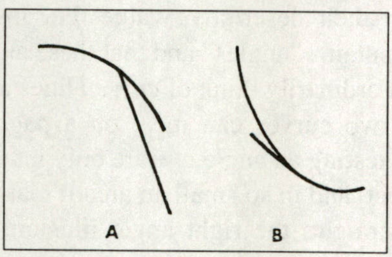

Figure 77

cerned with the point of connection, we have no difficulty recognizing the "T" created at that point.

• • •

The illusion of a right angle is a fascinating and powerful drawing phenomenon. Our eye is willing to identify any angle in a painting or drawing, be it wide or narrow, as a 90 degree angle tilted in space. In a context where this reading would be inappropriate, we simply ignore it in favor of a more suitable alternative; but the right angle reading does not retire meekly. In the characteristic manner of hidden readings, it struggles to assert its presence and thus contributes to the overall sum of perceptual tensions energizing the form of which it is a part.

Why the right angle illusion is so deeply ingrained in us, and so persistent a mode of perception when we look at pictures, are matters which, in these pages, we cannot and fortunately need not resolve. It does seem logical, however, that over the eons the ability to recognize right angles *from any viewpoint* would be a useful, and therefore inevitable, development. Then, too, the fact that in modern life we are surrounded by an enormous number of rectangular artifacts must undoubtedly contribute to a further strengthening of this perceptual response.

It may also be true that the eye, quite at home and proficient in its everyday 3-dimensional surroundings, finds itself, upon entering the illusionistic space of a painting or drawing, in rather strange territory. Seriously deprived of the wealth of clues ordinarily available for accurate appraisal of what and where things are, (particularly, bifocal vision) it scouts through this new and uncertain terrain struggling to make sense of the lines and planes it encounters and the forms they seem to suggest. In this circumstance, the eye must fall back upon both its instinctive and learned patterns of organization and impose these as suppositions upon the data it gathers. One of its strategies—the speculation that an acute or obtuse angle might well be a right angle—is clearly a favorite. Therefore, with careful drawing that *encourages*, and importantly, *does not subvert*, this interpretation, an artist can capitalize on this powerful perceptual bias.

I find it particularly significant that one of the most dynamic stylistic innovations in twentieth century art has been given the name Cubism. The cube and the right angle are intimately connected, the right angle being in a sense the germinal concept out of which the shape of the cube emerges. Thus the cube, as drawn, and, in particular, the illusion of a right angle at many of its corners, take on a special significance in the visual arts. In a sense, Cubism may be understood as a style that specifically focuses and elaborates upon the enormous aesthetic potential of the right angle illusion in picture-making.

• • •

Whichever style an artist chooses, the right angle illusion puts the energy of ambiguity at his or her service. And I must also mention the logical and equally valuable extension of this approach, which is that not only must an artist envision all lines as meeting at "right angles," but also insure that every two adjacent *planes* embody the illusion (obvious or hidden) of standing at right angles to each other. The two diagrams in Figure 78 illustrate planes set at right angles to each other—the two gray faces of the cube (or any of its two adjacent faces, for that matter) and the face and edge of the coin. In both cases, we perceive the acute and obtuse connections as planes standing at right angles.

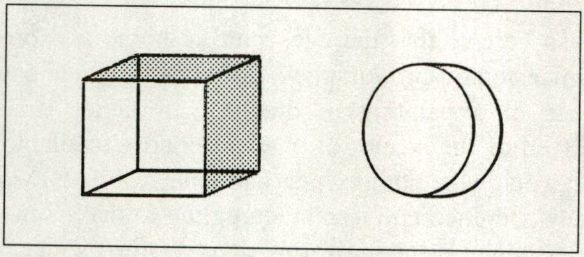

Figure 78

Needless to say, should the eye prefer to read two planes in a picture as *not* being at right angles to each other, the "right angle" reading will simply go underground. This happens in Figure 79, the diagram of an open book we saw earlier. Notice that at X we do not read the planes ABCD and BEFC as standing at right angles to each other. Nevertheless, as Y reveals, that reading exists as a latent possibility, its presence essential for maximum tension.

Systematic structuring of "right angles" where *all* lines and planes join is a powerful theme in art. Careful study reveals its omnipresent use as a drawing device in every masterful style of painting and drawing throughout history, including its inevitable and blatant flowering in modern-day Cubism.

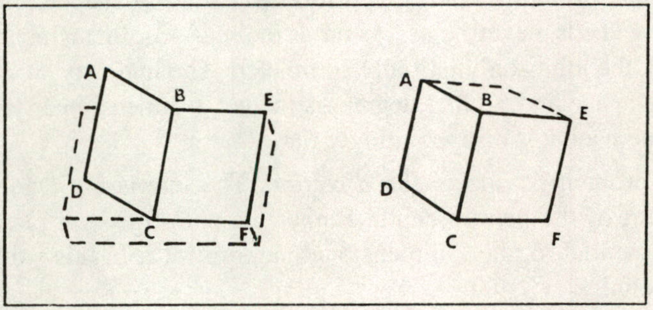

Figure 79

Chapter Four

Steering

Sometimes a line may be perfectly drawn but still need a particular kind of help. Though accurately positioned, carefully shaped and just what the drawing needs, nevertheless, as far as the line's 3-dimensional strength is concerned, the job is only partially completed. The line may sit well back in the picture space and, to that degree, is indeed 3-dimensional; yet we sense that in some way, it is disappointingly flat.

The problem is one of flat *direction.* The line is not leading the eye into and out of the picture depth. Rather, its path travels a plane set back from, but parallel to, the 2-dimensional page surface. In this way, it, too, is 2-dimensional.

The edges of the rectangle in Figure 80 illustrate this subtle brand of flatness. Set back in the diagram space (a partial 3-dimensional effect), its outline is at all points equidistant from our eye and exhibits no variation in depth. If such a rectangle were used in a picture to represent, let us say, a doorway, its "flat" positioning would make it fall short of the full 3-dimensional effect we hope to achieve. *Horizontal* and *vertical* lines such as we see here are often deficient in this matter of direction. So named because they run parallel to the edges of the page (which are 2-dimensional), horizontals and verticals tend to lock into matching 2-dimensional positions with the result that their direction reads "flat."

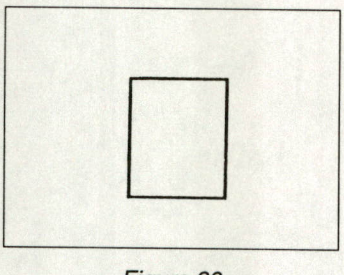

Figure 80

We see the difference between 2-dimensional and 3-dimensional direction (or "flow") in Figure 81 where, at X, lines AB, BC and BD express the cube's three dimensions of width, height and depth, respectively. When we separate the three lines (Y), we see that the horizontal AB and the vertical BC are "flat" lines, meaning that they travel 2-dimensionally *across* and *up and down* the diagram space, respectively. The diagonal BD, on the other hand, flows in an obvious 3-dimensional direction that leads our eye into and out of the diagram space—a more illusionistic, and thus a more exciting, course.

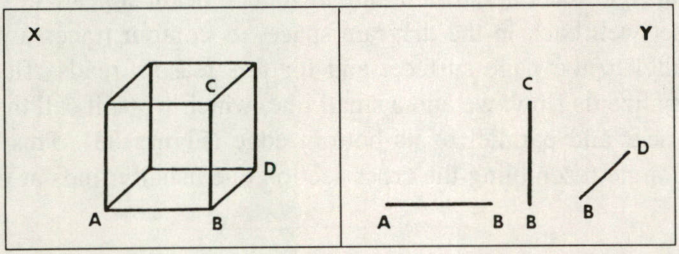

Figure 81

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Picture-making challenges us to create more than just a *passable* illusion. A picture ought to be as dynamically 3-dimensional as possible. Therefore any kind of flatness is unwelcome. A line that stands back in the picture space but is restricted to a flat direction, is not just a passive, half-strength element; it becomes an active detriment to the illusion of depth the artist wants us to see. It interrupts our exploration of the imaginary picture "place" as though we had hit a bump—some visual deadwood—that causes our eye to stumble. Movement in or out is suddenly shunted sideways, and instantly, the surrounding context flattens out and the bubble of illusion bursts. But we need not despair of this situation because we have a remedy. We can redirect such a line's 2-dimensional flow and guide it into a new 3-dimensional direction. We do this by means of the method I call *steering*.

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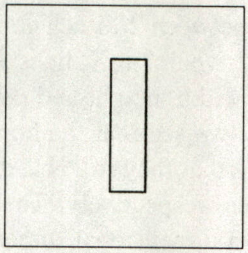

Figure 82

An upright rectangle resembling a wooden beam appears in Figure 82. Though set well back in the diagram space, its contour traces a plane that runs parallel to the page surface, and for this reason, reads "flat." To 3-dimensionalize its flow, we add a small line, which we will call the steering element, near and parallel to its bottom edge (Figure 83). This creates a small rectangle resembling the cross section one usually finds at the end of

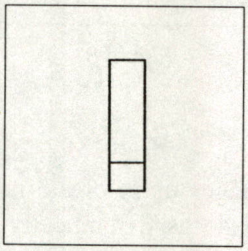

Figure 83

a wooden beam. This new visual information alters our perception so that we now see the beam tipped backwards in space as though it was lying on the ground, cross section end pointed toward us. Formerly upright, its vertical sides now tilt back into the picture space in a new 3-dimensional direction.

We can steer a horizontal "beam" the same way that we steered the vertical beam. Both ends of the beam at A in Figure 84 seem equidistant from us; but by adding a short line parallel to one of its ends (as at B), we pivot the beam to a new 3-dimensional position. Its right end is now turned toward us and its left end has retreated. This gives the beam a "near to far" 3-dimensional flow.

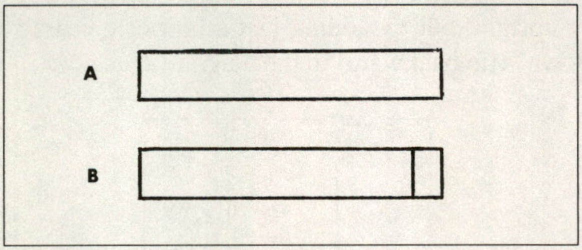

Figure 84

When we steer these "beam" rectangles, we are in fact steering *planes*, and if we compare the top row of plane figures in Figure 85 to the bottom row, we see that a plane *of any size or shape* can be turned into a new 3-dimensional direction by giving it a "cross section" or "edge." And we see that the strategy works equally well with planes that have *straight* or *curved* contours.

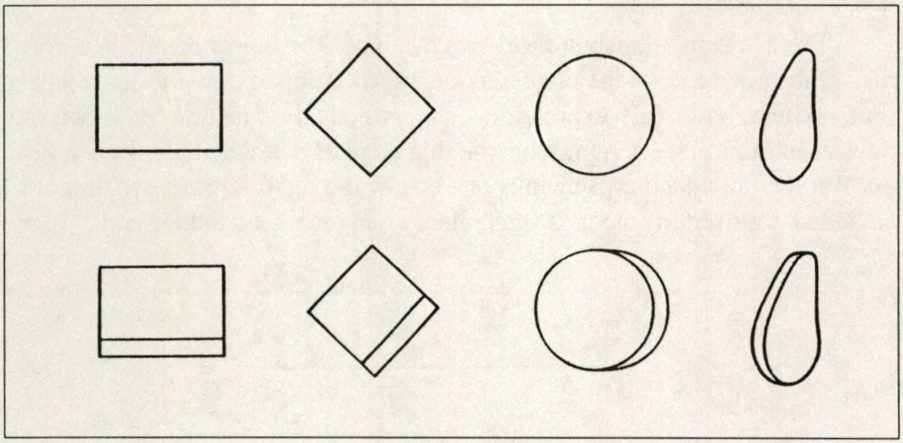

Figure 85

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If we keep the notion of a "cross section" in mind, we should have no difficulty recognizing the somewhat reduced, but unmistakable, cross section "signal" illustrated in Figure 86. The single vertical line at A stands 2-dimensionally upright, but by adding just a hint of a cross section (B), we make it "lie down" (tip backward) in the diagram space.

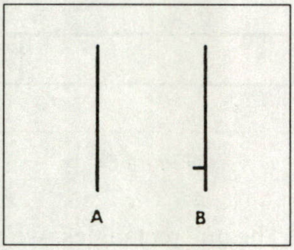

Figure 86

In Figure 87, we shift the direction of a horizontal line (A) by adding a short line segment near its right end to signal "cross section" (B). Now eye movement along the line carries us back from the cross section to a point deeper in space.

The eye scrupulously notices and evaluates the tiniest details in a drawing. Thus a mere dot—the cross section signal stripped down to its smallest, (but no less powerful) expression—can effectively function as a steering device. In Figure 88, A represents the thin edge of a wooden plank seen head on. But the dot added at B swings one end of the plank toward us. And at C, an added dot similarly steers a single line, giving it a near and far end.

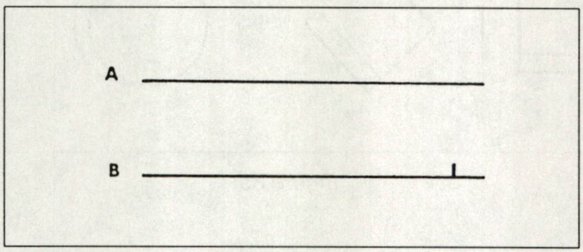

Figure 87

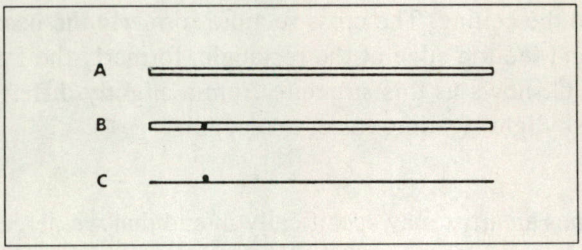

Figure 88

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Because we use the technique of steering to heighten a form's 3-dimensional impact, we can rightly suspect that spatial ambiguity must play a part in the process. This means that when we create a cross section, it must be a *reversible* cross section (which is why we used parallels in some of the examples). And, if we are successful, not only the cross section, but the entire structure will be reversible. To be honest, I reported only half the facts when I said earlier that steering an upright rectangle tips it *backwards* in space—in fact, it also tips it *forward.* This two-fold reading is apparent in Figure 89 where A shows us a long upright rectangle; then B adds a cross section that transforms the "flat" rectangle into a solid beam with its bottom end near us. But by making the steering element parallel to the rectangle's bottom edge, we insured that the cross section plane would be a reversible structure. As a result, the entire beam becomes reversible and, examining it carefully, we can find a reversed reading of B that resembles a long, narrow

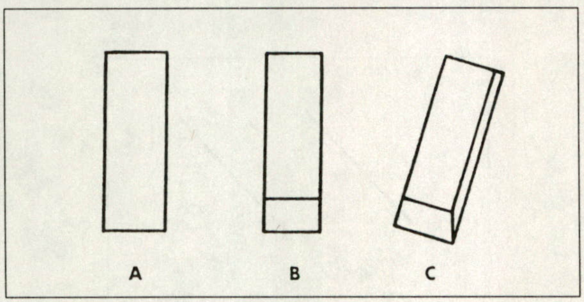

Figure 89

skylight set in the ceiling. The cross section, formerly the near end, is now the far end; and the top edge of the rectangle, formerly the far end, is now the near end. C shows us this structure from a slightly different viewpoint making B's "skylight" reading easier to recognize.

• • •

Sometimes an artist may specifically intend that we perceive a *vertical* line in a drawing as following a "flat" course. A vertical depicting the edge of a doorway would be a good example of a line intended to be understood as firmly upright and not tipped backwards in space. Similarly, the horizontal bottom edge of a window seen head on would not be intended as having a near and a far end. Nevertheless, in either case, we would give the line an additional *hidden* reading of 3-dimensional flow in order to bring it to full 3-dimensional and aesthetic strength; and, as we have learned, the hidden reading will not interfere with a strictly horizontal or vertical interpretation, it will merely "go underground" and there secretly infuse the line with extra tension.

• • •

Unlike the horizontals and verticals in a drawing, *diagonals* can usually (though not always) lead the eye in a 3-dimensional direction without the aid of steering. Nevertheless it often happens that the flow of a diagonal needs *refining* because it is not pointing in the precise direction needed to accurately describe the form being depicted. In such a case, steering enables the artist to shift the line into a new, more desirable 3-dimensional position.

The diagonal at A in Figure 90 (which might be a stick) already points

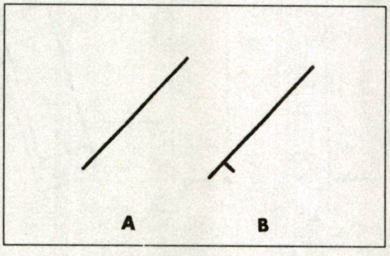

Figure 90

convincingly into 3-dimensional space. But when we supply a steering element (the small "foot" added at B), the line's direction changes significantly. Though drawn at exactly the same angle on the page as A, its top end seems to be pressed further back into space. Or, put another way, whereas A seems to point in a steeply uphill direction, B points across a flatter, more level terrain. In a particular drawing context, this new direction may better suit the artist's envisioned image.

The opposite result is achieved in Figure 91 where first A shows us the "stick" diagonal lying on the ground with its lower end near us, but by fashioning a cross section at the upper end of the line (B), we reverse this initial impression and make the *upper* end of the stick the nearer end.

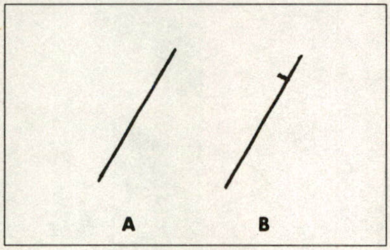

Figure 91

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The examples just given (and those that follow in this chapter) teach us that, by using steering, artists can manipulate lines to catch not only the precise contour of a form but also the specific angle at which the form as a whole is turned or tilted in the picture space. This makes steering especially helpful to artists as they grapple with the challenge of *foreshortening*.

• • •

A foreshortening problem arises when an artist wishes to express the full length of a form that is turned obliquely away from the plane of the canvas or drawing page. Learning to solve foreshortening problems is crucial because in our real 3-dimensional world (and our pictures are gauged by this world) hardly anything confronts us head on, but is almost always to one de-

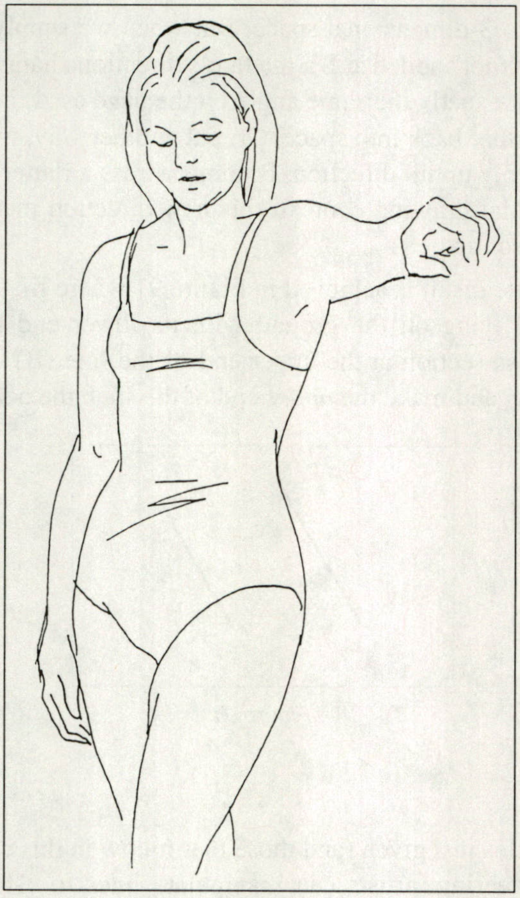

Figure 92

gree or another positioned obliquely. In an obvious example, when sketching a female model, her arm might be raised and pointing toward us (Figure 92). In such a case, the lines describing the contour of her arm will need to be shortened on the page, but nevertheless express the full length of the arm. Because the lifted arm will inevitably be compared to the figure's other arm, (which is hanging straight down revealing its full length), any failure of foreshortening will be (and here is) glaringly obvious. In another example of failed foreshortening, the thigh of a seated figure that is pointing toward the observer (Figure 93) appears stunted and disturbingly shorter than its partner leg. This kind of flaw—a stunted limb—is a common affliction in photography; and, unless the photographer intervenes and corrects the negative (which would then be drawing, not photography), there is no way of dealing with this problem.

Human limbs must match each other, whereas the limbs of trees need not. Thus, by contrast, drawing tree limbs can seem like child's play, and one may happily sketch them without noticing their foreshortening insufficiencies. But foreshortening is not a task confined to the representation of human limbs, reclining bodies and the like. It is a factor in the structuring of *all* 3-dimensional illusion. By this I mean that every 3-dimensional form we

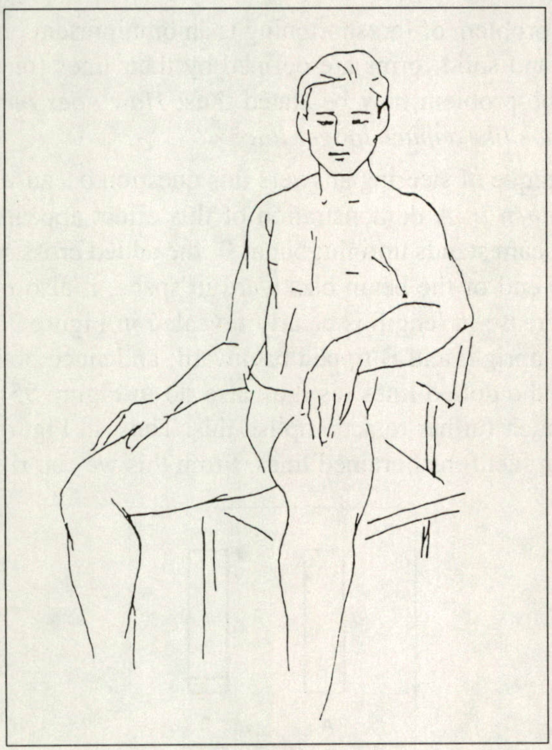

Figure 93

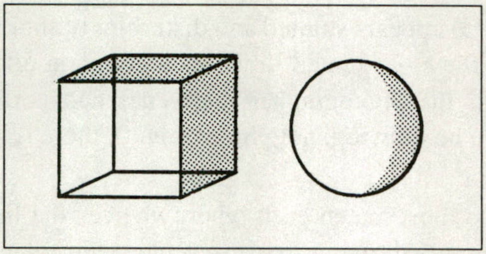

Figure 94

draw will have one or more planes—top, bottom or sides—that must be foreshortened. (In Figure 94, both the cube's top and right side, and the area of shadow on the ball are foreshortened planes.)

Thus the problem of foreshortening is an omnipresent one, and because foreshortened and solid forms are defined by their lines (or the equivalent, their edges), the problem may be stated thus: *How does one draw a short line that will look like a much longer line?*

The technique of steering answers this question because *when we steer a line we lengthen it*. A demonstration of this effect appears in Figure 95, where at A, a beam stands upright; but at B, the added cross section not only pushes the top end of the beam backward in space, it also makes it appear longer. B's increase in length is clearly revealed in Figure 96, where a side view shows A upright and B tipped backward; and since both span the distance between the dotted lines (as they also do in Figure 95) we see that B must stretch much further to accomplish this. Thus, in Figure 95, B's vertical edges are in fact foreshortened lines. From this we can rightly infer that,

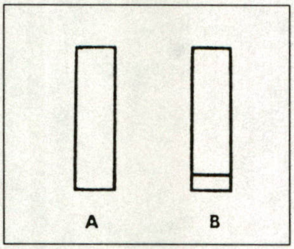

Figure 95

when steered, all lines (and all planes) will appear longer than they really are or, in other words, will be foreshortened. And if we add to these thoughts our intention that every line and plane in a picture will already have, or will be given, 3-dimensional flow (either obvious or hidden), we come to the realization that, in a sense, every element in a correctly drawn picture will be foreshortened.

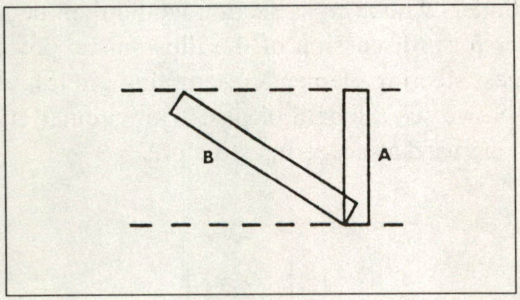

Figure 96

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Steering devices can be relatively simple structures. One commonly used steering device—a short line added to a longer line to form a reversible angle—appears in Figure 97. At A, we recognize an L-shaped "right angle." Then B shows us the tipped "beam" suggested by A. Finally, C makes the point that one can place the steering element *anywhere* along a line and evoke the same tipped-back-in-space illusion. This last structure resembles an upside down "T" and suggests a parking meter placed along a sidewalk edge. The tiny size and simplicity of inconspicuous little slivers of line like

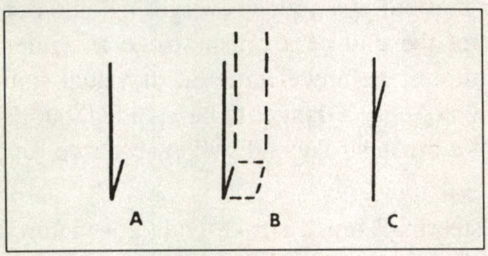

Figure 97

these makes them easy to add to any line to reorient its spatial position and boost its 3-dimensional strength. (Again, the vertices of all "L" and "T" structures must clearly contain the illusion of a right angle.)

• • •

As an alternative to using the beam and its rectangular cross section as a conceptual model for steering devices, one might instead imagine a length of pipe (or a cylinder) whose cross section would then be a circle. (See the following chapter for a discussion of the illusionistic power of the circle.) This would suggest steering elements resembling circles, ellipses and short arcs. In Figure 98, we see a length of pipe with circular cross section, and, next to it, a short arc used as a steering structure.

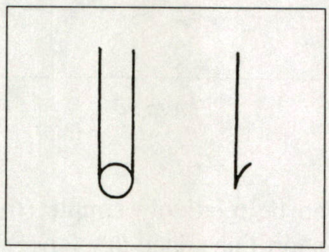

Figure 98

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A paint or watercolor brush creates a line that differs from a pencil line in an important way. Its track is wide and therefore its end has a distinct shape. Remember that our eye notices everything, and depending on what it finds, may interpret the end of a brush stroke as either a functioning 3-dimensional structure or an unwelcome bit of visual static. The alert artist will recognize here not only a danger to be avoided, but also an opportunity. Careful shaping of a brush stroke end will enable it to function as a steering element.

Two such "steering" brush stroke ends are pictured in Figure 99. A carefully tapered stroke forms an "L" right angle at A (suggesting the beam and cross section found at B). Then C suggests a rounded "pipe" cross section (as more fully illustrated at D).

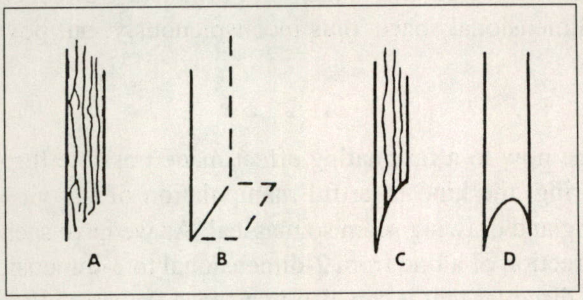

Figure 99

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A few more simple but very effective varieties of steering devices are worth mentioning. Earlier we saw the thin edge of a plank with its cross section established by adding a short line (repeated at A in Figure 100). Extracting just three essential lines from this configuration, we derive the structure pictured at B. It clearly retains the desired 90 degree shift in direction. Then at C, one straight line segment curves up to meet another. The result resembles a toboggan whose left end is steered back into space by the "right

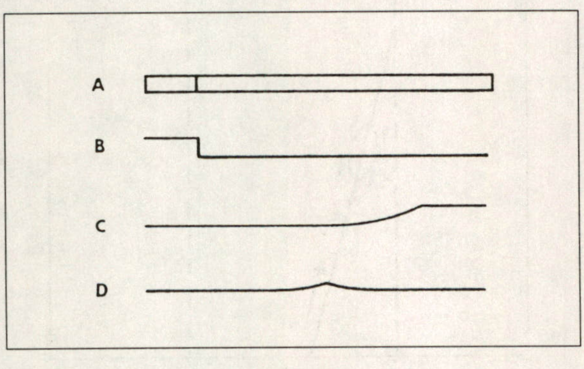

Figure 100

angle" turn at its "front" end. And finally, at D, two lines curve up to meet each other and suggest the slightly curled up corner of a sheet of paper. (Notice that the 90 degree turn at the point of juncture directs both segments back into 3-dimensional space, thus inconspicuously, but powerfully, energizing the line.)

• • •

We come now to a fascinating effect made possible through the technique of steering; the kind of artful manipulation of the viewer's eye that makes painting and drawing seem so magical. As we have seen, steering can change the direction of a line from 2-dimensional to 3-dimensional flow; but now we shall discover that it can also in a sense "reverse" the direction of a line. The following examples will explain what the term "reverse" means in this context of *shifting the perceived direction of a line*.

• • •

The diagram in Figure 101 represents a bird's eye view of a car traveling along a road that runs straight up and down the page. The dotted lines mark the two sides of the road and the solid line represents the path of the car. We see that the car is angling toward the left side of the road. Notice that the direction of the car relative to the *road* is the same as its direction relative to the *page*. That is, the car is heading leftward on the road and also leftward on the page.

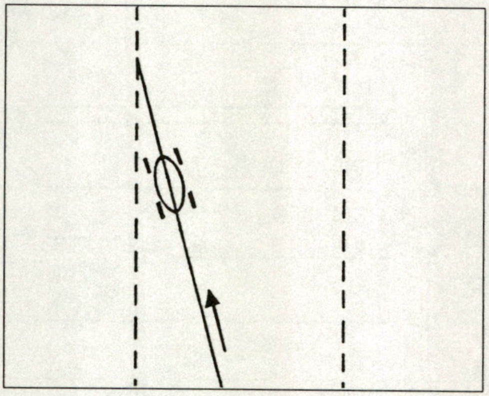

Figure 101

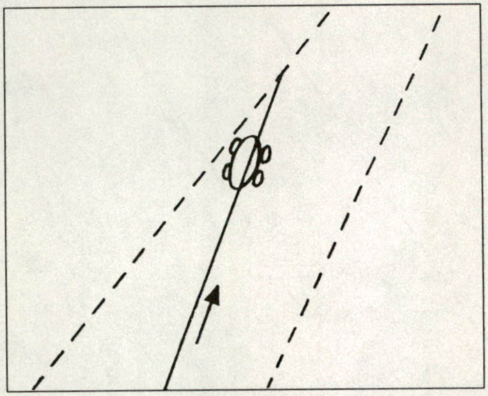

Figure 102

But in Figure 102, we give the road a different orientation on the page. The road now runs *rightward* and so, too, does the line of the car's direction. But nevertheless the car still appears to be veering over to the left, nor do we have the least difficulty perceiving this leftward movement. Thus we are presented with a paradox: as our eye follows the line of the car's direction *rightward*, it perceives the car heading *leftward*. This second diagram thus presents a more complex perceptual challenge than the first since, in order to understand the direction of the car, we must reconcile two contradictory suggestions.

What is happening, of course, is that the car is traveling with respect to *two frames of reference*—the road and the page. And as we try to make sense of these conflicting impressions (to which must be added the task of coping with the reversibility of the individual lines involved), we can expect that the sum of tensions will be gratifyingly high.

The mirror image of Figure 102—specifically, a car heading leftward on the page which we perceive as swinging rightward to reach the right side of the road—should be easy enough for the reader to imagine. Equally interesting is the flight path of the airplane indicated by the solid line in Figure 103. Despite our eye movement *upward* relative to the page, it creates the unexpected impression of *descending* to meet the center stripe of the airport runway.

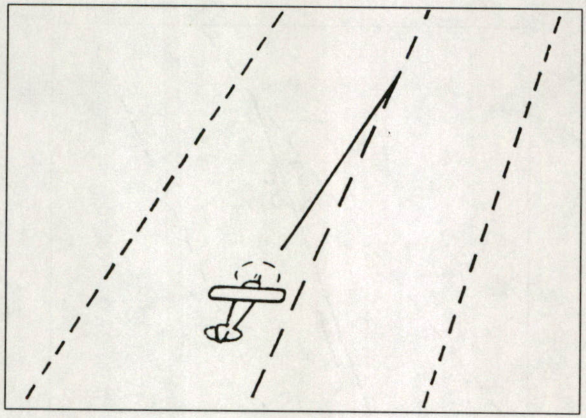

Figure 103

And, finally, a fourth kind of "reversal" of direction—the solid line in Figure 104 represents the path of a fly about to land on an overhead skylight. Though its line of flight leads *down* the page, we nevertheless perceive the creature heading *upward* to reach its proposed perch.

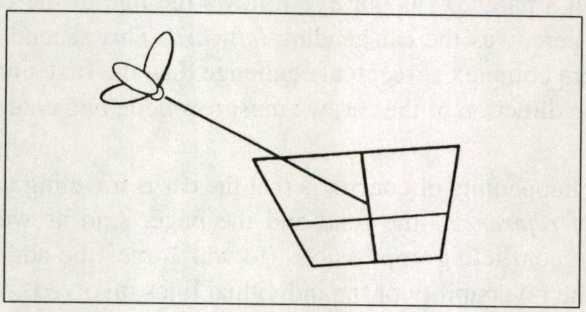

Figure 104

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Now suppose that we have drawn a line in a picture and wish to reverse its direction in the manner we have been discussing. It turns out to be remarkably easy to establish the *second frame of reference* needed to trig-

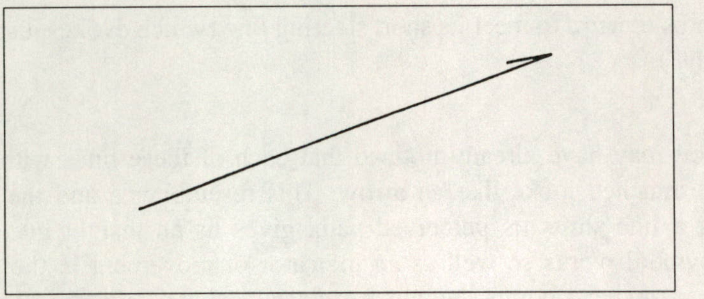

Figure 105

ger the effect. The method is illustrated in Figure 105 where we accomplish our purpose by simply adding an "L"-shaped steering element to one end of a long diagonal. Let's say that the long line indicates the path of a car, and the short line represents one portion of a road, reduced in this instance to the merest hint of "roadside." Remarkably, this tiny line segment exerts the same "frame of reference" influence as would an entire roadway. Thus, following the long line *rightward* on the page, we are convinced that it is heading *leftward* to meet the small bit of "roadside" steering.

• • •

Each of the four lines in Figure 106 illustrates a "reversal" of direction. As each flows toward its attached steering element, it seems to follow a course that contradicts its actual direction on the page. That is, A seems to be veering over to the *right*; B seems to be heading *leftward*; C (keep the airplane in mind) is *descending* to meet its steering element; and D (like the

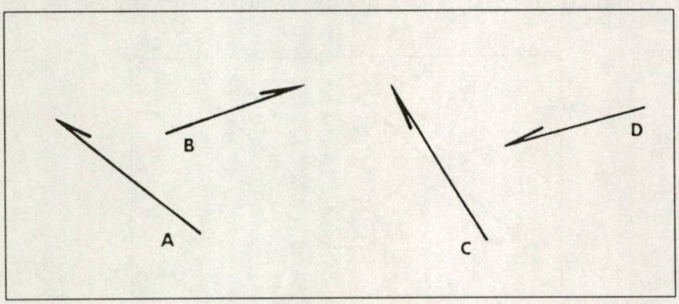

Figure 106

fly) zooms *upward* to meet its short steering line (which evokes just a hint of "skylight").

• • •

You may have already noticed that each of these lines with steering element attached looks like an arrow. This resemblance and the fact that steering a line shifts its perceived path, gives us an insight into why the arrow symbol works so well as an indicator of movement in the direction that the arrowhead points. Notice the *downward* and *leftward* flight of the arrow at A in Figure 107. Its dynamic appearance and convincing flow in the direction the arrowhead points can be traced to the fact that the arrowhead is functioning as steering and pressing its end of the arrow "shaft" (already 3-dimensional because it is a diagonal) into an even deeper 3-dimensional direction. As B makes clear, we see the arrow (emphasized) plunging excitingly into the diagram space like the edge of a building we look down at or a ceiling beam that we look up at.

The "L"-shaped steering element we have been using resembles only half an arrowhead, but its ability to press a line deeper into 3-dimensional space is not for that reason diminished. And it is worth noticing that the particular side of the line upon which we place the short steering element will determine the new "reversed" direction toward which the line will then turn. Looking back at Figure 106, the four "half arrows" illustrate this principle. Line at A swings *rightward* because we have tacked the steering line onto its right side; we push B *leftward* by attaching the steering line to its left side; C is given a *downward* fall by locating the steering element on its underneath side; and D is pulled *upward* by placing the steering segment on its upper side.

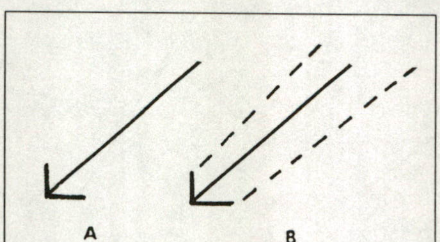

Figure 107

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The invaluable assistance offered by the technique of steering explains much that might otherwise puzzle us when we study the details of master drawings and paintings. Attached to the ends and/or middles of lines, we notice many curious and seemingly arbitrary dashes, dots, tiny angles, arcs, and similar touches. These are *not* experimental scribbles that the artist casually set down, subsequently rejected, but did not bother to remove. Rather, each was intentionally put in place to fulfill a steering function—to shift a line from a 2-dimensional to a 3-dimensional flow or to deepen a line's already 3-dimensional flow so as to more accurately catch the *precise direction* of a contour and/or the *spatial attitude* of a form.

Painting and drawing demand this kind of sophisticated approach. In the world that surrounds us (against which our imaginary picture world will inevitably be measured), exotic viewpoints, obliquely tilted lines and planes, multiple frames of reference and many other similar complexities, are not rare; they are the norm. For proof, prepare to draw the unclothed model and let your eye journey across that bewildering landscape of curving, undulating, separating and merging forms. As one examines and then attempts to draw these structures, the familiar suddenly becomes strange. How does one capture with any precision this vertiginous world of pitches, overhangs and roller coaster turns using only "simple" pencil or charcoal lines? The fact is one cannot. Only a sophisticated method of drawing can hope to recreate in a drawing or painting these subtle modulations of contour and surface in all their challenging intricacy.

Steering offers just such a method. The steering elements themselves are simple—tiny "L"s, "T"s, dots and the like—but, artfully placed, they can greatly enhance the expressiveness of lines and planes, enabling us to match in nuance and complexity the tilts, turns and convolutions of real forms disposed in real space.

Chapter Five

Curves: The Illusion of a Circle

An artist can trace a beautiful curve with just a single stroke of the brush or pencil; which fact might lead one to believe that curves are relatively simple creations and easy to draw. But, as I will show, a beautiful curve is in fact a complex visual phenomenon whose construction must satisfy a surprising number of important criteria. To begin with, the very fact of its beauty tells us that powerful perceptual forces must be at work filling the curve with aesthetic tension—forces that the artist must understand and purposefully build into each and every curve. But what are these forces? Rightly, we can suspect the presence and influence of spatial ambiguity and its contribution of hidden readings. But what might these hidden readings be?

• • •

First of all, to understand curves—to divine their "inner life," so to speak—one must be absolutely clear about what a curve is *not*. Drawn with a clean, flowing stroke, a smooth curve might easily fool the inexperienced eye and seem quite adequate. A practiced eye on the other hand, might quickly see that in many ways the curve does not measure up to the level of maximally effective drawing we are considering here. In the first place, a beautiful curve does not spring from the action of the *hand*, but rather from the action of the *mind*. The *manner* in which one draws a curve is irrelevant; it is only the finished product that counts. An artist's stroke may be smooth, swift and uninhibited, and buoyed up by an invigorating inspiration; yet nevertheless result in a curve that is non-illusionistic, flat, boring, deficient in tension and without beauty. Keep in mind that anything worth doing is worth re-doing, and curves often need re-doing. Therefore, unless and until the drawing page is completely worn through, one need not worry about "overworking" the curves in a picture. One can draw a curve slowly and carefully, study and evaluate it, thin it, thicken it, erase and shift parts or even the whole of it, and repeat this process over and over again, and yet arrive at a contour that yields not only a convincing 3-dimensional effect, but also an impression of freshness, spontaneity and flowing action that completely belies its careful and deliberate construction. This being so, we ask again: what specific guidelines must the artist have in mind in order to create curves that exhibit the desirable qualities just named?

For answers to this question we must look to a special family of curves for which the name "classical" curves seems appropriate. These are the elite group of beautiful curves that captivate us in the works of art we see in the world's great museums. These curves are beautiful for a reason, that is, they are carefully constructed so as to be spatially ambiguous. In the case of straight lines, we already know that diagonals tend to be automatically spatially ambiguous; and we also know that horizontals and verticals suffering from 2-dimensional flow can be steered and given a 3-dimensional flow that intensifies their ambiguity; but how exactly must a curve be shaped to guarantee its reversibility?

• • •

All curves that "work" in a picture—that are reversible and therefore 3-dimensional—are related to one fundamental "classical" curve—the mother, if you will, of all viable curves in drawing—namely, the *circle*. The circle is unique because we can immediately *recognize* and even *name* its curvature. Specifically, it exhibits *uniform* curvature around its entire circumference. This identifiability sets it apart from other curves and has enabled our eye to develop an exquisite tuning to the exact shape of the circle. We know this particular curvature in a deeply intuitive way. As our eye follows a curve and recognizes this curvature, a powerful anticipation develops as to where that curve is heading. Given this premonitory feeling, should the line stray even a hairsbreadth from the anticipated path, we notice the deviation immediately. If the deviation makes sense visually (that is, if at that point, the angle formed by the turnoff creates the illusion of a right angle), the shift in direction will not be troublesome and the 3-dimensional integrity of the picture space will not be violated. But the deviation may simply be bad drawing and, as visual static, confusing to the eye. In such a case, the departure from true circularity makes the curve fail as illusion at that point. Interfering with the curve's reversibility, the "snag" undermines and flattens its 3-dimensional flow. And it doesn't take much; a shift of a hundredth of an inch off track can bring about such a perceptual "crash."

• • •

When perfectly drawn, a circle is both reversible and 3-dimensional. I say this despite the fact that the plane of the circle shown in Figure 108 does

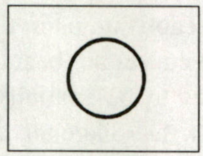

Figure 108

not seem to be either reversible or 3-dimensional! Admittedly, it does hold a 3-dimensional position back in the picture space, but its contour has a flat, 2-dimensional flow like that of a circle drawn on a wall as a target. But this means little, for, as we learned earlier, some straight lines (horizontals and verticals, particularly), though accurately drawn and perfectly acceptable in a drawing, will similarly follow a 2-dimensional track that keeps them parallel to the page surface instead of flowing into and/or out of the picture depth. Therefore, we must not jump to the conclusion that a circle cannot flow 3-dimensionally. It can, and we need only coax it a bit with steering to demonstrate both its reversibility and its power to create 3-dimensional illusion.

• • •

Just as we steered a "beam" in the previous chapter, we can also steer a circle. We do this by fashioning a plane that stands at right angles to the plane of the circle (Figure 109). In this way, we create the image of "coin" whose tilted-back position allows us to see its front edge. Now, the circle

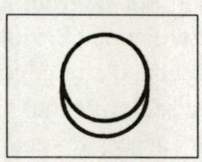

Figure 109

contour flows 3-dimensionally from front edge to back—into and out of the diagram space. And importantly, we can see this new image in two different ways. Besides resembling a coin (that we look *down* at), it can also be seen as a hole cut into the ceiling (that we look *up* at). Notice that in this alternate reading, the thick "steering" edge has shifted to the circle's far side. Thus, we see that a circle can be both reversible and 3-dimensional.

• • •

One of the reasons that the circle has always possessed a fascinating and almost mystical appeal for humankind is precisely because it is illusionistic. For this reason, though simple, it escapes being boring and, as a result, we find the circle used constantly as a design motif in the paintings, drawings and folk art of all countries and in all ages. Easy to draw, (and, needless to say, symbolically highly charged) the energy of its visual tension engages and pleases the eye wherever and however used. And, not surprisingly, any portion of a circle will also be ambiguous, stimulating illusion and giving aesthetic pleasure. Semicircles, quadrants and circular arcs of any size, drawn on a flat surface, spring to life as 3-dimensional entities; thus, they too are a fine art and folk art commonplace. Figure 110 shows us some thoroughly solid 3-dimensional forms based on circles, semicircles, quadrants and small circular arcs.

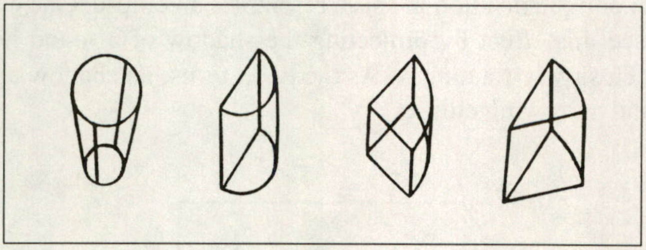

Figure 110

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In a sense, any person with a compass (or just a length of string tied to a pencil) becomes an instant artist, since any movement of the instrument produces a beautifully circular, "classical" curve. To be sure, most artists do not use a compass in their work; nevertheless they must draw each curve with the same high degree of precision that a compass affords—that is, with undeviating, hundredth-of-an-inch accuracy.

We evaluate the circles or portions of circles we have drawn against the standard of uniform (circular) curvature. But the circle is only one of the many possible varieties of curved lines. So how does one draw a curve whose amount of curvature is not uniform, but instead increases or decreases as it flows along? This is an important question since, in most pictures, few, and sometimes none of the curves possess circular curvature. How do we decide whether or not these non-uniform curves have been correctly drawn? Is there some perceptual benchmark, besides the circle, that can help us evaluate them? Surprisingly, we need no other standard—we gauge the fitness of non-uniform curves against the uniform curve of the circle—but with a fascinating twist!

• • •

The connection between the curve of the circle and that of all non-uniform curves is found in the ellipse. Admittedly, an ellipse is not a circle. Yet, in its own way, the right kind of ellipse *is* absolutely circular and absolutely uniform. I refer to that special group of ellipses that one can generate by rotating a circle around its diameter used as an axis. A circle turned to an oblique position in space resembles an ellipse. One can dramatically produce this effect by projecting the shadow of a round hoop onto a wall and then slowly rotating it. As the hoop turns, its shadow appears as a widening and narrowing ellipse.

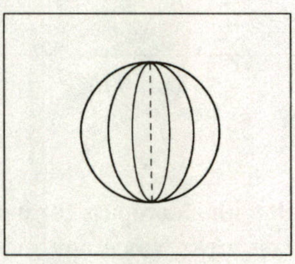

Figure 111

In Figure 111, the "lines of longitude" (also called "great circles") drawn on the "globe" illustrate just a few of the theoretically infinite number of ellipses that one might generate by rotating a circle. Deriving from the circle, each of these ellipses will necessarily have a highly specific curvature—one that unmistakably reveals its origin. The point is that when an artist draws an ellipse, he or she must work to catch this exact curvature. If the artist is successful, the ellipse, like its "mother," the circle, will be both reversible and illusionistic. And, needless to say, the illusion that appears will be that of a circle turned to an oblique position in 3-dimensional space. In this surprising way, the curvature of the circle functions as the standard to which all non-uniform curves in drawing must conform.

Earlier we saw that a similar rotated-in-space relationship exists between the square and the rhomboid. When used to represent the side face of a cube, a rhomboid evoked the illusion of a square. Figure 112 shows us a square and a circle, each paired with its related illusion—a rhomboid and an ellipse, respectively. And we should note that, just as a rhomboid will evoke the illusion of a square *provided* that each of its corner angles creates a flawless illusion of a right angle, so, too, an ellipse will evoke the illusion of a circle, *provided* that its contour exactly follows an *illusion of a circle* path.

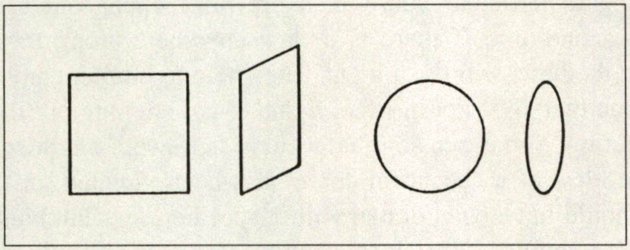

Figure 112

Tracing the contour of a correctly drawn ellipse, our eye can easily recognize a "rotated" circle; but should any part of that contour drift even a hairsbreadth away from perfect "circular" curvature, it will instantly sound the alarm. Moreover, the eye has no difficulty spotting imperfections along a curve made up of only a *portion* of an ellipse, whether that curve be long, short, tightly curved, shallowly curved, or even so minimally curved as to almost resemble a straight line. Amazingly, even with such slight clues, our eye, uncannily adept at such "curve evaluation," will immediately alert us should any of these arcs stray the least bit from a "circular" track.

• • •

Examining curves for trouble spots and deficiencies, an artist asks the following four questions. First, is the flow of the curve smooth and free of bumps, breaks, and swerves that might be flattening it out? Second, is the curve reversible—that is, can the apparent near/far positions of the two ends of the arc be easily switched in our mind? Third, since every curve must be all or part of a true circle, or all or part of an illusion of a circle (a "circular" ellipse), does the curve resemble part or all of some familiar circular object like a round tabletop or the top of a round tin can (or cross section of a cylinder) such as are shown in various positions in Figure 113. And, fourth, does the curve flow in one direction only until it either ends or moves off in a new, "right angle" direction? This last question is particularly useful when scrutinizing the very end of a curve where there is often a slight, almost undetectable (and undesirable) swerve which, but for this pointed inquiry, would likely go unnoticed.

Gauging a curve according to these highly specific criteria (whose value I acknowledge will be a bit difficult to appreciate unless one is actually examining a particular curve in a drawing) opens one's eyes to the curve's true condition. If there is a flaw anywhere along the line of the curve, these thoughts will flush it out. They help to pinpoint any place along a curving line that "just doesn't feel right,"—is flattening out the space and needs correcting. Some, sensing that a curve is flawed, might speculate that the Platonic ideal of a "beautiful curve" has been violated; or that perhaps the curve should have been drawn with a speedier, less inhibited stroke; or that the curve should more closely imitate some beautifully curved form seen in nature; or perhaps they will offer some other intriguing, but to my mind, vague and off-the-mark explanation. In contrast, the thesis of spatial ambiguity pins down with great specificity the criteria that determine the beauty of a curve. It explains exactly what is wrong when a curve is in trouble—it has jumped the track and veered away from the obligatory illusion-of-a-circle course. As a result, the curve has forfeited its reversibility, flows "2-dimensionally" only, and suffers a disappointing drop in aesthetic tension.

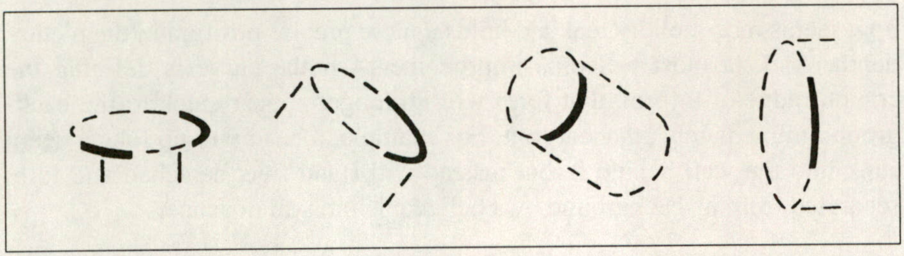

Figure 113

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Many drawing errors are of course due to the artist's hand, but often the roughness of the paper itself will cause tiny imperfections along the line of a curve that can jar it out of its smooth 3-dimensional sweep. The artist's creed must be that *no* bump, break or straying, *however slight*, can be tolerated. All trouble spots and departures from "circularity" must be "corrected," "cleaned up," "smoothed out" and in short, be made to "work." (Some examples of flawed, and then corrected, curves appear in Figure 114.)

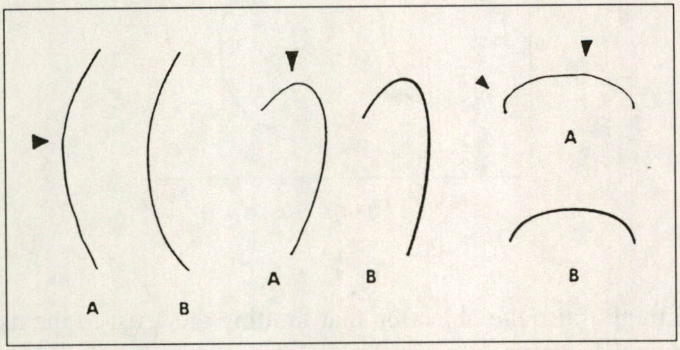

Figure 114

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A curve corrected and successfully nudged back on track responds as though an invisible restraint had been removed. It immediately drops further back into the picture space (a highly gratifying moment for the artist). Also, the form described by the curve (a shoulder, an apple, a bowl, or whatever) now seems more solidly real and holds a more precise position in the picture depth. And—a most welcome improvement—if the curve is defining the contour edge of a form, that form will no longer appear stuck to the background immediately adjacent to it. For example, a head will no longer seem sunk into the wall behind it, but instead will stand free, detached and fully separated from its background by a believable interval of space.

• • •

I should point out here that the technique of steering can increase the subtlety and expressiveness of the directions of curves just as effectively as it does that of straight lines. For instance, as Figure 115 shows, one can tack an "L"-shaped steering structure (A) onto one end of a curve or a "T" structure somewhere along its middle (B) and its 2-dimensional flow will be shifted to 3-dimensional flow; or an already 3-dimensional direction can be maneuvered into one that more fully satisfies one's artistic plan.

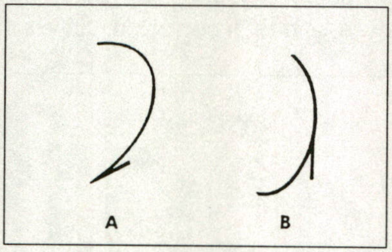

Figure 115

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One might raise the objection that limiting the artist to the use of only those curves that derive from circles and "circular" ellipses is too severe a restriction. But the complaint has no real validity. Rotating a circle in space can theoretically generate an infinite number of ellipses—some wide, some narrow, and some in between; and any of these (including the circle itself) may then be depicted in an infinity of reduced or expanded sizes. Given such an abundance of sizes and gradations of curvature, one can confidently predict that any curve an artist might need to express a particular form will find, somewhere among this profusion, an exact or nearly exact match. And if one cannot be absolutely faithful to the curve one sees (assuming a model or still life is the subject matter), only the tiniest of compromises should be necessary. This is not just an accommodation, it is exactly where the "art" of drawing lies. Adjusting a curve to fulfill the demands of pure drawing, and not just the "photographic" truth of the figure or object being represented, means seeing to its reversibility, releasing its current of illusionistic power, and using one's artistic skill and sensibility to move the form being described closer to beauty.

• • •

Earlier in this chapter, we persuaded a circle to tilt backwards in space by giving it a "coin" edge which we created by establishing a pair of *parallel curves*. Parallel curves create the characteristic look of a *ribbon*, which concept can also be useful when trying to make a curve "lie down" in the picture space. The "ribbon" effect appears in Figure 116 where an S-shaped curve (A) has been correctly drawn, but nevertheless exhibits 2-dimensional flow only and seems to have been inscribed flat on a wall. We correct its lack of 3-dimensional direction by first visualizing the S as a curled ribbon and then supplying a second line to run along as a curving parallel with the first (B).

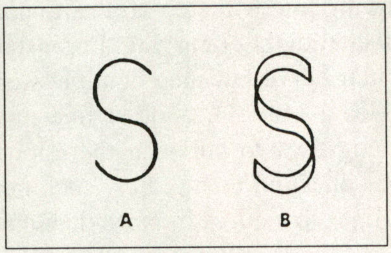

Figure 116

The width of the "ribbon" stands at a right angle to the overall plane of the S which now winds 3-dimensionally into and out of the diagram space. And, as Figure 117 shows (with helpful trapezoids added), this new "ribbon" can be seen in two different ways. At A, we look *down* at the ribbon as though it was lying on a table before us; and, at B, we look *up* at it as though it was fastened to the ceiling.

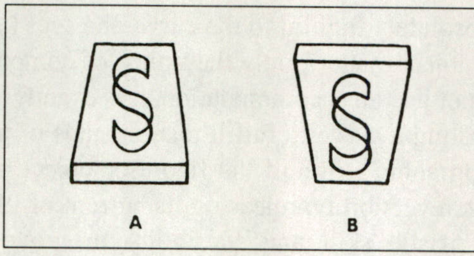

Figure 117

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The ribbon effect is an important device in calligraphy. Calligraphers use a broad-nibbed pen, which, held in a fixed position, leaves a track whose edges narrow and widen, but appear consistently parallel (the secret strength, incidentally, of much graffiti). This beautiful method of lettering (whose charm is also evident in many printers' typefaces) owes its aesthetic appeal to the unsuspected, hidden 3-dimensional flow created by ribbon-like, curving pairs of parallels.

• • •

Sometimes a curving line will stop at a particular point and strike out in a new direction, either straight or curving. For instance, the line in Figure 118 traces a semicircular curve but then continues on a straight course so that the result resembles a cane. Or another line might curve first in one direction and then swing over to curve in the opposite direction like the curious "S" shape. The question then is how such combinations of curved and straight lines and lines that curve in more than one direction can satisfy

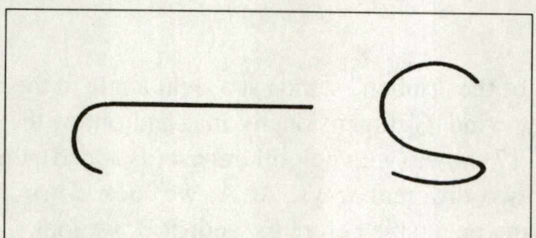

Figure 118

our mandate that curves must be parts of circles or circle-derived ellipses?

The answer is that we evaluate such lines segment by segment. In the case of the cane shape, for instance, the *curved* portion must conform to our requirement of "circularity" and the attached *straight* portion must simply run uniformly straight with no bumps, breaks or other perceptual snags. As for the two curves that make up the peculiar S-shape, we evaluate each separately for "circle" curvature. Thus, in theory, an artist might draw a very long line, made up of a number of both straight and curved parts which, at first glance, would bear little resemblance to a circle or a circle-derived ellipse. Yet, considered segment by segment, each curved portion would fit our "illusion of a circle" theory perfectly.

The "cane" construction just examined (Figure 118) is particularly interesting because it returns our attention to the drawing dictum that *when a line changes direction, the change must create the illusion of a right angle.* Though the configuration may at first glance resemble a cane that appears to lie 2-dimensionally flat on the page as a cane would lie flat on a table, we can also perceive a 3-dimensional construction more like a dowel or a cylinder whose straight side meets a "circular" cross section end and at that point of juncture the two are set at right angles to each other. The emphasized portions of the cylinder in Figure 119 show that a curve and a straight line can indeed (like a circle and its tangent) flow smoothly one into the other and yet create the unmistakable (and indispensable) reading (obvious or hidden) of a 90 degree shift in direction.

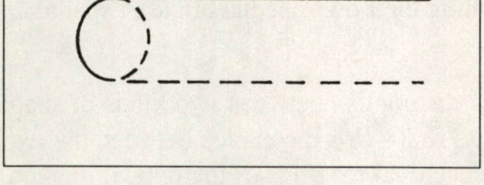

Figure 119

Chapter Six

Materials vs. Drawing Pressure

The materials of art—the physical paint strokes, pencil marks, collage elements, etc., that the artist places upon the canvas or drawing page—besides depicting figures, objects and space, can contribute to the effect of 3-dimensional illusion in a second, equally important way. Specifically (and paradoxically), they do this by *resisting* the artist's efforts to transform them into illusion.

Here's how it works. We already know that spatially ambiguous drawing enables one to press one's brush strokes or pencil lines back from the 2-dimensional picture surface to positions deep within the picture space. We might call this process one of applying "drawing pressure"; and it follows that the more skillful the drawing, the more intense the drawing pressure generated.

But in the best drawing we find a second force working in opposition to that of drawing pressure. This would be a counterpressure generated by recognition of the artist's *materials as such*. The building of this counterpressure would then constitute the "art of materials," a process whose importance makes it *the vital other half of the art of 3-dimensional drawing*. Materials are valuable in picture-making precisely because they are *real*; and the artist's strategy therefore is to coax them into lending their *material* reality to the *illusionistic* reality of the picture image. An image becomes more "real"—meaning, believable—as we add to its overall sum of perceptual tensions; and we shall see that a picture's materials can increase tension by contributing their own special brand of spatial ambiguity.

• • •

We must now distinguish between two kinds of spatial ambiguity. We have already met the first—it is the choice between the two readings of a reversible structure. The dual readings of the optical illusion cube, the reversible flight of stairs and the reversible cylinder (as pictured in Figure 120) are examples. Note that in each case, the ambiguity is *spatial*—that is, it per-

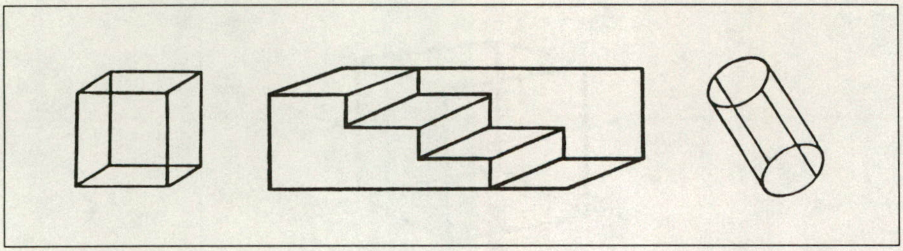

Figure 120

tains to the relative near/far positions of the structure's lines and planes. And note particularly that the ambiguity has nothing to do with materials, but is strictly a choice between *two illusions*.

In the second variety of spatial ambiguity, we are asked to choose between *illusion* and *reality*. For instance, when we examine a painting of a woman, we might focus either on the woman (the illusion) or the paint sitting on the surface of the canvas (the reality). But interestingly enough, this ambiguity again involves spatial position. The paint sits near us on the picture surface, but the image of the woman appears further back in the picture space.

We can only see the illusion in a picture by forcing our awareness of its materials "underground." But, like any other repressed reading, it resents its banishment, fights for recognition in consciousness and, in so doing, becomes a source of perceptual tension. And since this tension of materials versus drawing pressure is based on an ambiguity that is specifically spatial, it adds directly to the 3-dimensional strength of the picture image.

• • •

While it is true that materials are already thoroughly real when we set them down in a painting or drawing, it is possible through various techniques to make them more obviously, or perhaps the word is more *aggressively,* real. The idea is that the more strenuously the materials insist that we recognize their presence, the better they can resist submergence by drawing pressure, or in other words, the better they can function as a *counterpressure*.

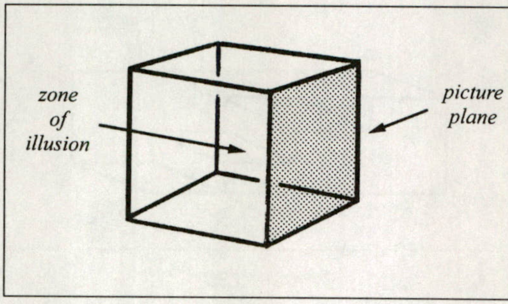

Figure 121

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A diagram illustrating the opposition of materials vs. drawing pressure appears in Figure 121. The shaded face of the cube represents the 2-dimensional surface of the picture (the "picture plane") where we find the artist's actual brush strokes, pencil lines, collage materials, etc. The interior volume of the cube is the zone of illusion where, pressed back from the surface, the materials magically become the picture image. But though drawing pressure works to force the materials *inward*, this must not happen too easily. The materials must resist with an opposite and *outward* pressure of their own.

As it happens, art materials have a natural tendency to seek the surface of the picture (much as a tennis ball seeks the surface when held under water). The main source of this tendency is our *bifocal vision* which allows us to see a painting or drawing clearly only if we maintain a single, unvarying focus. Thus, the report of bifocal vision is not an illusion of depth, but merely a collection of marks, scratches and lumps of material spread across a uniformly flat surface. But this "flat" evaluation wherein materials sit blatantly on the picture surface is exactly what we seek. Thus, bifocal vision gives us a solid base upon which to further build materials counterpressure.

• • •

Materials put up their best fight for release from their unhappy condition as repressed readings when their identity as real substance is clear, familiar and obvious. As it happens, each of the artist's materials—paint strokes, charcoal lines, pencil marks (including their offshoots, scribbles, smudges and erasure tracks), watercolor blots, collage elements or whatever—has its own characteristic identity or "look." As an example of material that is unmistakable as such, one might scissor a piece of cardboard into the shape of a trapezoid and paste it into a collage to depict a table top. As we enjoy the table top illusion, certain background thoughts—the texture of the cardboard's surface, its unmistakable thickness and the quite noticeable dark shadow it casts along one or two of its edges, assert the cardboard's identity as material and pressure it to compete with the image of the table top for our attention. The result is a surge in perceptual tension which, added to that engendered by the already competing double readings of "table top"/"skylight," raises our ultimate perception of the table top illusion to a greater level of 3-dimensional strength and aesthetic appeal.

• • •

Spatially ambiguous drawing, more than simply *freeing* brush strokes or areas of color to drop back into the zone of illusion, *drives* them back with compelling force. But this can be a problem in that its strength can sometimes far surpass the basic (bifocal) counterpressure of a picture's materials and, unless these inward and outward forces are equally matched in strength, tension cannot build to its fullest. Therefore, to avoid this danger we must maximize materials counterpressure.

Two strategies are available. One is *prevention*, the other is *action*. Looking first at prevention, our approach will be that, having set down our materials—paint strokes, charcoal lines or whatever, we take care not to obliterate their identity by overworking them. By overworking I mean the kind of fixing, fussing and fudging of lines and areas of color that renders them unrecognizable as material substance—real "stuff," so to speak. As I say, each of the materials of art has a familiar and characteristic appearance; a clean brush stroke, for instance, looks unmistakably like a brush stroke and not just an anonymous smear of color. It asserts its physical identity as forcefully as does a piece of torn and wrinkled cloth pasted onto a collage. Admittedly, we must often tinker with lines and planes to get them to work 3-dimensionally, but if, in the process, we blur or fudge them into anonymity, we diminish their strength as materials, and this loss will mean loss of valuable counterpressure.

• • •

Our second strategy is *active*—here we use various devices to *enhance* the recognizability of materials *after* they have been set down on the canvas or drawing page. As obvious as one's materials might seem, there are nevertheless ways to further increase the viewer's awareness of their physical presence. And unlike obvious materials like thick paint strokes, watercolor blots and collage scraps, some materials are particularly characterless and in great need of "identity-strengthening." A pencil line, for instance, drawn on a smooth sheet of paper, can seem quite insubstantial as "material." As a result, it may be so thoroughly absorbed into the illusion of the form it is describing that we cannot even react to it as a line, let alone as graphite, but see it as merely the edge of a plane. The lines describing the edges of the cube in Figure 122 produce this impression. Ideally, they could be telling us much more about their real selves—what they are made of, how they got there, how they are interacting with the paper surface, etc. In contrast an "unfudged" charcoal line will strike us as something patently real. We recognize its true "materials" nature at a glance. In fact, a good part of our "global" response to the line—how it looks and how it "feels"—is our realization that it is right there before us and will blacken our fingertips if we touch it.

Another example of obvious "stuff": A line drawn on rough paper with the broad side of a pencil tip, will leave a track that contains tiny white spots where the graphite did not reach the deeper levels of the paper. Such a line unequivocally proclaims itself "graphite" on "rough paper" or, in other words, materials.

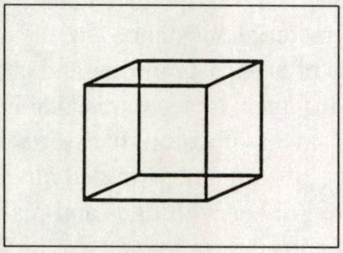

Figure 122

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For a convincing demonstration of what I mean by a "real" line as opposed to a vague, characterless line, one might try drawing a short straight line on a page and then place next to it a similar, short straight piece of black wire. Because the wire is real, its "presence" will be far more immediate and forceful than that of the far less impressive pencil line. However, we can strengthen such a "weak" line through the simple expedient of making it look more like a wire. We do this by creating a bit of open space immediately behind it. Then, because it stands free against an empty background, the line will no longer appear to be merely the edge of a plane, but will instead appear to be much more a thing in itself. This "reality-enhancement" technique is illustrated in Figure 123, where at X, line AB registers as nothing more than one edge of the cube. But when we lengthen it (Y) to make it protrude up into the empty space above the cube, the newly added segment BC takes on the unmistakable appearance of a wire sticking up independently in the air. This resemblance to something real—a wire placed on the page—is a far more substantial appearance, one that pressures the line back toward the 2-dimensional surface.

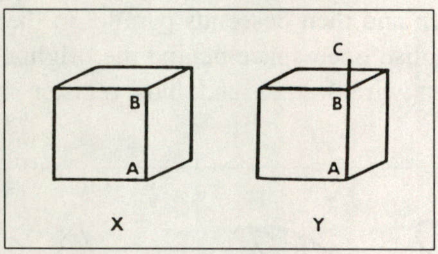

Figure 123

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In another example of creating open space behind a line—the right angle at A in Figure 124 creates the illusion of one corner of a sheet of paper, but little else. The two lines that make it up seem to be nothing more than the two edges of the sheet. But at B, we artfully draw a line that crosses one leg of the angle and runs parallel to the other. The skewed and parallel relationship of the two verticals separates the new line from the angle depthwise with the result that the "corner," formerly opaque, now appears transparent with open space behind it. The angle now resembles a wire bent at 90 degrees. The change is subtle but unmistakable, and the identity of the line as "materials" has been strengthened.

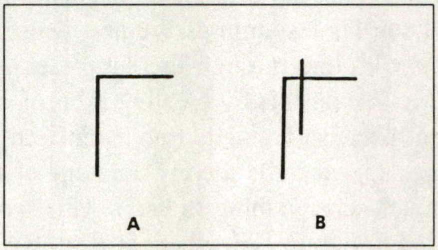

Figure 124

The two shapes at A and C in Figure 125 resemble those we might see in a drawing. However, as materials, their contours are pretty much nondescript and we perceive them not as lines, but merely as edges. Therefore in each case we sketch in lines that are parallel and also cross the edges of the shape. At B we use a curve to create a parallel partner, and at D an added line curves up and then descends parallel to the contour's sides. In both cases, we establish open space behind the original forms so that they now look like open wire frames and thus register more powerfully as materials.

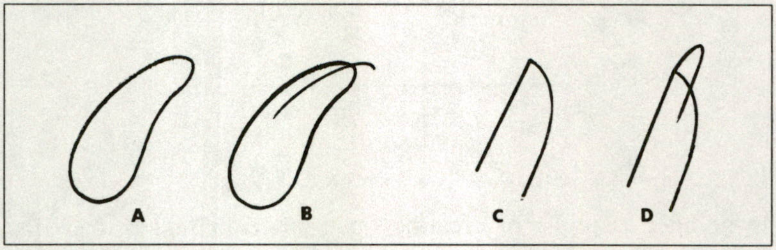

Figure 125

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In the same way that we can make a line look more like a wire by indicating space immediately behind it, we can transform an *opaque* plane of color or gray (Figure 126) into a *transparent film* of some material like cellophane or photographer's gelatin that has been dropped onto the canvas or drawing page. Again, we simply add a line parallel to one edge that will then hold a 3-dimensional position behind the area of tone. Because we can see through the gray plane to the new line behind it, it strikes us as a transparent *film*, or in other words, materials.

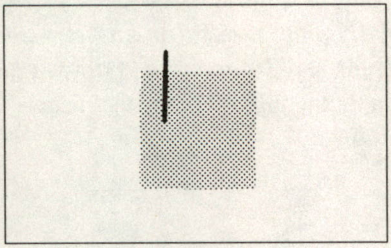

Figure 126

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We can accentuate the reality of the picture surface itself by creating *trompe l'oeil* effects that imitate features typically found on such a surface. Bumps, ridges, cuts, holes, the thick edges of pasted-on cardboard, cloth or canvas, etc.—all of these can be successfully faked to add texture and thus draw our attention to the picture plane.

For instance, one can create a trompe l'oeil *bump* by first selecting a small area on the picture surface that is a bit lighter than its surroundings and then darkening the area just underneath it (Figure 127). The illusion of a bump will appear—a slight protrusion that seems to be catching "room" light—that is, the overhead light illuminating the room in which the picture is hanging—and casting a small shadow. This makes the canvas or paper appear rougher and thus more obvious as a real surface.

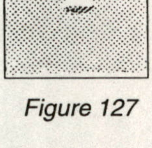

Figure 127

One can also simulate a trompe l'oeil *ridge* by establishing on a background of intermediate brightness a long light area in conjunction with a long dark area that runs immediately beneath it (Figure 128). In both cases—bumps or ridges—the device will indeed fool the eye, and just three or four such touches can dramatically heighten the viewer's awareness of the 2-dimensional picture surface. An important caution: Such a bump or ridge can (and must) play a double role—one, as *materials*, and two, as a carefully shaped *spatially ambiguous drawing structure*, thus achieving the pressures of both materials and 3-dimensional drawing and avoiding the introduction of a flat element that would sabotage the picture's illusion of depth.

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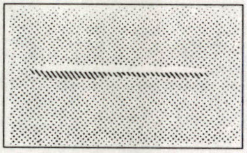

Figure 128

A line that is emphatically black or very dark creates a false, but convincing "cut" in the surface of the picture (Figure 129). A light line does not create this effect because real cuts are quite dark. For this reason, a pen drawing using black ink has a greater visual impact than a drawing made with light pencil or light-colored ink. By suggesting a cut in the paper surface, a black line forces the viewer's attention to the material reality of the picture surface being scanned.

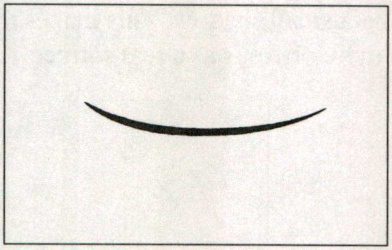

Figure 129

To gain an appreciation of the special impact of black, or very dark, lines, the artist reader might want to try an interesting experiment. In just one or two places on a drawing made with light pencil lines, make part of one line very dark or black. The striking presence and immediacy of that portion of the line will be in dramatic contrast to the lines around it (as in

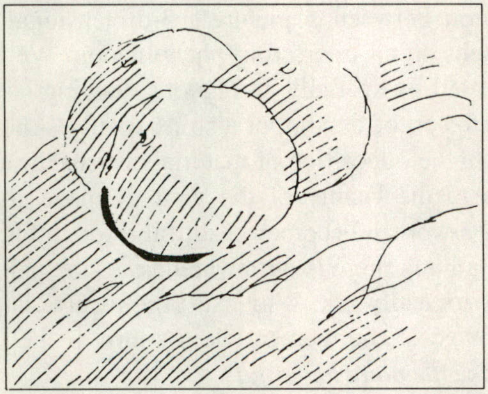

Figure 130

Figure 130). The line will have become stronger, not just because it is darker, but because it has become a trompe l'oeil "cut" in the paper and thereby gained the additional strength of materials reality. Nor will anything be lost as far as the illusion of depth is concerned. In fact, the illusion will grow more intense and more real as the reality of the materials merges with and adds to the illusion of real objects that skillful 3-dimensional drawing has already given the picture image.

• • •

I must mention an additional and quite wonderful benefit to be derived from making one's materials as obvious as possible—namely, the excitement of *texture*. What a picture "feels" like is an important part of what it looks like. It is another way of "knowing" the picture—part, you might say, of its *gestalt* or "global" impact. Texture appeals to the viewer's sensuous instincts, to his or her appreciation of what the picture surface would feel like if they ran a finger across it. Often underappreciated, texture is nevertheless one of the delicious pleasures we enjoy, not just in sculpture, but in paintings and drawings as well. And a picture made up of "wires" and "films" will have far greater tactile appeal than one made of nondescript lines and anonymous areas of tone.

• • •

The interaction between a picture's 3-dimensional drawing and its materials sheds light on an interesting phenomenon. We have learned that the tension stimulated by spatially ambiguous drawing is what gives a picture not only its illusion of depth, but also its beauty. And additionally, the tension gained from the opposition of materials versus drawing pressure will further contribute to the beauty of the picture image. As an example, a painted illusion of a woman becomes beautiful through the action of its hidden readings, and among them is our awareness of the paint as such. And if this is so, we may logically ask: Why can't the reverse happen? Why can't the illusionistic image of the woman take its turn as the repressed, hidden perception and *make the paint beautiful*?

And, in fact, the benefits of aesthetic tension *do* flow in both directions. Of course, we are bound to focus on the image of the woman far more frequently than we do the paint. But when, from time to time, we *do* focus on the paint, its appearance is in fact supercharged and enhanced by the repressed illusion. One often hears gallery-goers enthuse about the paintstrokes in certain pictures, describing them as "delicious," "luscious" or "sensuous." Or they remark that the artist "puts the paint on beautifully." Such comments can be directly traced to those fleeting moments when the viewer becomes conscious of the painting materials as such and reacts to the tension *they* contain with enthusiastic pleasure. And this phenomenon is of particular importance to the perceived *colors* of the artist's paint. Enhanced first by drawing pressure and then materials counterpressure and then further enhanced by the complication of the illusion of light (see Chapter 8) they become visually exciting (both as illusion *and* materials) far beyond their ordinary state, and will appear more beautiful than any color that might be squeezed directly from a tube or carefully mixed on a palette.

Picasso once said that he liked paintings that were full of thoughts. The varieties of ambiguity that can be present in a picture image were almost certainly among the kinds of thoughts to which he was referring. And in just the same way that an arresting 3-dimensional image will be the product of many hidden influences, so, too, can the painting's actual materials be *transformed*, that is, become supercharged with tension and made beautiful beyond their ordinary state.

• • •

Pictures fall more or less into three groups depending on the state of balance between the inward-directed drawing pressure and the outward push of materials. When the two pressures are equal in strength and as intense as possible, the energy of their competition results in both a 3-dimensionally convincing and sensuously satisfying picture image. This is painting and drawing at its best. On the other hand, if one pressure is strong and its opposing pressure weak, the picture will disappoint in either of the following two ways.

Let's suppose that the 3-dimensional drawing in a picture is strong, but the impact of the materials is weak. The symptom of something amiss will be a feeling that the picture lacks texture. Where we would prefer a sensuously pleasurable "roughness" or "resistance," the eye will instead slip across the picture surface encountering little or no resistance. The effect is one of *slickness* and, in general, a visual blandness. Lacking the "reality" and "presence" that materials might have contributed, the picture seems somehow in limbo—not emphatically *here* but muted and somewhat removed from us. Although the artist may in fact have achieved something quite admirable in the 3-dimensional drawing of the picture, the lack of a strong presence of materials is a serious fault that robs it of considerable tension. Such a picture is a job half completed and must be relegated to the category of *illustration.*

The second kind of pressure failure occurs when the 3-dimensional drawing is weak and the presence of the materials easily overpowers the illusionistic image. The problem is not, as one might suppose, that the artist has used materials that are too thick or too heavy. Truly powerful illusionistic drawing can transform thick paint as easily as thin. The problem rather is that spatially ambiguous drawing, which would have pressed the materials back into the picture space, is lacking. As a result, relatively untransformed and far too much in evidence, the materials sit inertly (and boringly) on the 2-dimensional surface. Ideally, materials should most of the time remain hidden, but in this case they dominate our attention. Moreover, without an intense competition from the hidden pressures of illusion, materials cannot claim their share of beauty, but rather will seem merely lumpy, oily and, to the experienced eye, distasteful.

• • •

In recent years, an interest in *flatness* as a virtue in painting has developed. The supposition is that the 2-dimensional surface, *without the help of illusionistic drawing*, can generate a charm of its own sufficient to carry a picture. Such thinking reveals a faulty understanding of how drawing works or, worse, an indifference to beauty. We have seen that when a picture image is beautiful, its materials, too, are beautiful. It may well be that those who champion "flatness" have seen this kind of "readings-loaded" and enhanced paint and were impressed by its aesthetic impact *unaware of the dynamics that supported it*. They then make pictures that feature thick paint, or prepare their canvases with a lumpy surface, or paste on obvious collage elements and, in short, try any and all devices that emphasize "surface." But in failing to supply the vital counterpressure of illusionistic drawing and, therefore, unable to generate materials vs. drawing pressure tension, they arrange that their work will be half formed, without transcendence, and barred at the outset from any possibility of beauty.

Chapter Seven

Minor Methods

The transformational magic sparked by the double readings and hidden images created by spatial ambiguity give the artist an advantage found in no other drawing technique. This establishes spatially ambiguous drawing as the *major* method for creating three-dimensional illusion.

In contrast, there are some other approaches in drawing generally thought to be three-dimensionally effective, but which are, in this respect, surprisingly weak, so that we must rank them as only *minor* methods. I will discuss four such methods—(1) the use of *perspective*, (2) *modeling with light* (chiaroscuro), (3) the *figure/ground* effect, and (4) a phenomenon I call the *lower is nearer* tendency. For good reason, each of these devices has a well-established place in art; but because none specifically engages the energy of spatial ambiguity, their contribution to the three-dimensional structure of a picture is distinctly limited.

• • •

Perspective

Perspective drawing focuses on an intriguing truth about how our surroundings appear to us—that is, that things shrink in size as they retreat further from us. Thus, when painting a landscape, we make our figures and objects progressively smaller and smaller as we wish them to appear more and more distant.

A scheme of perspective guidelines converging toward a vanishing point can specify for the artist the precise angle at which to draw the "horizontal" ground and roof lines of buildings so that they lead the eye into the picture space and away from the plane of the canvas. Such an approach would seem to promise strong three-dimensional results. But, the shortcomings of perspective become glaringly obvious when an artist portrays a long row of buildings whose sizes have been carefully reduced in conformance with perspective; but, unmindful of the requirement of spatial ambiguity, has drawn them *poorly.* Specifically, suppose that at each of the many corners of the buildings, the viewer consistently fails to find the crucial illusion of a right angle; and discovers also that lines that ought to be exactly parallel are in fact slightly off? The result of these basic errors would be a seriously flawed illusion—spatially inexact, weak and confusing.

Carefully considered, perspective is little more than a device for *copying* a particular effect seen in nature. But artists must not merely copy, they must create. True, any picture that resembles some real place or thing will spark some interest in the observer because resemblance is after all a species of ambiguity. (Do I see a person or strokes of paint?) But resemblance falls into the category of *content* (what the picture is about) and does not engage the matter of *form* (how the picture is put together). Thus a picture might clearly resemble its subject matter (a quickly sketched caricature, for instance, can easily catch an engaging likeness of the subject) but, lacking in formal strength, be totally unconvincing as a three-dimensional illusion and at a great remove from fine art.

Another point: An artist will lay out a perspective scheme by first establishing a vanishing point, then marking off intervals around the edges of the page, and, finally, make ruler-drawn connections between these and the vanishing point. But this is too mechanical (and, when you think about it, too simple) a device to act as much more than a beginning ground plan. In fact, before any serious drawing is done, a perspective scheme can often appear totally devoid of depth and as flat as a spider web.

Furthermore, though perspective can be helpful in depicting landscapes, cityscapes, architecture and the like, what possible help can it offer the artist who wishes to draw non-geometrical, or highly detailed, or, in particular, round and curving forms? And these usually make up the *preponderance* of forms that an artist will confront as subject matter in the studio or invent from his or her imagination. For example, when sketching forms like the muscular contours of a posed figure, the convoluted folds of a throw of drapery, the delicate details of clouds, leaves or flowers, reduction in size with distance—the concern of perspective—has little or no relevance. In contrast, spatially ambiguous drawing offers close-up guidance for the precise three-dimensional construction of just such details, and, in fact, bears upon the three-dimensional drawing of any line, plane or form whatever its shape or size. This makes it a far more universal and valuable tool.

Finally, we see the most telling indicator of the limitations of perspective in Figure 131—a table top whose back edge is *measurably* wider (!) than its front edge. It clearly shows that perspective can be ignored and even blatantly contradicted with no sacrifice in three-dimensional believability, *provided* the structure possesses spatial ambiguity.

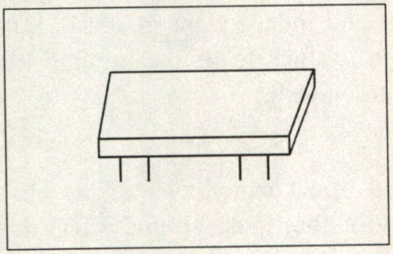

Figure 131

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Figure/Ground

A figure/ground effect appears when one draws a simple contour like the rudimentary "head" in Figure 132. The area within the contour becomes the *figure*—that is, the "thing" or "object"—and the area outside the contour becomes the *ground*—meaning a plane or open space behind it. Describing the situation another way, we might say that the figure "overlaps" the ground.

Ideally, a contour line should do more than simply describe the shape of an object, it should also make eminently clear the fact that the object stands *in front of*, and, more, is *detached from*, the ground. When this happens, we have a full three-dimensional illusion. But the technique of over-

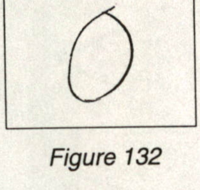

Figure 132

lapping one form with another for a figure/ground effect cannot *all by itself* be counted on to create three-dimensional illusion. It can only *suggest*, and weakly at that, that the figure stands in front of the ground. As it happens, "in front of" can sometimes mean very little. A stamp, for instance, stands in front of its envelope, but creates no three-dimensional effect whatsoever. Similarly, a child's scrawl of a circle (like the one shown above in Figure 132) will technically stand in front of the paper upon which it is drawn, but though a child might be satisfied that he or she sees a beautifully rounded head floating detached and independent in space, a more mature eye will recognize that the form is stuck to its background like a decorative stone face cemented into a garden wall.

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The figure/ground effect can, however, be an asset. Though not a powerhouse space builder, the figure/ground effect does create a mild *suggestion* of depth, which in an interesting way makes an important contribution to the tension in a picture. I will explain its action presently, but first I should describe the kinds of structures that produce the figure/ground effect.

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Any *angle* or *curve* in a line will automatically suggest a "figure" on one side and "ground" on the other. The angle in Figure 133, for instance, creates a figure and a ground. The figure appears on the angle's "inside"—that is, the *smaller-angle* (less than 180 degrees) side of the line. The ground appears on the *larger-angle* (greater than 180 degrees) side. Of the two sides, the figure side of the line seems to contain a tangible "thing"—an arrowhead perhaps, or one corner of a sheet of paper. The ground side, on the other hand, strikes us as simply a plane located behind the figure or just empty space.

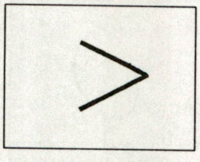

Figure 133

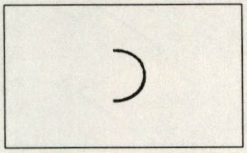

Figure 134

The *curved* line in Figure 134 also creates a figure/ground effect. It also has two sides, and, again, we sense the figure on its inside (its *concave* side) and the ground on its outside (the *convex* side). And again the inside area is the more thing-like (resembling perhaps half an orange), while the outside is merely a plane or open space.

Having clarified these figure/ground criteria, we can now apply them to simple configurations of lines; and, interestingly, we discover that when a line curves or bends first in one direction and then in another, a situation of ambiguity develops.

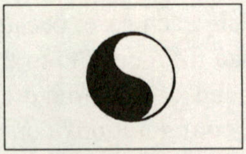

Figure 135

The Yin Yang symbol (Figure 135) is composed of a circle divided into one black and one white area by an S-shaped edge. Focusing on this division, we see that it creates two "insides" and two "outsides." Therefore, depending on where we look, we perceive one area as the figure and the opposite area as the ground. But, as with all ambiguous configurations, this decision is only tentative. As our eye shifts, our interpretation will shift as each side challenges the other for dominance as figure. The Yin Yang symbol is therefore a puzzle that cannot be solved—the hallmark of ambiguity. In this case, specifically, we have a *figure/ground ambiguity*.

The zigzag line that appears in Figure 136 creates the same kind of figure/ground ambiguity as does the Yin Yang symbol—each of the two less

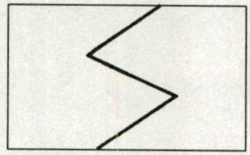

Figure 136

than 180-degree angles (marked f) asserts its area of the diagram as "figure." But both sides also contain a greater than 180-degree angle (marked "g" for ground). Thus, they continually contradict each other and the result is a tension-filled standoff.

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In a drawing or painting, the figure/ground effect of angles and curves performs a "triggering" function. Spatially ambiguous constructions are delicately balanced for reversibility, thus, the gentle "in front of" signal picked up by our eye where figure overlaps ground can easily trigger a reversal. We see this situation in Figure 137, where each of the structures—cylinder and box—has a double reading. In each case, because figure pushes forward of ground, a transfer of our gaze from one "f" to the other triggers an immediate shift which brings that end of the structure forward. And since angles and curves are elementary configurations constantly encountered, we can expect figure /ground signals to be flashing at us from just about everywhere in a picture, their delicate, balance-tipping nudges urging us to reverse our perception of the ambiguous lines, planes and forms.

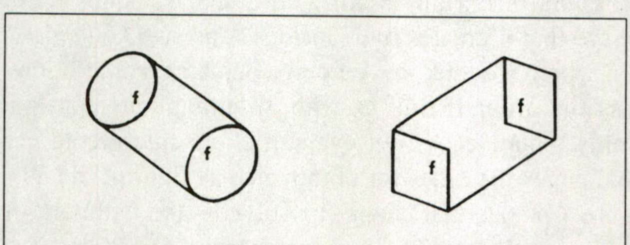

Figure 137

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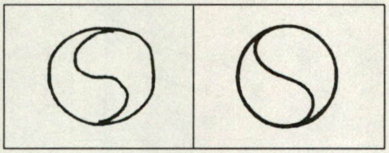

Figure 138

Because the figure/ground effect continually stimulates, if not actual reversal, at least the impulse to reverse a picture's ambiguous forms, it helps to spark and maintain the tension that supports three-dimensional illusion. But can figure/ground *all by itself* be a strong generator of illusion? Put another way, would the Yin Yang symbol be so visually pleasing if the artist did not bother to make all of its parts reversible? What if its outer contour was some poorly crafted shape, less illusionistically potent than a perfect circle? And what if the arcs that make up the S-shaped dividing line were other than "circle-derived" curves? And, finally, what if at the two ends of the S-shaped line, where it meets the circle, no care had been taken to construct vertices that contained the illusion of a right angle? The diagram at A in Figure 138 has these flaws, and, though the dividing line creates *figure/ground* ambiguity, the result, nevertheless, is a fairly flat image. In contrast, the correctly drawn Yin Yang symbol (B) has the solid 3-dimensional roundness of a baseball. Recognizing A's comparatively flaccid appearance, we are forced to consider figure/ground ambiguity no more than a minor method for evoking three-dimensional illusion.

• • •

Lower is Nearer

A form placed lower in a picture tends to appear nearer to us than one placed higher up. This lower is nearer tendency is an instinctive perception that undoubtedly has its roots in humankind's (and a long list of ancestor species') extensive experience scanning the surrounding terrain and, more often than not, finding its nearer features in the lower portion of the visual field and more distant ones higher up.

Deeply ingrained, this assumption carries over into our perception of the near/far positions of the forms we see in pictures. I stress that this is only a *tendency*, a bias of relatively mild influence. But, like the figure/ground effect,

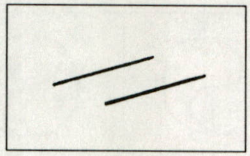

Figure 139

it, too, can tip the balance toward one or the other of a structure's two readings.

For example, glancing at the pair of parallel lines in Figure 139, we tend to perceive the line on the right side of the diagram as the nearer of the two simply because it is lower. But this reading is arbitrary—parallels are reversible, and by imagining that the two lines are high above in a "skylight" position, we can easily switch perception and see the line on the left as the nearer.

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Like the force of gravity, the lower is nearer influence pervades every part of a picture. Placed lower on the picture surface, any line, plane or form, of whatever shape or size, will tend to appear nearer than a form situated higher up. For example, the two forms in Figure 140 have been drawn approximately equal in size so that neither will seem nearer because it is bigger. But because the eggshape is lower on the page, it appears to be nearer than the rectangle.

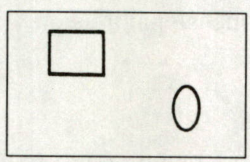

Figure 140

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Switching perception from one reading of a structure to its reverse by mentally willing the change is an essential, ongoing activity when an artist is painting or drawing. With practice, it becomes easier and easier, and, with time, through an unconscious growth process, the technique becomes second nature and eventually a force that informs intuition itself. But clever use of the lower is nearer "pull" gives us an alternative way to evaluate the reversibility of the forms in a picture. By turning a painting or drawing upside down, we can change its appearance dramatically. The familiar identity of forms—a face, a chair, a haystack or whatever—becomes obscured and can no longer distract us as we evaluate the purely formal aspects of the picture image. The maneuver causes a mass reversal of the positions of the picture's lines and planes which helps us recognize whether or not a specific line or plane is reversible. If correctly drawn, a line or plane turned upside down will have no trouble reversing and fitting easily into the picture's new spatial arrangement. Incorrectly drawn, it will now be obviously flat and thus jarring and discomfiting to the eye. Where this happens, we have a sure sign that spatial ambiguity is lacking and that the line or plane needs correcting.

• • •

Light

Much has been written about how to create the illusion of light in a painting or drawing. One "shades" a form—an apple, let's say, by giving it a light and a dark side. Then, on its light side, one can add highlights and lesser highlights; and, on its dark side, suggest illumination from a secondary light source, or "reflected" light bounced from other, nearby forms,

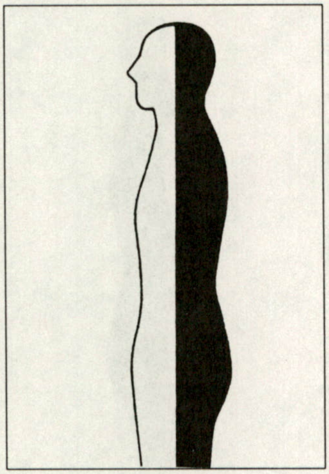

Figure 141

table tops or walls. Over hundreds of years, these and more subtle details of the method of chiaroscuro drawing have been fully described and amply illustrated, and unquestionably are well worth an artist's study.

However, despite the connotation of sculpture implied in the term "modeling," the common belief that modeling with light can, all by itself, invest a form with full sculptural roundness, is simply not true. Figure 141 shows clearly that the results of shading may be a lot less than three-dimensional. The outline of the figure has been darkened on one side to give it the appearance of being bathed in light. The tactic works to a degree, but only so far as the illusion of *light* is concerned. A close look reveals that the modeling has achieved only a faint suggestion of 3-dimensional roundness.

But art must do more than *suggest*, it must *convince*. More than being merely *reminded* of a man, we want as much as possible to *see* a solidly "real" man. Here the long edge dividing light from shadow subverts the artist's intentions by failing to capture the three-dimensional truth about the human body. The problem is that neither the light nor the dark plane is a reversible plane. Thus, the "modeling" creates no three-dimensional effect and the diagram resembles little more than a flat wooden cutout of a man, painted half black, half white.

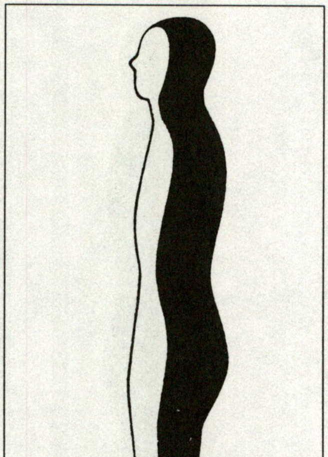

Figure 142

We see a much better result in Figure 142. Here the dividing line interacts with the contour edges to establish reversible planes that create not only an illusion of light, but also a more convincing three-dimensional illusion of a human form.

But, to be fair, despite its limitations as a generator of three-dimensional illusion, the illusion of light has much to offer. Moreover, in the following chapter I discuss the fact that not only can the light illusion be lifted to transcendent heights far beyond mere "shading" by supercharging it with the energy of spatial ambiguity, but also that one can imbue one's *color* with a fullness of expression and beauty that is only realizable when one unites the energies of both these sources of drawing magic.

Chapter Eight

Transparency, Light, Sculpture

Transparency

A brick wall functions as a barrier to the eye, blocking out the space beyond. A glass wall, on the other hand, being transparent, allows the eye to pass through. Thus the walls of a house made of glass would give its occupants a greater feeling of openness, expansiveness and breathing space than would the opaque walls of a brick house.

In painting and drawing, where the illusion of space and openness is of the essence, transparent planes are highly desirable, not only for their space-enhancing, see-through value, but also, as I will explain, for the "reality"-heightening effect they have on whatever it is we see when we look through them.

The primary transparent plane of a picture is obviously the rectangle of the "picture plane." Our eye must pass through this plane to enter the imaginary picture "place" beyond. This plane is transparent, but that does not mean that it is nonexistent or that it has no effect upon the picture image. The four edges of the drawing page form two pairs of parallels, and together these suggest something like an invisible membrane or sheet of window glass that stretches across the page surface. This plane exists by virtue of its *perceived presence*, or, in other words, because on some level of consciousness, we believe it exists. If an image is then discovered back in the picture space, we see it through this plane as though through a window glass; and our sense of this intervening presence is a powerful thought affecting everything we see.

When we look through a rose-colored window, its tint immediately betrays its presence so that we are not surprised when the view beyond appears rose-colored. But, in a drawing, the covering plane is invisible so that its influence is more intriguingly subtle and magical. It functions something like an obstacle that we must struggle through or, at the very least, make part of our perceptual calculations. This increases visual tension and, in so doing, heightens both the 3-dimensional and aesthetic impact of the forms and space beyond. In other words, the picture becomes more real and more beautiful. Not a rose color, but a *thought*, suffices to work this transformation.

• • •

Figure 143 demonstrates quite clearly the enhancement that occurs when one looks through a transparent plane. Examine the wavy line at A and compare it to the same wavy line repeated at B, where it is boxed by a rectangle. If both wavy lines are meant to represent distant mountains, the line at B is by far the more convincing of the two. Factoring in an awareness of the invisible covering plane implied by the rectangle has added to our perceptual tension. This makes the "mountains" more believable, and makes us all the more certain that we are entering a new illusionistic world.

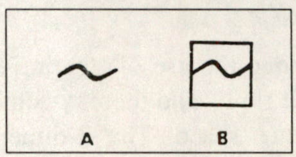

Figure 143

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But the picture plane is not the only plane to be found in a picture. Planes are everywhere, and the above thoughts about transparency can be applied to any and all of the planes that make up the picture's individual forms. This means that the artist must arrange for the viewer to be able to see through the "skin" of each form (as though it was transparent) to examine its "insides," its back surface (and—why not?—even the space beyond!).

Our declared strategy of making every line, plane and form in our picture reversible now works to our advantage. It means that each form, besides appearing as a solid, will also have a reading that is the opposite of solid, that is, hollow or transparent. Two examples of solid, and at the same time transparent, forms appear in Figure 144. Seen from below, the cone at A seems not only solid, but opaque as well. But viewed from above in its

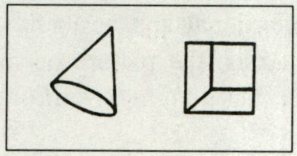

Figure 144

reversed reading, it becomes completely transparent. And the same "opening up" happens to the apparently solid chunk of chocolate. We can easily turn it "outside in" and peer into its hollow "empty room" interior.

This convenient transparency accords nicely with our intention to allow the eye the utmost freedom of movement into and out of the picture space. It does not mean however that, when completed, our picture will resemble a glass house. Remember that the bulk of the available readings in a picture are hidden, and this will include any illogical readings of transparency.

Earlier, I recommended the use of steering to avoid the eye-blocking flatness of "2-dimensional flow" and thereby achieve the goal of maximum penetrability of the picture space. The 3-dimensional flow of readings achieved by steering must sometimes be suppressed as inappropriate in their context; but, by "secretly" amplifying the picture space, they become nonetheless *perceptually* gratifying. The same applies to transparency. If every form in a picture is transparent, many of these readings will be suppressed, but nevertheless subliminally add to the viewer's sense of a satisfyingly open and accessible depth of space.

• • •

In the preceding chapters, we learned how one may create forms with double readings. These, as I say, will also create the duality of solidity/transparency. Thus, we already know how to create transparency—we simply use reversible planes. The additional point I wish to make now is that deliberately visualizing the "inside" of a form can be wonderfully helpful when adding a new line to a form to develop its structure. The form's double reading of solidity/transparency can give us, in a sense, a double opportunity to gauge the best shape and placement of each new element to be added.

Suppose, for example, that we wished to draw a small trapezoid on the side of a chunk of chocolate where the brand name might be stamped (Figure 145). To find the best placement, we first study the "solid" reading, and then, reversing the diagram in our mind, try to imagine the same trapezoid as a window on the inside wall of the "empty room." This tactic is eminently logical because if the "window" does not sit satisfactorily on the *inner* wall surface, the "brand name" trapezoid, in the reversed reading, will not sit accurately on the *outer* surface of the chocolate chunk and as a result the image's 3-dimensional integrity will be weakened.

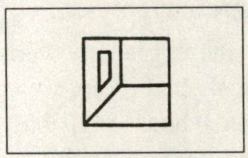

Figure 145

In a similar example, we want to place a window-shaped highlight on a polished egg such as the one we see at A in Figure 146. Again, we search for the best placement by visualizing both the egg's solid and (reversed) transparent readings; and again we use the idea of a room and placing a window on one of its walls (B). Careful placement of the *inside* window enhances our chances that the "window" highlight on the *outer* surface will follow the egg's curving contour accurately, and that we will thus achieve the roundest possible 3-dimensional effect. To be sure, even if the highlight were placed poorly, it would create an illusion of light, but at the same time it would flatten the surface of the egg unacceptably.

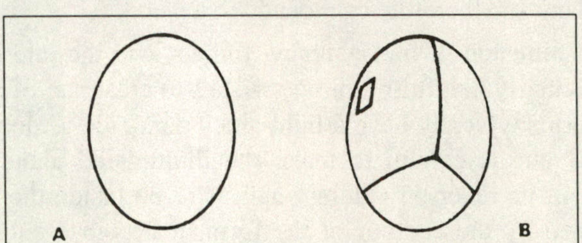

Figure 146

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Earlier (Figure 143), a rectangle framed a wavy line and transformed it into a mountain scene. Keeping this idea of a *frame* in mind, let's see how it applies to the image of the chunk of chocolate. Reversed, the chocolate with a trapezoid on one of its sides becomes a room with a window on one of its walls. Thus, what we are seeing is a tiny picture, and the rectangle forming the outer contour of the room *frames* our view of its interior. We can therefore suspect that our perception of the room, including its window, is enhanced and made more believable by our gaze having to pass through the invisible "glass" that this frame interposes.

Similarly, returning to the egg shape whose highlight reverses to become a window in a tiny egg-shaped room, we can assume that the egg contour also acts as a frame whose invisible oval glass enhances the believability of the room and window within. And at this point the reader will be sufficiently sophisticated about the human eye to appreciate that the reversed perception—meaning the highlight on the egg's surface—also profits from the tension created by the egg-shaped "frame" and "glass" that enriches its "inside" counterpart.

• • •

Generalizing about the phenomenon of the "frame," we can infer that *any shape in a picture can act as a frame* and, in so doing, beneficially influence whatever lines and planes are perceived within it. But there is a very important proviso: *Only a shape that is spatially ambiguous will function as a frame and create the intervening transparent plane needed to generate tension.* A poorly drawn shape—one that is not reversible—cannot create an intervening plane and therefore cannot add to tension.

This phenomenon of transparency, frames, and the interiors of forms becomes particularly helpful when one wishes to create an illusion of light. Illuminated forms typically have a light and a dark side as does the cube in Figure 147. If one is careful to make the illuminated plane a reversible plane, it will, in its reversed reading, appear to be inside the form. In this position, framed by the contour of the form, it becomes enhanced by the presence of an invisible, intervening plane. This complex visual situation results in a more exciting effect of light—the white area on the light side of the cube looks *even whiter* (!) than the white of the page itself, although both are in fact the same color. Our unconscious surmise is that an intervening plane is dimming the actually more brilliant light of the illuminated area. Thus what we perceive is an assumption of what the illuminated area would look like if no such plane intervened. This results in an impressive illusion—a white hot light—that could not possibly be produced by shading that lacks the charge of ambiguous "energy" supplied by a reversed, "transparent" reading.

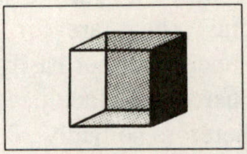

Figure 147

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Light

In the preceding chapter ("Minor Methods"), I stated that shading a form to give it a light and a dark side may fail to yield an illusion of 3-dimensional roundness and solidity. Now I must go further and assert that *by itself* shading cannot even produce (for purposes of *fine* art) a satisfactory illusion of light!

The problem again is lack of tension. Artists want to portray the widest range of kinds and moods of light—warm or cool light, reflected light, candlelight, the kinds of light one associates with various times of day, effects of translucency and incandescence, to mention only some—and to express these powerfully. As I have suggested, to do this the artist must incorporate in these effects the tensions available through spatially ambiguous drawing. In painting and drawing, tension is the agent that compels belief. And the tension of ambiguity that can make an illusion of depth can also by its presence heighten the effect of the illusion of light *and* the beauty of the color of a form. Logically, when a form has a solid, real appearance, it bolsters our belief in the reality of the light falling upon it. The more real the form, the more aggressively it compels our attention and demands that we take seriously every lump, bump, dimple and groove suggested by markings on its surface, whether deliberate or accidental. And because the form seems believably round, each such feature will be interpreted in relation to its position in space and the amount of exposure to the light relative to such position.

Thus, the more precisely we understand the position of a form in the picture's 3-dimensional space—that is, the exact angle and tilt of its various planes and how much or how little they face toward or away from the source of light—the more "thoughts" there are for our mind to evaluate and process. This is a complex operation, but easily within the powers of (and gladly undertaken by) our perceptual faculties. But if the drawing of the form is unambiguous and therefore so badly plagued by "visual static" that we are not convinced of its 3-dimensionally solidity, this effort may be slighted, or even abandoned, in which case the illusion of light may completely fail to appear.

Space does not permit an exhaustive survey of the benefits to be derived from supercharging the illusion of light with the tension of spatial ambiguity. I will only suggest that, as with the illusion of depth, the basic effect of light falling on a form as well as a great variety of subsidiary light effects are significantly enhanced when they contain a multiplicity of readings rather than just one.

• • •

What has space to do with color? Just as the illusion of light needs the backup "magic" of spatial ambiguity, so, too, to be at their best, the colors in a picture need its support. How we feel about any particular form in a picture is a *gestalt*—a sum total of our physiological reactions, psychological associations, and the image's purely formal (read spatially ambiguous) attributes, plus the added complication of the illusion of light. Thus painters, hoping to achieve beautiful color in their work, begin by selecting tubes of color that they anticipate will go well together and, using these, and guided by their original vision and intuitive taste, then mix subtler and more complex colors on the palette. So far, so good. But as they begin to introduce these colors into their painting, a last, vital ingredient remains to be added. The "magic" of spatial ambiguity must be present to enliven and enrich each brushstroke and/or larger plane of color making up the painted image. Fusing its energetic tension with the charm achieved with carefully chosen, carefully mixed and carefully juxtaposed colors, spatial ambiguity can carry them to a higher and more satisfying level of expressiveness and beauty.

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Sculpture

A sculpted figure is a thoroughly real object—something that we can reach out and touch. A painting of a figure, on the other hand, is not real at all, but merely an illusion. This fundamental difference might tempt us to believe that painting and sculpture are two different media, each mandating its own unique goals and methods. But because we see both with the same eye, and particularly because both share the goal of beauty, it should come as no surprise that the concerns and strategies of painters and sculptors are much more alike than we think.

Years ago, as I was wandering through New York's Metropolitan Museum of Art, a fascinating experience opened my eyes to the powerful link connecting painting and sculpture. What I realized was that, for success, both depend upon *illusion.*

Glancing through an archway into a gallery that had on display some examples of Greek sculpture, I saw at a distance what seemed to be the full-size torso (from the neck to the knee) of a young man. But as I drew nearer, I discovered that in fact the figure stood no more than about 20 inches high! How, I wondered, could I have so completely misjudged its size?

It then occurred to me that the figures we see in paintings *always* deceive us as to both their size *and* the dimensions of their settings. For instance, we can easily accept as full size a figure painted on a canvas no larger than a book cover. This is because the brush strokes, made illusionistic by means of spatially ambiguous construction, float back from the canvas surface to relocate as new, imaginary forms in a newly created "place." Accepting this transformation, we then gauge the sizes of things according to the scale dictated by the new setting. This illusion of radically altered *place* and *scale* is thoroughly familiar to us in painting. But sculptures are real objects—solid forms right there before our eyes. How can they be illusions?

The answer to this question lies in the fact that one creates a sculpture in much the same way one does a painting or drawing—that is, by organizing its lines and planes *for spatially ambiguous effect.* A curve is a curve, an angle is an angle, and parallels are parallels whether we encounter them in a painting or a sculpture, and therefore we follow the same guidelines when fashioning them. This means that the elements just named must contain double readings to create a structure balanced for reversibility. When this is done, we should expect to see the same awakening of illusion that occurs in painting. And, in fact, this is exactly what happens.

One reason why I have scarcely mentioned the making of sculpture in the preceding pages is that I thought it would be far easier for the reader to grasp the nature and workings of spatial ambiguity as revealed in painting and drawing. But it was not my intent to slight sculpture in the least, and in fact just about every word set forth in these pages about spatially ambiguous construction in pictures can be directly applied to the fashioning of the forms, planes and contour edges that make up a sculpture.

For example, an artist might be cutting out shapes in sheet metal to be assembled into a sculpture. Fashioning a shape in the form of an ellipse, he or she would keep in mind that it must contain the hidden reading of a tilted circle. Similarly a triangular- or rhomboid-shaped cutout would require at each of its corners a precise illusion of a right angle.

Further, sculptors who paint areas of color or scratch lines on the surface of their completed pieces can create parallels, "right angles" and "classical" curves as a means of adding visual excitement to their work. By thus "opening up," deepening and enlivening the sculpture's surfaces and contours, the sculpture's physical reality can be transformed into illusion.

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As for the illusion of a new setting—we know that a successful picture image disengages itself from its real place—the canvas surface—and magically appears to be somewhere else. Likewise, if all of its parts are illusionistic, a sculpture, too, will disengage itself from its real place—meaning the room or gallery where it stands—and appear to be somewhere else, *and*, if need be, some other size as well. In this way, a carved marble figure, or a stainless steel geometric abstraction, heavy and solid though each may be, can achieve the ephemeral nature of an illusion in every sense of the word. The new "zone" or "place" to which a sculpture removes itself, will be elsewhere and will not include the gallery surroundings. Specifically, it will be limited to the space occupied by the sculpture itself and just a little bit of the area surrounding it. Thus, we can accurately say that a successful sculpture *creates its own space,* which then frees it to *create its own scale*. This latter fact explains my experience in the museum. Freed of the constraints of the gallery setting, and transported to another space and scale, the torso of the young man effectively convinced me that it was fully life size.

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The word "ambiance" is often used to describe a certain exciting disturbance of the atmosphere surrounding certain sculptures. One can detect something like an aura—a glimmering and thickening of the enveloping space that is almost palpable. Significantly, the word is evoked only when a sculpture is beautiful. We can now identify its source—"ambiance" tells us that an illusion is present. Actively ambiguous, the sculpture is not only deceiving us as to its true size, but has also shaken off its real surroundings and created for itself a shimmering new world—a setting that is magically somewhere else; but a tiny glimpse of which we can catch just beyond the sculpture's edges.

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