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## Limitations

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A little over a century ago, *Flatland* was published anonymously. It was a book written for amusement (his own, as well as that of his readers) by a grave and serious Shakespearian scholar, Edwin A. Abbott. So exuberant was its demonstration of imaginative power and so Swiftian its satirical description of an alien society that it achieved a popularity that has never diminished.

To this day, it is probably the best introduction one can find into the manner of perceiving dimensions. We are made to understand the way in which the inhabitants of Pointland (zero dimensions), Lineland (one dimension), and Flatland (two dimensions) are satisfied with their universes. They are not only incapable of understanding the limitations of their view but are enraged by any attempt to enfource them to transcend those limitations.

We might well imagine that we, from our superior viewpoint of three dimensions, faced with no fewer than three stages of transcendence–from point to line, from line to plane, from plane to solid–would be ready to understand the concept of step-by-step increase of dimensional number without end. Certainly, we could accept and understand a universe of four spatial dimensions.

Not so! Abbott shows how an inhabitant of Spaceland (our own familiar three-dimensional Universe), after explaining in detail the two-dimensional limitations of Flatland, and forcing an inhabitant of tha plane to accept the additional dimension, himself falls into a rage when asked to contemplate a fourth dimension.

And this is true of three-dimensional beings (we ourselves) generally. One of the problems faced by anyone trying to understand Einstein's theory of relativity is that it forces us to look at the universe as more than three dimensional. We must accept time as a kind of fourth dimension, though one somewhat different in its properties from the other three–which introduces yet an additional level of complexity. One escape from that problem is to seek refuge in mathematical representations without inquiring too deeply into the geometric significance of the equations.

*Flatland*, however, gains further significance if it is viewed not merely as a matter of dimensions, but as a study of the human mind and its attitude toward limiations generally.

If a limitation is inherent, because of a body's physical limitations, how can one get round it? How does one explain color to someone who has been blind from birth, or music to someone who has been deaf from birth? One can explain the differing

wavelengths of light and sound; one can refer to analogous differences in sensations that can be experienced, such as those of touch. An intellectual understanding can be reached, perhaps. But never can this compare with the level of comprehension that the sight of a garden, or the sound of a Beethoven symphony, even if only for a few seconds, could bring about.

But what about the limitations that represent only an ingrained habit of thinking? The Flatlanders accept not only their two-dimensionality as an unarguable law of nature, but also the mental inferiority of women. Yet while the Sphere tried to correct the two-dimensional limitatioin, he made no effort whatever to enlighten the Flatlander over the matter of feminine infereiority. But then, this Flatland attitude reflected the common British attitude in Victorian days (as did the set-in-stone class distinctions of Flatland) and we may suspect that the author himself may have participated in those now antiquated social views although he was totally enlightened with respect to dimensionality.

This book, then, should lead us to question the limitations we set to our Universe generally, not only those that are mathematical and physical, but those that are sociological as well. How far are our assumptions justified, and to what extent are they merely careless, or self-serving, misinterpretations of reality?

Oddly enough, the casual acceptance of unnecessary of wrongful limitations has its obverse as well. The limitations we live with constantly, or that we have been brought up to believe, we tend to accept without question. Not so with limitations that lie outside our ordinary experience, even though such limitations may be very real.

For instance, we are accustomed to the fact that no matter how rapidly an object is moving, applying a force in the direction of motion will cause it to move faster. Every time you step on teh accelerator of your car, you are making that assumption, and your car invariably behaves in such a way as to bear it out.

That, however, is only true at comparatively low speeds. As speeds become greater and greater, forces become less and less effective in making the speed increase furthere. It turns out, therefore, that the speed of light in a vacuum, 186,282.4 miles per second, represents an absolute maximum speed for any material object. It was Einstein, in 1905, who first discovered this limitation in our Universe.

Yet this is the one aspect of the theory of relativity that laymen seem most unwilling to accept. The question that is invariably raised is, " *Why* can't we move faster than light? What's to stop us? Why can't we just keep the rocket jets going and move faster and faster?"

The best argument in response is that we can't do so because that limitation is part of our Universe, just as our own existence is. If the limitation did not exist or if it were different in detail then the Universe might still exist but it wouldn't be *our* Universe.

It might even, conceivably, be a Universe in which some other limitation would be introduced that would make our kind of life impossible.

Might not Flatlanders, in similar fashion, simply dismiss all chance of a third dimension by saying that the inability for more than two dimensions to exist in the case of any material object is a limitation that is simply part of the Flatland Universe? In a three-dimensional Universe, they might insist, other limitations could exist that would make Flatland and Flatland-life impossible.

And yet since *we* can easily imagine a Universe transcending Flatland, might there conceivably be some Universe transcending ours in which the speed-of-light limit does not exist, and might we, at least temporarily, work out a way to enter that transcendance as the hero of *Flatland* lifts out of his own Universe for a time? Certainly, in my own science fiction stories, I routinely allow my characters to "jump" through something I call "hyperspace" in order to make interstellar travel practial, and to allow my plots to progress. Someday might this become reality? Very unlikely, I admit, but–

In short, *Flatland* is not just an amusuing and witty exercise in geometry, but is a dissertation that could lead to very profound thought about our Universe and ourselves.