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The Illusion of Depth in Stained Glass: Exposed to the light

Robert Oddy

Stained glass artwork often looks flat. Of course, most stained glass panels are flat. What I mean is that the objects depicted look flat. In my own work, I have given a lot of attention to creating the illusion of depth. What is depth? It refers to the spacial dimension that recedes directly away from our eyes into the distance. If a picture has depth, we see some of its elements as solid objects; some appear closer than others; we are aware of foreground, middle distance and background.

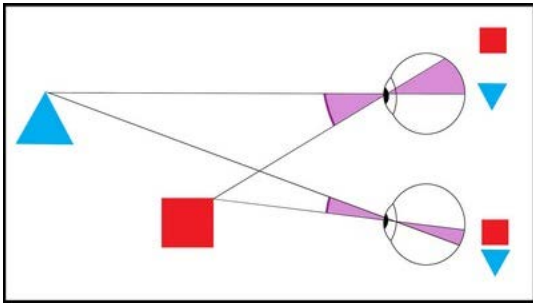


Figure 1: Stereopsis: the eyes see different images of the pyramid and cube.

As artists, we need to be aware of how we perceive depth in the real world. Much of what I say will be obvious to you. My message is that if you want to add the illusion of depth to your stained glass panels, keep these thoughts in mind.

This is the first of a two-part series. I will talk about depth perception from an artist's point of view. Vision is a very complex phenomenon, with physical, biological and psychological aspects, many of which I am not qualified to talk about. I will only touch on these aspects enough to make my artistic points. While a few techniques are discussed in this

article, I will go into more detail in the next issue.

Language of Vision

For those of us fortunate enough to have two good eyes, our principal method of perceiving depth is through stereopsis. Our eyes are a couple of inches apart in our faces, so they see slightly different images. Figure 1 illustrates this. The brain makes sense of the differences by interpreting the scene as 3-dimensional. A similar effect can be experienced by moving the head slightly, even with just one eye open. We can also judge relative distances from the movement of objects across our field of view. If two people are walking at the same speed but on opposite sides of the street, the closer one will appear to be going faster than the more distant one. Some movies simulate stereopsis.



Figure 2: Daffodils near and far. If two objects are of about the same actual size, the more distant one will appear to us smaller than the closer one.

Modern methods use

superimposed polarized images, viewed with polarized glasses, so that each eye sees a slightly different image. And, of course, movies have movement! But none of these clues to depth is easy to simulate in stained glass! Fortunately, there are other visual clues which we can exploit.



Figure 3: Differences in depth: see the silver-clad woman in the foreground and the building in the background at Convent Garden, London.

The apparent size of things is an important clue to depth. If two objects are of about the same actual size, the more distant one will appear to us smaller than the closer one. Look at the daffodils in Figure 2. We also use anomalies in the apparent sizes of different kinds of object to aid in depth perception. For instance, we know that a two-storey building is usually much bigger than a person, but if that difference is not apparent in the image, we infer that they are at different distances. See the silver-clad woman in the foreground and the building in the background in Figure 3. Another implication of this apparent size effect is that textures, such as ripples on water or leaves on a tree, may be clear in the foreground, but not in the background.

Bits and Pieces



Figure 5: Perspective: the railroad tracks appear to converge, even though in reality they are parallel.

dimensionality. This is actually closely related to apparent size. The shapes of real 3-D objects are distorted by distance. In the classic example in Figure 5, the railroad tracks appear to converge, even though in reality they are parallel. Imagine what would happen to a train if they really did converge! We use perspective unconsciously in the material world. We do



Figure 4: Partially hidden buildings at Westminster.

Another clue to depth is that nearer objects may partially hide further objects (Figure 4). Overlapping the various objects in your design will enable you to exploit this clue. Of course, the impression given by hiding objects should be consistent with that given by their apparent size, unless you want to create a visually disturbing effect.

Perspective is an important clue to 3-



Figure 6: Too Long at the Fair (1990), stained glass 30" x 40",

not consciously see the distortions We use them subconsciously to judge depth. This ability is so ingrained in us that even small errors of perspective can disturb the viewer. If an artist gets the perspective wrong, we are either bothered by it or we misinterpret the image. Of course, we can get interesting effects and reactions by breaking the rules. For example, see Peter McGrain's creative distortions of perspective in Figure 6, adding to the impression of chaotic movement.

Peter McGrain's creative distortions of perspective.

Distant Colors



Figure 7: Color often become less intense with distance.

Colors also give us clues to distance and 3-dimensionality. I will mention two different ways in which this is true. First, colors often become less intense with distance (see figure 7) This is because some of the light is absorbed as it passes through the atmosphere. We are accustomed to seeing more remote objects as less intensely colorful. Sometimes, when we look out on a very clear day, we are astonished to see how close the distant hills appear to be. Because the atmosphere is so clear on that day, we see an unusual intensity in the colors of the hills, which confuses us.

The other depth-related feature of color is that it varies with lighting and shadows. Even in an object that we know to be monochromatic (for example in Figure 8), we actually see many colors. The variations give us clues to the position and contours of the object in 3-D space. A curved surface reflects different colors as

its angle with the light source varies. The color variation gives a clue to an object's 3-D shape. Also, one object can cast a shadow over another, changing the apparent color shade. This gives us a clue to the relative positions in 3-D space of the two objects. So, an artist needs a varied palette to hand.



Figure 8: A monochromatic rose: notice the apparent color variation.

Edges and lines



Figure 9: Edges become less distinct with distance as shown with Riveaux Abbey.

Lines also carry information about depth. Lines don't really exist in nature. What we really see are the edges of things, because that is where there is a contrast in color and value. Edges become less distinct with distance. See Figure 9. This is partly due to the atmosphere, which distorts the light and reduces differences in color intensity, and partly due to our limited (though impressive) optical resolving power.

If a feature, like a flower, is over-simplified in shape (to make the glass cutting easier, for

instance), the lines will be more noticeable, and the feature will appear flatter. The undulations in a petal or leaf make the edges appear more complex than they actually are. (Of course, some do have intrinsically complex shapes.) So the lines around such features also give clues to their 3-D shapes (see figure 10).



Figure 10: The undulations in a petal or leaf make the edges appear more complex than they actually are.

Sharp Attention

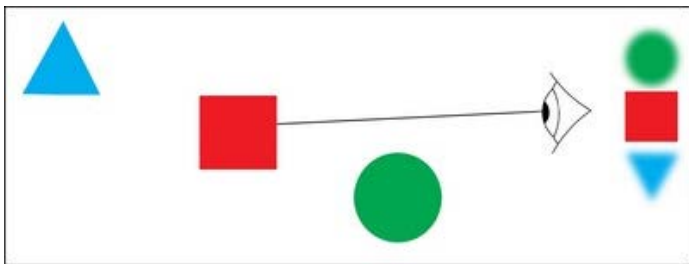


Figure 11: The red block in focus stands out from out-of-focus objects behind it and in front of it.

behind it and in front of it (see figure 11).

My final category of evidence to depth is focus. Focus has two connotations in ordinary language. In the optical sense, an object is in focus when 'the image is sharp'. In the psychological sense, to focus on an object means 'to give it one's attention'. These two senses are closely related. The object that is in focus optically stands out from the rest of the field of view, which is what we want when we pay attention to it. Standing out is a dimensional phenomenon – the object in focus stands out from out-of-focus objects

A sharp image is formed in the center of the retina by the lens of the eye, aided perhaps by glasses! The central area of the retina has a very high density of color-sensitive receptors (cones). Outside the central area, the cones are mixed with a much larger proportion of rods, which are good at detecting low light levels, but are not so sensitive to color. Both types of cell decrease in density as we move away from the center of the retina. You can easily observe the effect of this arrangement by staring at one word on a printed page. Without moving your attention away from that word, see how small the area of the page becomes that is clear.

Focusing is not just a matter of optics – it is coupled with giving attention to something. The brain directs the eye to focus on what it wants to pay attention to. If it is a large object, the eyes scan it very quickly to pick up all the desired detail.

Focus on the Flow

When you look at two-dimensional artwork – paintings, photos, and stained glass windows – the whole picture is in focus in the optical sense. More precisely, it is the medium that is in focus. Many painters seem to ignore the optics of focusing – either everything is in focus or, as in some impressionism, nothing is! Figure 12 is a painting by Renoir, in which the woman does appear to be in better focus than the man. In looking at a picture, the viewer will be scanning for something to focus on

(i.e. give attention to). Wherever the eye settles, the retina will sharpen up that area, but the eye will be drawn to places where that is easier, or which are more important to the interpretation of the picture.

Even if the whole picture is clearly delineated, the directions of flow in the design will draw the eye toward focal points. In Figure 13, I have drawn in the directions of flow, which guide the eye to the lower flower.



Figure 13: Rhododendron (2000), stained glass

24" x 14", Robert Oddy, drawn in are the directions of flow, which guide the eye to the lower flower.



Figure 12: La loge (1874), by Pierre-Auguste Renoir in which the woman does appear to be in better focus than the man.

Brighter colors and more detail also draw the eye, as do objects of emotional or social content, such as faces. Whatever artistic notion has drawn the eye to a small area of the picture, the rest will be in peripheral vision, and thus appear out of focus. So, the feature that is the center of attention will stand out, contributing to the illusion of depth.

The image that is cast onto the retina is not at all the same as the real world within our field of view. It is distorted in several ways, which I have pointed out in this article. In our normal moment-to-moment existence, we do not give this conscious thought. We use the distortions to interpret our 3-dimensional environment. So, it is easy to overlook the distortions when we do art.

My goal here was simply to expose them to the light! Techniques for giving an illusion of depth specific to stained glass will be the focus of my next article.