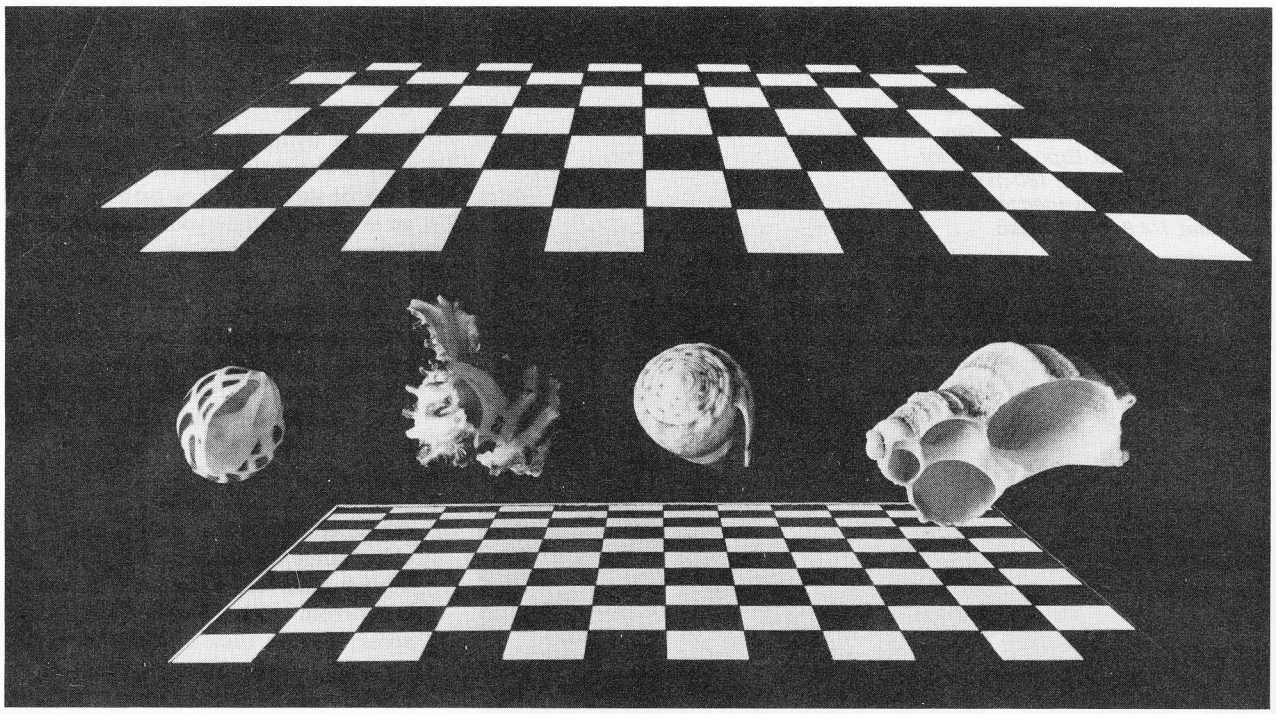
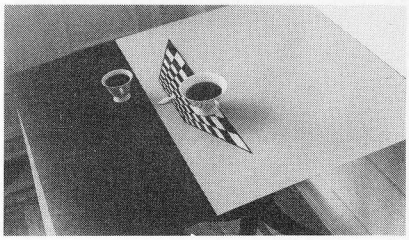


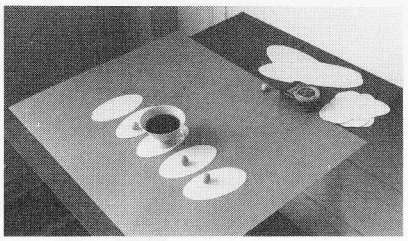
SPACEMANSHIP:
How to control picture-depth illusion

By Ralph M. Hattersley

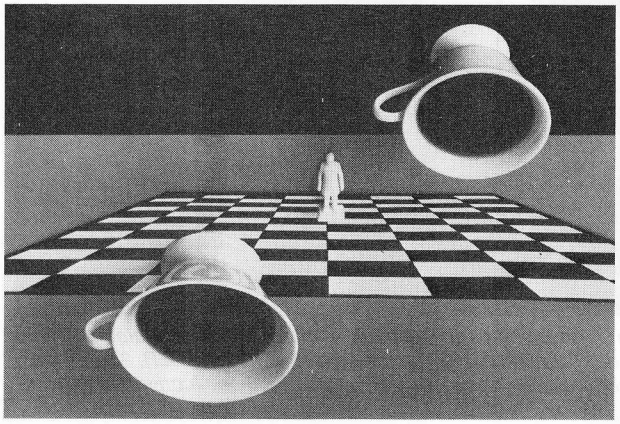


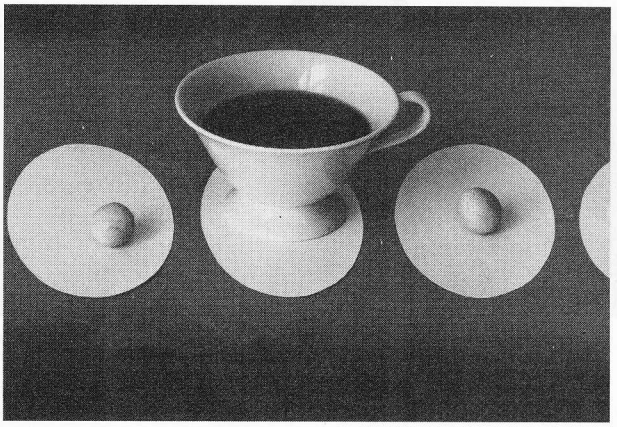
Checkerboard "squares" (below) are skewed; when we assume constant size of squares, space is turned upside down. But coffee cups show that things are not exactly as they seem. Small picture above shows setup used for photo.

Human beings depend heavily on vision, and one of the things it tells them is how far apart things are—what is space doing? We are strongly aware of space at all times, for we must operate in it as we move around. Strong though it is, this awareness is mainly unconscious or semiconscious, but we definitely need to have it to survive. Unless you know exactly what space is doing, you can't even walk safely across the room. Without space awareness you would indeed be in dire trouble.

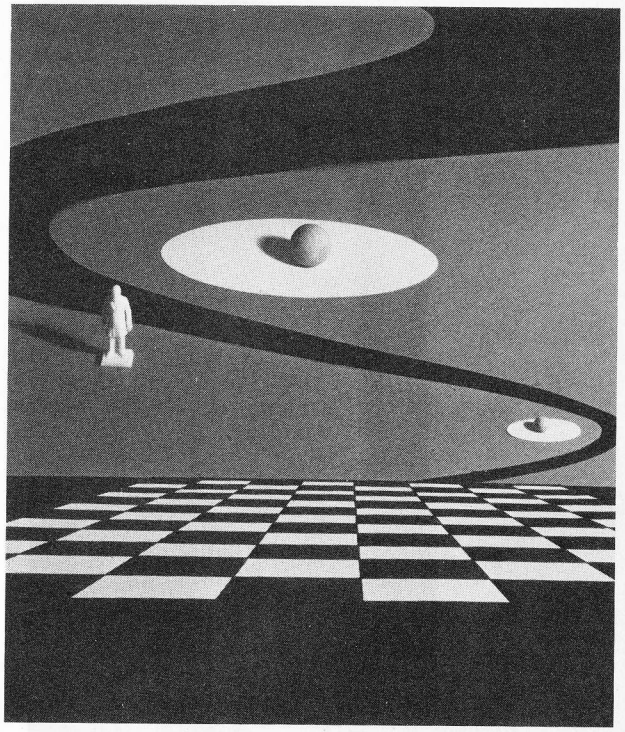


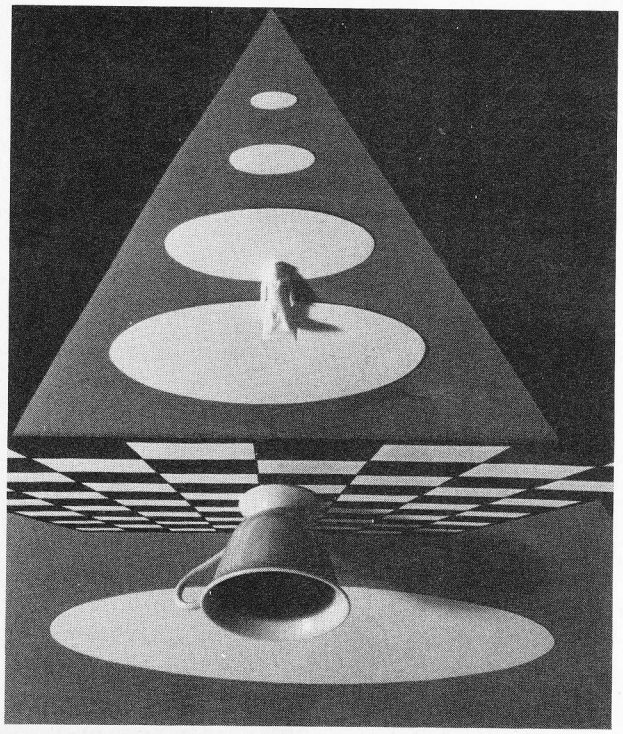
Circles (ellipses turned endwise below) tell us that we are looking at a plane perpendicular to the lens axis. But, again the coffee cup says otherwise. It looks warped, somehow. Small photo above shows picture was made with ellipses.



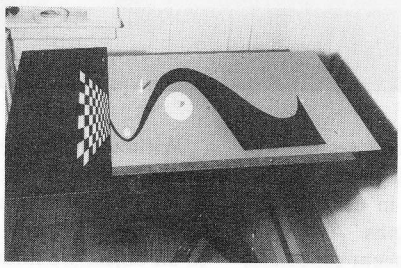


Shells (l.) appear to float without horizon as reference point. Skewed checkerboards make them seem to be airborne.

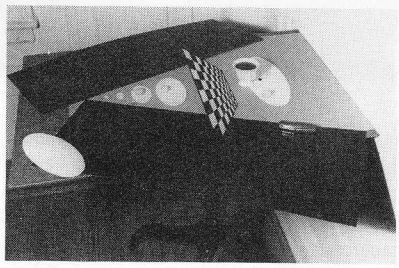




Tricky checkerboard (above) reinforces "horizon" so that S-curve with reverse skew seems to be in air. But figurine and balls deny this, seem to rest on a horizontal surface. Setup used is shown below.



Ellipses and converging straight lines give us strong cues for seeing positive space. But cup and checkerboard prove otherwise. Similar setup (r). shows that checkerboard is very heavily skewed.



We all see space in photographs, though it is only an illusion. Without this illusion, however, pictures wouldn't make any sense at all, for all subject matter would seem to occupy the same plane at the same distance from the camera, which we know seldom happens. The illusion of space simply has to be there for pictures to work properly; there are exceptions, but they are few. Ordinarily, good space control is an important part of being a good photographer.

One way to develop heightened sensitivity to space in pictures is to deliberately manipulate pictorial space, which is fairly easy to do. If you know how picture space works you can stretch it, compress it, tilt it, or turn it upside down. However, the main objective is not to make trick pictures but to learn how to handle space.

There are known reasons why we can be aware of the space that surrounds us. Our environment provides us with numerous space cues (or clues) that constantly tell us what space is doing. Without them our vision would be of little use to us. All of the cues work for ordinary space perception, but a few of them won't work for the illusion of space in pictures. We will dispense with the latter right away, then get on to pictorial space.

Binocular vision is a primary nonpictorial space cue. In looking at things in front of us our two eyes form slightly different images of them. The visual information from the images is transmitted to the brain, which interprets the difference in term of space. Binocular vision works best for nearby things and does little for objects in the distance.

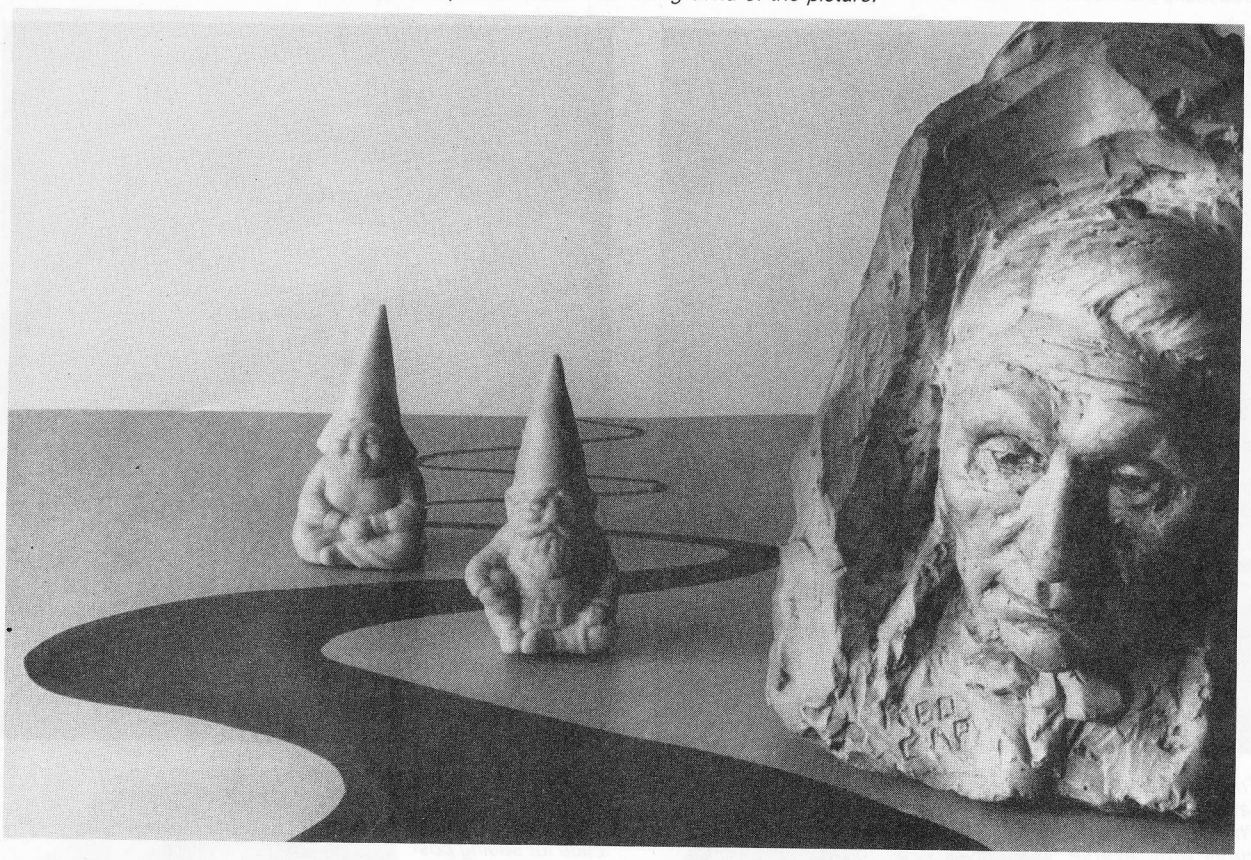
Head movement provides another primary nonpictorial space cue. When you move your head when looking at things at different distances from you, they also seem to move. However, nearby objects seem to move in one direction and distant things in the opposite direction. The brain interprets this difference in terms of space.

Variable eye focus gives us another nonpictorial space cue. As we look around us our eyes constantly change focus, which requires a certain effort by muscles in the eye. The brain interprets this effort in terms of space.

Most of the other cues used in everyday space perception will also work in pictures. They are *contour, shadows, contrast, gradients, selective focus, size constancy, converging straight lines, ellipses, S-curves, overlap,* and *horizons.* They are discussed in considerable detail along with several others in my book *Photographic Lighting; Learning to See,* (Prentice-Hall, 1979). Several of the illustrations are from the book. In this article I will tell you enough about the cues to enable you to use them creatively.

Much of our space perception is habitual. We see space cues working in certain ways and automatically assume

The "road," in this instance made up of skewed S-curves, makes the two small figurines seem to be back quite a distance from the sculptured head in the foreground of the picture.



that we are confronting so much space. This space perception habit is very strong in humans, and it makes it possible for us to be easily fooled by falsified space cues.

As you will see, it is very easy to fake some of them. It turns out that it is much easier to see something that just isn't so than it is to change visual habit.

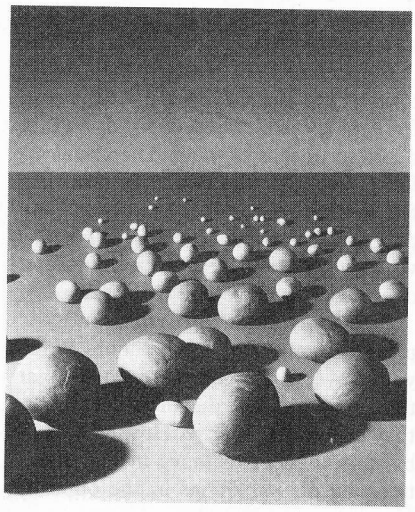
For an object to have an identity as an object, it must have a contour. It is also required to make an object seem to fill space. If contour is lost, accidentally or on purpose, the object loses most or all of its identity and flattens out into nonspace. We see this in certain very light high-key photographs.

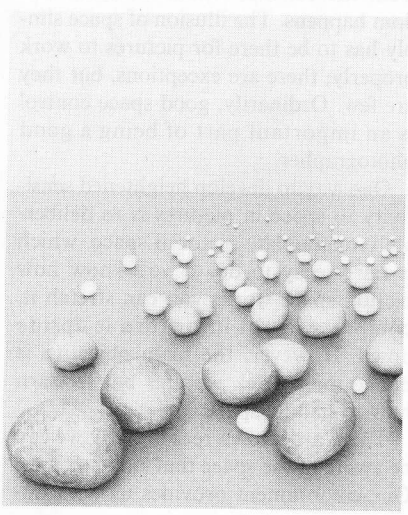
In making pictures seem especially deep, contour should usually be strongly rendered so that objects seem to stand out from their backgrounds. There are two main ways of doing this: 1) make your setups with things that are very different in tone, or 2) use lighting to build up the contrast between contours and their backgrounds.

Without being very aware of them, we depend rather strongly on shadows to tell us how things relate to each other in space. When a shadow is attached to an object we know that the object is resting on a surface and that it stands out in space above it. This can be faked, to be sure, but it is the usual situation.

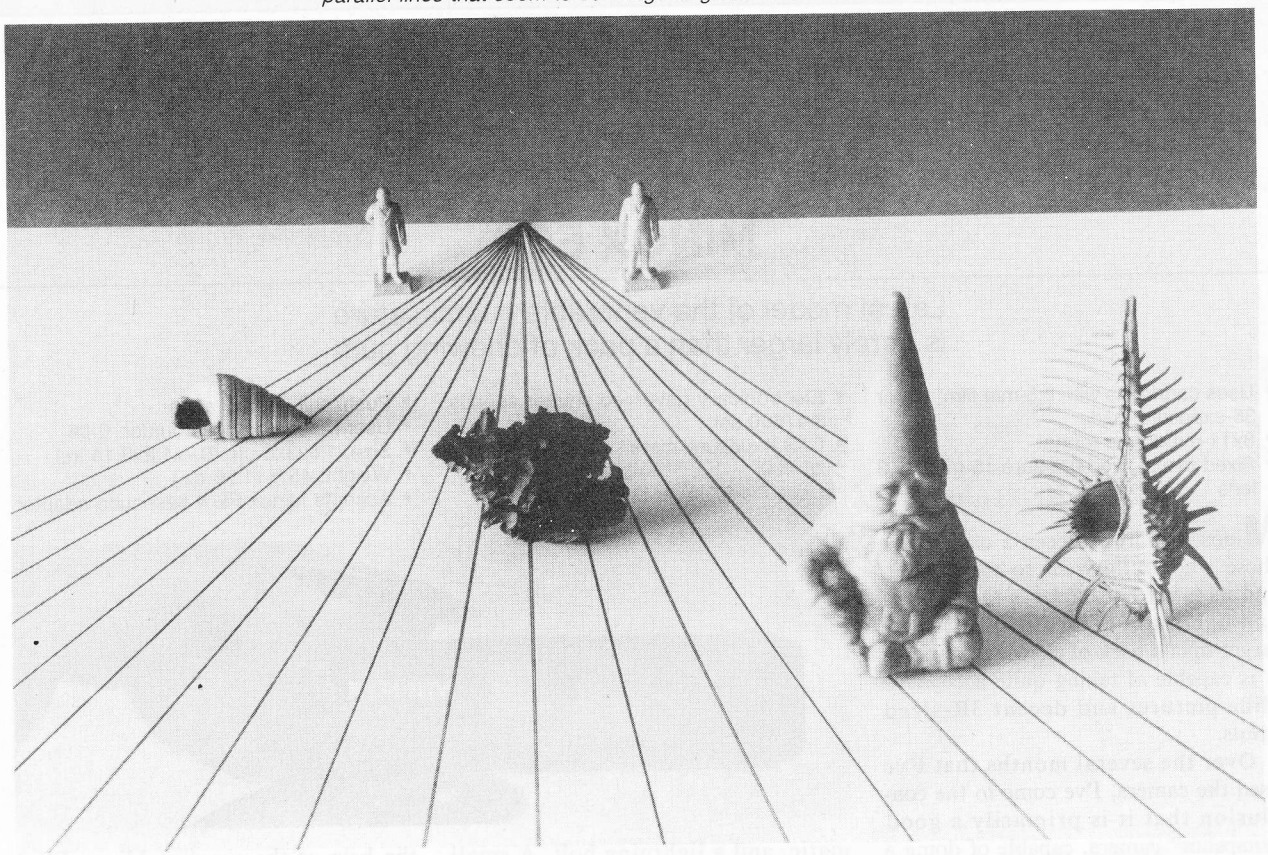
Shadows are such strong space determinants that you have to be very careful of them when you are trying to stretch space, compress it, tilt it, or turn it upside down, for they might give

Balls all look alike (r.); we tend to assume they are all the same size. Thus we account for the size differences by "seeing" deep space. Horizon and shadows help us do this. Same setup with most of the lighting contrast removed by flat overhead bouncelight (far r.) shows that we see less depth when contrast is kept low.





Familiar device of converging lines that intersect on the horizon provides the illusion of depth by simulating the appearance of parallel lines that seem to converge at great distances.



your tricks away. For most setups it is best to use a side bouncelighting that will create cast shadows with very soft edges or none at all, because such shadows draw very little attention to themselves. Sharp-edge shadows tend to destroy space illusions.

Though sharp edge shadows tend to define normal space rather clearly they can sometimes be so strong that they badly confuse it. The thing to do is to make yourself aware of them so that you can figure out what they're doing.

If a picture has no contrast it also has no depth; it doesn't even *look* like a picture. For a picture to look deep it should have quite a bit of contrast, but not too much. Extremely high contrast often washes out depth and can even make an image look as if it had been hit with a hand grenade.

Ideally, the contrast should be highest in the front part of a picture and gradually diminish as you go into the distance. This duplicates the effect that you get in deep landscapes in which aerial haze gradually lightens dark areas as they become more and more distant. We are used to seeing space this way, so it also works in pictures.

The word contrast can also be used in the sense of meaning difference. The more a thing differs from its surroundings the more it seems to come forward. This applies to psychological differences as well as the physical kind. The more a thing interests us the closer it seems.

Most deep pictures have normal or somewhat higher-than-normal tonal contrast. If the contrast is lower than normal the depth is more shallow.

A gradient is a gradual change in something, for example, a tone or size change. In everyday depth perception we use gradients all the time—they tell us how distant things are. A tone gradient tells us we are perceiving space. A pattern gradient in which the elements become smaller says the same thing. There is also a contrast gradient in which we go from high to low contrast and into space. Texture gradients are simply small patterns.

In everyday space perception we are accustomed to viewing patterns at an angle and thus seeing the elements become gradually smaller. For pictures such a gradient can be skewed so that the size change is more radical—this increases the feeling of depth. For example, you can photograph a pattern made of rocks that actually vary considerably in size. To increase the depth put the largest rocks closest to the camera and the smaller ones farther away. It will look like a normal gradient but will actually be skewed.

A phony pattern gradient can also have a reverse skew so that small elements are closest to the camera and larger ones farther away. This way compress space, reverse it, or turn it upside down, depending on what else is happening in the picture. In reversing a skew you should use elements that look alike but are of different sizes. We assume that things that are alike in shape are also the same size, which makes the skew effective.

When you focus your eyes on something close to you the things behind it appear relatively unsharp, and your brain interprets this sharpness differential as space. Though you don't consciously see the unsharpness, your brain is fully aware of it. But a camera lens will do the same thing as the lens in your eye, making some things sharp and others unsharp. We sometimes call this *selective focus* when it is put to use in pictures. Since it mirrors a natural depth percep- */continued on page 132*

The Hattersley Class

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tion process, it gives space to pictures.

The space is limited, however, to that existing between sharp and unsharp areas. In the unsharp areas the space is practically wiped out. If they are far enough out of focus, they may look like a single, undifferentiated tone in a picture, thus having no feeling of space at all. But this tone will seem to be well behind the sharp areas.

If you look at a lot of people walking down the street away from you, their images on your retina will vary considerably in size. However, your brain assumes that the people are all about the same size in actuality and interprets the retinal size differential as space. This thing that the brain does is called the assumption of *size constancy,* and it helps create an important space cue.

We tend to assume more than size constancy or alikeness, however. It is human nature to assume that things that are alike in one or more ways are alike in all of them. This is especially true in pictures. In a photograph, for example, we might have a large seashell and a small one and assume that they were the same size because they look alike. Then we would interpret the size differential as space that never actually existed. Thus we may assume size constancy in things that aren't the same size, which is not the same thing as the assumption of size constancy that psychologists talk about. They speak of things that are *actually* the same size, and we assume this to be true.

If you make a setup of identical objects positioned at different distances from your camera you will get depth. If they look very much alike but vary greatly in size you can get a lot more depth, even unto infinity. Just create a size gradient with the larger things closer to the camera. The brain will assume size constancy where it doesn't actually exist and interpret the size differentials in the images as space.

In some of the illustrations I have used checkerboards in which the "squares" look alike but vary considerably in size. Such a board can stretch space, compress it, tilt it, or even turn it upside down. It represents an intentional perversion of the assumption of size constancy. The thing is that you can make people erroneously assume constancy by using things that merely look alike. Fortunately, many large and small things do.

You know that if you look down a straight railroad track the rails will seem to converge in the distance—we use this *convergence* to tell us how great the distance is. Furthermore, we know that all parallel lines viewed obliquely tend to converge, or would if they were extended.

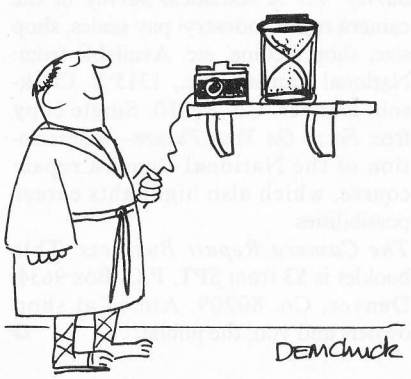
Most straight lines in our experience are the edges of rectangles. Thus we have lines that intersect at right angles and parallel lines that try to intersect if viewed obliquely. From long experience with such lines we can draw a psychological rule: all straight lines that intersect are either at right angles to each other or are parallel lines being viewed from an angle. Though this rule doesn't always apply it usually works very well for pictures.

A V-shape in a picture will thus make you think you are looking at parallel lines that were photographed from an angle. Depending on how strong it is and how it is placed it will stretch space, compress it, tilt it, or turn it upside down. It provides a very powerful but falsified space cue.

In our environment we have almost constant contact with circular things. Viewed at an angle, they make elliptical retinal images. Since *ellipses* as such are relatively rare, we can say that they have no psychological existence. Whenever we see one we think that we are viewing a circle from an angle. We are particularly sure of this when we see an ellipse in a picture—we are most definitely seeing a circle. Thus ellipses can easily be used to stretch space, compress it, tilt it, or turn it upside down.

If you have ellipses of various sizes you can also play with the assumption of size constancy. Or they can be used with V-shaped lines to falsify space. You can get templates for drawing sizable ellipses from an art supplies store; the little ones won't do you much good.

In early days of photography *S-curves* were frequently used to depict space. We found them most often in roads in bucolic landscapes, which were once very popular. Since the S is a letter of the alphabet, we encounter it very frequently in our reading and make certain assumptions about it that make it



very good for manipulation.

First, we assume that all S's of any kind are regular—that is, the tops are the same size as the bottoms. This is true of all alphabet S's and most others that one encounters. When we get a retinal image of a bottom larger than a top we assume we are looking down on the S from an angle. When a top is larger than a bottom we assume we are looking up at the S from an angle. When a top and bottom are exactly the same size we assume that the S is at right angles to our line of sight.

When we see a regular S-curve from an angle we make the correct assumption of the amount of space that we are experiencing. However, S-curves can be skewed to intentionally distort the space, especially in pictures. If a bottom is made considerably larger than a top it will stretch space. If the top is much larger it will turn space upside down. You can also arrange it so that an S viewed from an angle has a top and bottom of equal size—this takes all of the space out of a picture.

Since people never expect to see skewed S's they can easily be taken in by pictures that have them, expecially if you draw them carefully. To do this it helps to have some french curves from an art supplies store.

When objects in our environment overlap we know that the things are partially cut off are behind the others.

This also applies to pictures, but with one reservation. If two things in a picture overlap they should have good tonal separation (contrast). Otherwise they may seem to be joined together in the same plane. By increasing separation you extend space. By decreasing it you compress it.

Without being aware of it we always know where the *horizon* is when we are above ground, for it is always at eye level. We are also constantly aware that it is distant. Thus pictures with horizons nearly always look deep. Fortunately, almost any single strong horizontal line in a picture may work like a horizon, thus adding depth. However, it helps if the "sky" and "ground" areas are quite different in tone.

In using V-shapes to simulate parallel lines viewed at an angle you should have the lines of the V converge at your horizon, for that's the way it happens in everyday space perception. Use very small objects close to your horizon and larger ones closer to your camera. Since a horizon is a very strong space cue, you should generally have one.

When you begin to twist space around, the deception in your pictures may be so complete that there is no evidence of it, even if space has been turned upside down. Thus the images may look very ordinary. To get around this you can use "provers"—objects that force viewers to see that space has been changed around. My favorite provers are cups of coffee and glasses of milk. If you see a normal-looking picture with an upside-down cup of coffee, the space has been falsified.

Provers do more than prove what you have done—they add a lot of interest to pictures.

It is rather easy to manipulate space in pictures and to make yourself more aware of it all the time. The awareness of your control of space is mainly what you should go for, though it is also fun to make trick pictures.

Offbeat

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At this point, I can hear someone I know shouting, "If you do that, if you don't make students aware of what has gone before, they may waste effort by, figuratively speaking, reinventing the wheel." That this is nonsense can be seen by noting that photographers, given old-time processes like gum-bichromate without reference to the past, have indeed made new and refreshing images that do not in any way look like those of the old-time pictorialists.

The teaching of history at the beginning of a course in photography is somehow similar to trying to teach someone art via by-the-numbers coloring books.

Earlier I said that I was *not* against the teaching of history. All I propose is that students be given the raw material to work with, find their own way, and then, after having created on their own sans preconceived notions, *be very emphatically introduced to history.*

At that point students can see how their work relates to what has gone before, and how similarly or differently the tools have been used, properly or improperly.

And, very important, students can then develop a kinship with the old masters, and perhaps learn from them in much the same manner as if helped by a kind father or mother, rather than a harsh master or mistress.

This reminds me of an event that was supposed to have happened many years ago at *Life* magazine. Great photographer "A" announced that he was going to a rain forest in Africa to shoot a story. Whereupon great photographer "B" said, derisively, "That's been done before!" To which "A" retorted, "However, *I* haven't done it!"