

An Alternative Perspective on Spatial Dimensionality

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Introduction

The observation that spatial dimensionality is limited to three dimensions has been a puzzle to scientists. Our mathematics does not limit us to three dimensions. Why are there only three dimensions? We often believe we can conceive of universes having only two dimensions, that is, a 2-D or planar universe. We conceive of the 2-D universe as a subset of our 3-D universe. And we see how complex explanations in a 2-D universe would be for events we find simple in our 3-D universe. Relativity theory made spatial dimensionality elastic. The space-time continuum was conceived. Four dimensional space-time was proposed and attempts to visualize a 4-D space as an extension of our 3-D world became popular. We talk about 3-D space being curved around a 4-D sphere like the atmosphere around the earth.

In science fiction, discussion of alternate planes or dimensions of existence have become ingrained. Religious "Heaven" has been moved from the stars and galaxies to these alternate dimensions.

Many modern physicists in their attempts to unify theory have proposed the existence of many space dimensions beyond three. The multi-dimensional efforts at grand unification have mathematically helped describe theory, but attempts at visualization seem lame indeed. We talk of extra dimensions being curled into minute 3-D spaces.

Can anyone other than spiritualists and esoteric mathematical geniuses offer any insight into the question of spatial dimensionality?

It occurs to me that the question of spatial dimensionality can be answered by looking at the subject from a new perspective. I am a "realist" in that I base explanations upon the premise that something called "reality" exists independent of my knowledge of it. In many ways this is the classical view of physics. Even today, when discussing spatial dimensions, I conjecture that most physicists believe spatial dimensionality to be a property of this "reality." Hence, the dilemma of why just three dimensions.

Conjecture

As an alternative, consider the proposition that dimensionality is not a property of "reality." Instead, what if spatial dimensionality is a characteristic of our conceptions? This means it is a characteristic, or property, of knowledge rather than of reality. What if spatial dimensionality is a property of the observer rather than of the observed?

The Distinction between the Observer and the Observed

What is meant by something being a property of the observer rather than of the observed? Consider probability. In our modern society, the use of probability to

describe events is pervasive. What's the chance of rain today? Who's favored in the game? We use probability so much that we forget that probability does not describe the event being observed. Probability describes our knowledge of the event. Thus, probability is a property of the observer (us) rather than of the observed (event). [\[1\]](#)

If spatial dimensionality is a property or characteristic of our knowledge and all knowledge is illusion, does this mean that spatial dimensionality is irrelevant or trivial? For further discussion of the relationship between knowledge and reality (see [The Nature of Knowledge](#)).

Not at all. To say spatial dimensionality is a very powerful tool may be one of the all-time greatest understatements. However, if spatial dimensionality is a property of our knowledge, then it is not a fixed universal truth. Perhaps, other sentient beings may not find spatial dimensionality a useful or necessary part of their knowledge system!

Just as probability changes with our knowledge base, does spatial dimensionality change as our knowledge changes? I believe that it has. I conjecture that at some point in human development our knowledge did not encompass a three dimensional concept. Our concept of time is an evolution of spatial relationships. Now we discuss the 4-D space-time continuum and speculate on the existence of 10 and more spatial dimensions. However, these changes in spatial dimensionality are not as frequent or shallow as the changes in our estimates of the probabilities for event outcomes. Why not?

We base scientific estimates of probabilities upon physical measurements and observations of similar events. To predict the weather, we measure a myriad of parameters, such as temperature, humidity, pressure, and velocity; then we input these data to sophisticated models. Probabilities are products of our knowledge, but they are based upon our measurements of "reality." Upon what measurements do we base our spatial dimensionality?

¹ **Probability: A Property of the Observer, Not the Observed**

If a coin is flipped, you say the probability that it will come to rest with the "head" side up is 50 percent. However, there is no "real" probability to whether the coin lands heads or tails. Oh!, but you say, if the coin is tossed a large number of times I know the percent of times it lands heads will approach 50. And I say the coin or the toss could be rigged to land heads on every toss. Then you say, in that case it is not a fair coin or toss. And I reply, what is a fair coin or toss? You reply, a fair coin and toss is one which can be repeated an infinite number of times and found to land an equal number of times on heads and tails. A "fair coin or toss" can never exist! It is a concept in our knowledge, not an actual entity or event.

If I awake in a windowless room and hear the radio announce there is a 10 percent chance of rain, I might think to myself there is no need to carry an umbrella to work. But, if I open a door and peer outside and see a heavy downpour I would no longer think there is a 10 percent chance of rain, though before I opened the door I thought there was a 10 percent chance of rain. What is the "probability of rain" describing? Whether it is raining or the state of my knowledge!

The way we so frequently and casually use probabilities today makes us believe that probability is describing the things we apply it to. Probability describes the observer, not the observed. In fact, probability always describes our knowledge, and knowledge is not "real." [\[Return\]](#)

The Physics of Sight

The answer, of course, is that our spatial dimensionality is based upon what we see. Of all the senses which a typical person possesses, sight is the one which plays the greatest role in the perception and conception of reality. The perception of spatial dimensions does not have to be based upon sight. Other natural methods of measuring space include counting steps and timing echoes. Certainly, persons blind since birth can and do develop spatial concepts. But, the concept of a 3-D universe is the product of sighted humans. Could it be that the **physics of our eyes** defines the spatial dimensionality of which we conceive the world to exist?

Our eyes are essentially 2-D arrays which sense light reflected from viewed objects. Therefore, we never actually “see” three spatial dimensions. We see (perceive) stereographic 2-D pictures. In our mind's eye, we conceive the existence of a third dimension.

If our eyes are 2-D sensors enabling us to conceive of a 3-D universe, what spatial dimensionality would we conceive the universe to be if we relied upon a 1-D sensor as our principal sensory input? What might be a 1-D sensor? My guess is that hearing is essentially a 1-D system of perception. Answering the first question is not as simple as quizzing a blind person. First, blind persons do not function independent of the sighted world; therefore, their conceptions must necessarily be largely shaped by sighted concepts. Secondly, although blind persons may have heightened hearing with respect of seeing persons, I doubt that any use hearing as their principal means of sensing spatial dimensions. To answer the first question, we need to know the mind of a sentient being which uses its hearing as the principal spatial sensor. Bats perform amazing spatial maneuvers using sonar. Unfortunately, it is hard to believe that bats are sentient. Porpoises and whales, on the other hand, probably have some degree of self-conception and may rely upon sonar as their principal spatial sensor.

Of Men and Porpoises

Perhaps we may legitimately ask how many spatial dimensions does a porpoise conceive the universe possesses. Research in communication with porpoises has been conducted for at least several decades now. We seem to have made considerable progress in training porpoises; but, apparently, we have not made a great deal of progress toward understanding the minds of porpoises.

In our intellect, before we developed writing but after we developed language, we used sight as our principal environmental sensor and hearing for communication. If porpoises are sentient, it would seem logical that if hearing is used as their principal environmental sensor, then seeing would be used for communication. Perhaps we have been erroneously applying the human model to our studies of porpoise communication by trying to discover a porpoise language in their sounds. Maybe the language exists in their movements. Because we humans sense the environment principally through our 2-D sensing eyes, we use pictures to depict what we have seen. If porpoises sense the environment principally through their 1-D sensing ears, perhaps they use sound pictures (songs) to depict what they have heard. Although a picture of a shark and the word “shark”; may convey to a human the same meaning, it would be a mistake to interpret the picture as a language element. Likewise for understanding

porpoises, although a song depicting a shark and an gesture meaning "shark" may both convey the same meaning, it would be mistake to interpret the song as a language element.

Hypothesis

Let us now flesh out this alternative view of spatial dimensionality. Suppose the following rule holds true for sentient beings such as us. Suppose that one spatial dimension can be conceived beyond the number of spatial dimension perceived. We humans with our normal vision perceive two dimensions and conceive a third dimension. Perhaps, porpoises perceive 1-D with their sonar hearing and conceive a second dimension. Could this rule also apply upwards? Could a creature perceiving in 3-D conceive a world in 4-D?

For humans to visualize a world in more or less dimensions than 3-D is no trivial task. It may even be impossible, without physically modifying ourselves. If dimensionality is not a property of the universe, but of ourselves, then our attempt to "visualize" 2-D and 4-D universes in terms of our 3-D abilities is not only futile, it is nonsense. If a song is a "picture" in 2-D, how can we draw a song? To imagine a 2-D universe to be a subset of a 3-D universe is nonsense. As the poet said "A rose is a rose is a rose," we should say "Reality is reality is reality!" The reality perceived by the 2-D being is the same reality as perceived by the 3-D being and the 4-D being. Their methods of description will vary greatly, but they are each attempting to describe the same thing.

It would be extremely interesting to converse with a society of "sightless"; humans which has evolved its knowledge totally independent of "sighted"; humans. If my hypothesis is correct, the sightless humans would not, could not, conceive the universe to be 3-D. Such a society does not exist. However, some testing of the hypothesis could be gleaned from studies of the differences in spatial conception between sighted and sightless human individuals. Unfortunately, sightless humans do not naturally gain a replacement sensor for spatial perception, such as sonar. Sonar devices to aid the blind have been created. It would be interesting to study whether persons using these sonar devices can alter their spatial conception.

There are rare cases of persons, blind since birth or early childhood, gaining the ability to see. Such persons have not had the chance to develop, or strongly ingrain, "sighted" visualization of 3-D space. These persons are suddenly given the ability of 2-D perception. Accounts of such cases appear to be consistent with the hypothesis of sentient beings struggling to create new spatial conceptions consistent with their expanded sensory perception. [\[2\]](#)

This alternative perspective on spatial dimensionality has offered a rational answer to the question of why do we conceive the universe to be limited to three spatial

² Dr. Oliver Sacks, neurologist, presents an account of such a case in the chapter entitled "To See and Not See" contained in *An Anthropologist on Mars*, Alfred A. Knopf, Inc., New York, 1995. Sacks presents the case of a 50-year-old man, essentially blind since early childhood, who regains sight following cataract removal. His regained sight was not perfect, his eyes having suffered other disease and degeneration. Sacks also provides references to other historical observations of similar cases. [\[Return\]](#)

dimensions. The answer is the universe is not limited; it is we who are limited. Another dimensionality issue that is answered is that of the co-existence of multiple dimensions beyond three. This issue becomes nonsense. A object cannot pass to another plane or dimension of existence because these planes or dimensions do not exist. No dimensions exist except in our minds.

Expanded Hypothesis [\[3\]](#)

Since we have looked this far beyond conventional wisdom, let us look a bit farther. I have proposed that dimensions are tools which we use to organize and understand the universe. It seems reasonable to believe that a being who can conceive an “n”-D universe can develop more elegant knowledge than a being who can only conceive an “n-1”-D universe. In essence, the more dimensions we can conceive, the more about the universe we can understand. Suppose that "time" is a sentient being's way to organize information about the universe for all those mysteries for which he has not been able to fit entirely into his spatial dimensionality framework. Remember the initial hypothesis was that a being who perceives “x” dimensions, will conceive the universe in “x+1” dimensions. We are now expanding the hypothesis to say that a being who perceives “x” dimensions, will conceive the universe in “x+1” dimensions plus “time”. Therefore, as a beings may increase in the total number of dimensions in which they perceive and conceive the universe, there will always be a temporal dimension to the universe for the beings.

If we could increase our perception to 3-D so we could then conceive a 4-D universe, many phenomenon which we now describe as occurring at different times would then be described as occurring at different spatial locations. The progressive increase in spatial dimensionality moves explanations from the infinite reservoir of “time” to spatial locations. However, even though the number of spatial dimensions may increase without bound, the conception of “time” remains constant for all beings, from 0-D to 3-D to “n”-D. [\[4\]](#)

End

<http://neoperceptions.com/futureperspective/futpers.htm>

³ I offer this expansion to the hypothesis without further foundation in this paper. However, it is rooted in an assumption that the most viable model for conceptualization of the universe is that of an infinitely dimensional solid. [\[Return\]](#)

⁴ I am using “conceive” in a much narrower context than previously used in my paper: (see [The Nature of Knowledge](#)). Here, conception is much more concrete than mere intellectual acknowledgment. By conceiving a third dimension, I mean we are able to construct a “vision” within our minds of objects as existing in 3-D space. The conception here is so strong that it is carried out without conscious thought. The third dimension is so “real” to us that we do not often question its existence. The third dimension is so embedded in our minds, that subconscious brain functions may be “hardwired” to better enable its “conception.” [\[Return\]](#)