

T H O R O U G H T H E L O O K I N G G L A S S . . .

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Mirror inversions are very strange...perhaps you have noticed. Have you ever wondered why right hand goes on your left in a reflection? Or perhaps you think you understand that phenomena. Then have you ever wondered why your head doesn't go upside down in the reflection? No matter how you turn (try looking in a mirror while lying horizontal) the mirror seems to know your orientation...it only inverts right and left. Could there be some intelligence, some psychic property to mirrors?

By this time all my physicist friends will be certain I have gone off the deep end. But don't be so cocky. As I recall, your explanation has always been to apply ray drawings and show that the inversion is understandable. I challenge you to do that drawing in three dimensions and establish a frame of reference (or even a smoothly varying change of coordinates) so that you can tell me why the right-left of (any or multiple) observers in any orientation inverts only right-left.

So my psychologist friends say it is due to binocular vision? Then try the experiment with one eye closed. Better still, try the experiment with right/left retinal differentiation or occlusion. The results are the same in any case.

So what gives here? It's done with mirrors you say? It's magic you say? No, but it is an amazing property of the human mind - and perhaps other minds as well. Let's analyze the mystery in detail.

Suppose you examine something (you have written) in a mirror. Of course, you are familiar with the fact that it appears as 'mirror writing' or right-to-left writing instead of the usual left-to-right orientation. In other words, the image seems to have been rotated 180 degrees about the vertical axis. And indeed it has been! Observe the whole process once again in detail! you write on a piece of paper

BYE and look at it in the mirror - oops, I forgot to say 'turn it over' and look at it in the mirror. Well, there is our 180 degree rotation about the vertical axis. Now, we tend to 'turn things over' about the vertical axis for some compelling reasons! Things tend to be less stable when rotated about the horizontal (right-left) axis - things spill out of containers, things fall off surfaces, often a structure is designed to have vertical support - but only if it remains 'right-side-up' - and so things break or in some other way are deformed when inverted about the horizontal. So, Mystery solved! Things appear inverted right-left and not top-bottom because we actually rotate them that way in order to see them in the mirror.

WRONG! What about all those objects that we can see in the mirror - each inverted right-left - that we have never even touched, objects that have not been physically rotated? Why aren't they inverted top-bottom? Why should the mirror or another nature care what we think about as being right-left versus top-bottom? By elimination then, we now know that the explanation is not purely physical nor is it explained by binocular vision nor are objects actually rotated. We are left with one alternative - the inversion is a selection or filtering property of the mind. Somehow the mind is able to keep track of it's own local orientation (reference frame), that of the rest of the world, and accept only those inversions that fit some sort of pattern it understands. So what is that pattern?

First of all, we assume that things we see in the mirror are what we would see of an object if it were rotated about the vertical... primarily because we are familiar with that particular rotation, but also because the world is full of symmetries about the vertical axis. Thus, we do not expect to find intrinsic ordering in the horizontal plane, whereas we do expect intrinsic ordering in the vertical plane - as I said before, things deform when inverted in the up-down direction (gravity, you know). Clearly, when we go to check this out, sure enough we turn the object around (you guessed it - about the vertical axis) and there is the object we saw. But what if we had rotated it about the horizontal axis? We would still have seen the same view! Only if the object has some inherent ordering that saves, as one shipping carton, 'this side up' do we feel that something is wrong with the orientation. And this means of course that we know where 'up' is at all times...even when looking at a mirror while lying horizontally.

How wonderful the mind that it can keep track of all the proper names of things, all their 'proper' orientations, our own orientation, and that of the world about us! So many rotations, so many independent orderings, so many translations in space - and like Alice, we are always able to find our way back through the looking glass.