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The Fear of Space

Man's fear of the unknown has always been two-pronged. He knows that danger may lurk in regions unexplored. But he dreads more the darkness at the bottom of the stairs.

by **ELLERY LANIER**

I HAVE OFTEN WONDERED about the sensation of gripping fear which we would experience if we descended a stairway in the dark and found no landing for our feet. The frightening internal shrinking which would take hold of us would be filled with a primitive terror of the unknown.

But to experience an equivalent sensation in reading fiction or in listening to music can be absolutely delightful. This, I suspect, may be the secret behind the pleasure we derive from science fiction, or the chill we get from eerie paintings like the early de Chirico's, where in imagination we look out on a silent and deserted universe that leads into infinity.

This terror of empty space, 'Agoraphobia' has an utterly helpless feeling about it, as well as a sense of hidden power. It is intimately tied to its oppo-

site 'Claustrophobia', the fear of being shut up in a confined space. If the fear is not conquered, it can become overpowering and totally crippling. With mankind confronting a future in space we will have to come to grips with both of these conversion hysteria complications—confinement in the box-like space cabin of a rocket ship and complete isolation in the endless vacuum of space.

A particular kind of courage will be needed and it should not be forgotten that an even greater challenge may await us—the possibility of passing *beyond* normal space. The frontiers of science fiction are yielding to the reality of space travel, but the possibility of passing through our space to other dimensions still remains totally unexplored. I have not been able to find a single scientist with a serious proposal for a Space Warp Drive, like the ones so

frequently used in science fiction. No one seems to have the courage to face up to this challenge. But why should a classic area of science fiction be treated like a tabooed territory?

Are scientists frightened by the missing step at the bottom of the stairs—Are they so badly alarmed that they are hiding behind shallow excuses and evasions?

The real conquest of space will not have been completed when we've reached and explored the planets. We must ultimately try to break the space barrier itself. If we could go from one planet to another by getting into a machine, pressing the contact switch, and arriving on Mars—or across the light years to the stars—in a matter of minutes, science fiction will have pointed the way to the greatest victory of all.

A clue to the mystery of why our space scientists have carefully avoided this challenge may perhaps be found in a talk given by Dr. V. Hlavaty to the Institute of Aeronautical Sciences. His conclusion is gloomy: "Hence, according to this theory, we are living in a space whose structure we can never grasp or understand."

But even if Dr. Hlavaty is right about our inability ever to understand completely the space we live in, we should not reject the possibility of a Space Warp Drive out of hand. We have been extremely successful with many problems which we do not fully understand including the intricacies of atomic structure.

Dr. Hlavaty used the analogy that was once made popular in a book called "Flatland." The people in Flatland were all flat, and lived in a world that was two-dimensional. They could not travel in any direction that had a blocking line in front of it. They were compelled to go all around the obstruction on the flat surface. But such limitations would only exist in an *imaginary* flat world. Until the coming of the airplane most human movement was virtually in terms of a two-dimensional world. We in our three-dimensional world could easily lift the flat man from his flat world and 'transfer' him over the thin line to where he wanted to go. The flat man, of course, would never know what had happened to him. He would probably look upon the occurrence as a supernatural one.

In the same way anyone viewing us from a four-dimensional world could readily comprehend how *easily* we could travel from place to place if the obstruction of the in-between 'space' could be removed. But we cannot even begin to imagine what the shape of that four-dimensional world would be like.

It has been argued that we can imaginatively comprehend the structure of our space by using our intuition which suggests, if it does not actually tell us, that the world we live in is a kind of three-dimensional plane which is flat, rather than a three-dimensional surface which is curved. But according to Dr. Hlavaty we cannot rely on our intuition. It has deceived mathematicians too often in the past. Another approach to the problem is based on our ordinary everyday experience, which tells us that space is flat, or, at the very least, that *things* have *surfaces*. This claim is also disposed of

by Dr. Hlavaty, who reminds us that a firm conviction that the earth was flat misled our ancestors—until Columbus.

Actually, two fairly reliable techniques exist for attacking the problem of what our space is really like. One is geometry—the other Einsteinian Relativity. The geometry we were taught in school goes back two thousand years to Euclid. It is based on our intuition and common sense, and works out very well in our everyday experience.

There are any things we simply take for granted in ordinary life, such as our every day belief that a straight line is the shortest distance between two points. This seems too obvious to need proving. But Euclid's ideas really can't be proved or disproved. One of his ideas about space, for instance, is actually only an abstraction based on mathematical assumptions. It is his Fifth Axiom. (Axiom's are ideas which we can't prove but take for granted anyway). It says in part that two lines that are parallel to each other meet at infinity.

After Euclid, many mathematicians tried to confirm this experimentally. They were convinced that if they could only prove it, instead of taking it for granted, we could start to know something about what happens to our space when it comes to an end—assuming that space *can* come to an end. It wasn't until about 130 years ago that Lobachevski and Bolyai achieved something really important in this direction. In trying to find out why nobody was able to prove Euclid's Fifth Axiom before, they figured that it probably couldn't be proved at all. If such was the case, then it should be possible to prove—that reality had an unknown dimension.

To accomplish this they used all of Euclid's axioms except the fifth, which they replaced by another which flatly contradicted it. The new idea outraged intuition—and common sense as well. It affirmed that through any point outside a line two lines can be drawn. The new geometry was called non-Euclidian and Lobachevski went so far as to derive a set of useful formulas from it.

Lobachevski came to the conclusion that if his geometry really described our space the existing curvature would be too small to be detected in our daily lives. He tried to check his theory by attempting to measure the curvature of our space. He used a giant measuring triangle stretching across to the stars. The figure three-pointedly joined the Earth, the Sun, and the star Sirius. The results were uncertain. They seemed to confirm his hypothesis but there was no way of determining the accuracy of the instruments or allowing for a reasonable margin of error. The effort turned out to be a failure.

But Lobachevski's failure opened new and unexpected fields for scientific research. It was found that the set of rules we use are determined by our own choice and completely independent of the space in which we happen to live. It was found that it is possible to imagine all kinds of space, and that we don't really know the geometry of our space in a non-Euclidean sense and can only enlarge our knowledge by experimentation.

One way to study the space we live in is by

means of relativity, which gives a geometrical description of the world which involves gravity. According to this viewpoint our world has four dimensions, but it is impossible for us to detect its curvature.

According to the general theory of relativity we live in a four-dimensional curved "space-time." But it is physically impossible for us to visualize what this unorthodox space is really like. All we can ever know is the three dimensional cross-section of the four-dimensional space-time that comprises ultimate reality.

Hlavaty uses the example of a mathematician born blind who can give a complete description of colors from the mathematical point of view. He can even tell you what to do with colors, how to handle them, how to measure them. But he himself will never know the real importance of what he is doing.

If someone tried to explain to him that fire was red and snow was white he would incorrectly think of red as heat and white as cold and upon checking his formulas he would find the most glaring contradictions.

But a good mathematician will take his mathematics seriously in spite of the contradictions, and come to realize that he can never truly comprehend the true meaning of his theory, even though he has mastered it abstractly.

"All that remains to him is the faith that there is some more powerful intelligence than his which understands not only his abstract theory, but also its *true* interpretation." Hlavaty thinks by the same token it is impossible for the human brain satis-

factorily to solve the mystery of the structure of the universe in the light of ultimate reality.

But is Hlavaty right? Are we really doomed to never be able to 'know' the four dimensional curved space-time in which we are embedded? Spengler believed that all previous civilizations, as well as our own, have developed a taboo that has served to shield them from really coming to grips with the problem.

Instead of facing it without subterfuge they project a symbolization of their own devising and find escape from the problem in a profound mysticism. Their escape has produced the Gothic Cathedrals, the Moorish Mosques, the paintings of Rembrandt, the dark tone-worlds of Beethoven's quartets; the solids of Euclid's geometry, the miraculously beautiful proportions of the Parthenon and the pyramids, the Nirvana of Buddha, and the visions of all the world's great mystics. We find it operating forcefully through the whole realm of modern technology, right into the workings of the cyclotrons, betatrons, cosmotrons.

But it has only been in the realm of science-fiction that the idea of really moving through this multi-dimensional world was approached as a reality, and not as an escape from reality. And now the question remains as to whether the scientists of our civilization will really accept the challenge and start to build a practical Space Warp Drive. But until this happens—or doesn't happen—it remains for the imagination of science-fiction writers to plot the adventurous possibilities of the greatest adventure of all—the final conquest of our fear of the step at the bottom of the stairs.