Chapter 7

The Misfit

So, going back to the subject of 2D, please take a look at this simple syllogism:

If it is the case that…

a. The 2nd Dimension does exist within the 3D physical world (or we wouldn't have three dimensions)

And…

b. True flatness does not exist in the 3D physical world

It therefore follows that…

c. The 2nd Dimension is not flatness.

That is strange, is it not? Haven't we all been taught that 2-Dimensionality in our world is flat and there the matter ends? But according to this very simple logic it can't be, because quite simply, nothing *real* in our world is truly flat. So if the 2nd Dimension isn't flat… *what is it?*

First let's talk some more about what it is not…

Because we can represent 2D by removing one of the dimensions of 3D, this lulls us into the belief that we know what the 2nd Dimension actually is. Simply removing the dimension of 'height' may result in the concept of flatness, but, as we have seen, the flatness of the plane thus produced is a mental construct. We might say that the *surface* of a thing – say water or glass – is flat, but even then it is an imagined flatness because the atoms and molecules nearest the surface are themselves not flat. It's just the *idea* of the surface that we conceive of as flat.

But it gets worse, because we then proceed to do exactly the same with the next dimension, eradicating *two* of the dimensions from normal everyday 3-Dimensionality to pare it all down to a line. Euclid, the father of geometry, described the line as *'a breadthless length'*, but I'm sure he noticed that it is also heightless, and whether we define it as the shortest distance between two points or a geodesic circle around the Earth, a 1D line is a theoretical entity that possesses no real existence outside the brain.

However, theoretical or not, lines and planes are very easy and intuitive for us to imagine. So we allow our minds to persuade us that since 3D is clearly solid and real, 2D must be flat (and real) and 1D is a line (and real). 3D may be all around us, but the line and the plane are nothing more than *representations* of 1- and 2-Dimensionality; useful conceptual tools to enable us to function rationally in relation to the physical world. But there the reality ends, in the imagination!

Taken together, we have the impression that 1D and 2D and 3D are all fundamentally similar, which leads to the *assumption* that three spatial dimensions actually exist. But, if the 1st and 2nd Dimensions only exist conceptually in our minds, *how can we say that they are as spatial as the 3rd Dimension?* How can we say *what* they are?

To summarise: the 1st and 2nd Dimensions exist because they stack up in keeping with our *Flatland*-derived *Principle of Stacking*[a] to form the 3rd, but they are not present in the world as flatness or a line. We have on our hands a conundrum. It gets worse…

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[a] *The Principle of Stacking:* Each dimension is composed of an indefinitely high number of cross-sections (slices) of the dimension below, stacked together and fused into a single entity.

Time Gentlemen Please

In his classic 1895 novel *The Time Machine*[a], HG Wells wrote,

> *'There is no difference between time and any of the three dimensions of space except that our consciousness moves along it.'*

No difference, except… Leaving aside the glaring anomaly that neither he nor anyone else knew what consciousness was[b], after considering the basic 3-Dimensional structure of his everyday, pre-Einsteinian world, HG expected that the 4th Dimension would turn out to be pretty similar to the other three – just another dimension of space. But in terms of the physics, apparently not. Here's US cosmologist Janna Levin,

> *'As much as we try to make time the same as space, it still seems different, different enough that we continue to give it its own name. For one, we cannot move freely in time. We cannot, for instance, move backwards.'* [c]

Scientific thinking over the past hundred years or so holds that the first three dimensions in our 4D universe are *spatial,* or *space-like,* whilst the fourth is not. It is *temporal*, or *time-like*, which sounds like a circularly reasoned statement that *time is time*. Although space-time intervals[d] may be said to be 'space-like' or 'time-like' depending how they lean, when applied as a description of the dimensions themselves it's a bit like saying that a hedgehog is hedgehog-like. If a hedgehog were camel-like, now that would be something!

Space is space and time is time – it all reminds me of Costas Dimitriades, the character played by Tom Conti in the 1989 film *Shirley Valentine* who, in a moment of philosophical intimacy observed in his charming accent that (among other things) *"Boat is boat"*. No wonder Einstein rolled all four of them together into one handy equation-ready bundle he called 'space-time', and by describing them as a 'continuum' brilliantly sidestepped the need to separate them all out.

Following Einstein's slick *en passant*, scientists continue to refer confidently to the first four dimensions as *"three of space and one of time"* or *"three spatial dimensions and one temporal"*. I think I can safely say that I have yet to read a popular publication by any physicist anywhere, either in print or online, in which he or she does not make this statement at least once. In an effort to open up discussion, US physicist Heinz Pagels remarked in 1985 that,

> *'One feature of our physical world is so obvious that most people are not even puzzled by it – the fact that space is three-dimensional.'* [e]

But progress has been slow. Matthew Chalmers writes in *New Scientist*,

> *'Physicists have wrestled with this perplexing question of space's essential three-ness for a good while now – not, it must be said, with much success.'* [f]

The scientific world remains somewhat non-committal on the subject. As a result I quote this fairly typical excerpt from the *Wikipedia* entry on *Spacetime*:

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[a] I appreciate that it was a novel, not a work of physics, but HG Wells was a man of science and incorporated his ideas into his books.
[b] We still don't.
[c] Janna Levin, *How the Universe Got Its Spots*, Phoenix 2003
[d] Distances between things and events in space and time.
[e] Heinz R Pagels, *Perfect Symmetry: The Search for the Beginning of Time*, Simon & Schuster 1985,
[f] New Scientist, *Seeing Triple*, Matthew Chalmers, 28th Sept 2013

'Spacetime is usually interpreted with space as being three-dimensional and time playing the role of a fourth dimension that is of a different sort from the spatial dimensions.' [a]

Usually interpreted? playing the role? a different sort? What does all this actually mean? It doesn't sound tremendously scientific. So the first three are of the same sort. *Are they?* Reading the literature they tend to be described as the 'usual three', the 'normal three', 'three ordinary dimensions' and so on, which suggests to me that they are routinely accepted as axiomatic in the world of physics.

Let Sleeping Dimensions Lie

Going back to our discussion of 3/2/1D, I do not believe it is possible to arrive at what the lower dimensions actually are, simply by removing bits of a higher one. Lines and planes are obviously extremely useful concepts and I dread to think where we'd all be without them, but has it been wise to base all of physics on them? I came across someone recently on an online forum who enquired as to the emperor's clothes… "*Why should there be three of space and only one of time?*" Brave contributor! Questioning received wisdom as he or she was, the predictable torrent of replies served merely to compliment the emperor on the exceptionally fine cut of his cloak. Something like… "*Well, because there are, and you're an idiot* (or other popular online synonym) *for asking!*"

As we endeavour to apply the principles of *Flatland* we will be taking nothing for granted.

The point I am making here is that it does not seem logical to say that there exists *more than one dimension of space but only one of time*. As things stand, I would have expected the very idea that there exist three dimensions of one character and only one of another to set off alarm bells in every university in the world, although there's no doubt it makes physicists' chairs less comfortable. Janna Levin confesses quite candidly that physicists *'try to make time the same as space'* – replacing Goldilocks with another bear – so, clearly, many physicists are unhappy with the idea of the 3 + 1. They are not questioning the 4th Dimension's geometrical status or relationship to Relativity – in that respect it behaves itself fine – but without a doubt, time *as distinct from space* doesn't sit well with them.

Reflection… It is my belief that the reason we perceive the first three as similar but the fourth as different has less to do with the *nature* of the dimensions themselves than it has to do with our *viewpoint*, the result of our position as human beings within the dimensional structure (which we will look at in the next chapter). In addition, within the context of a *Flatland*-based dimensional structure the normal three might be expected to assume a far greater significance. We will explore this approach in more depth as we go.

In view of the fact that we appear to be up a cul-de-sac on this one, why not try something new? I propose that we take the converse approach, namely: to explore the possible *individual* character of the first three 'spatial' dimensions. Perhaps they are not all bears at all.

[a] https://en.wikipedia.org/wiki/Spacetime - Accessed 29th Dec 2012

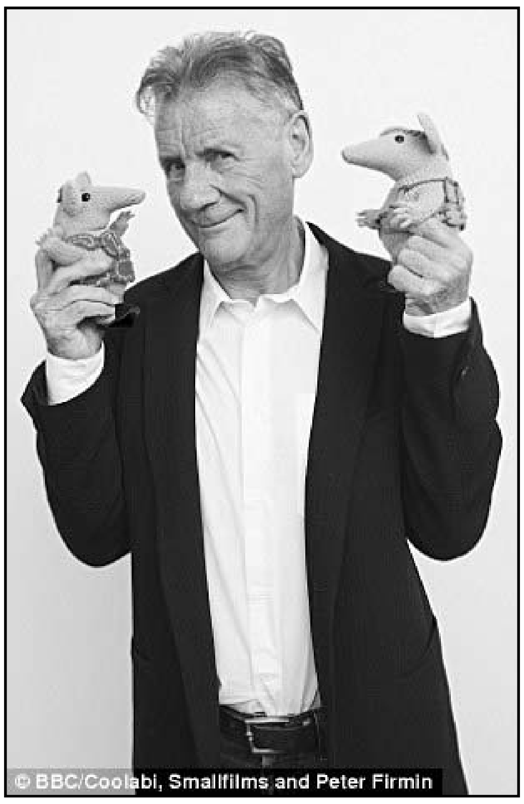
Technically, there are five possibilities:

a) The four dimensions are all of the same character. *Tried by physicists, without success.*
b) The four dimensions are divided into three of the same character and one of a different character. *The conventional view, as discussed.*
c) The four dimensions are divided into two of the same character and two of a same but different character.
d) The four dimensions are divided into two of the same character and two of an individually unique character.
e) The four dimensions have each an individually unique character.

Deploying Occam's razor, options c) and d) seem unnecessarily complex, as does option b). Of the five, a) or e) would seem the most straightforward, and a) has already been ruled out… leaving e).

Exhibiting Properties

Of course, it is true that a representation can represent something that doesn't exist at all, like a child's drawing of a unicorn, or the cute little glove-puppet *Clangers* who represent a bizarre race of lovably-knitted soup connoisseurs living on the moon. But there is a world of difference between representations of things we know to be imaginary and things we know to be there. We know the 1st and 2nd Dimensions are there, or there would be no 3rd, and I'm sure we're all agreed there's a 3rd. Maybe the questions are simply unanswerable and therefore not worth the asking – but don't tell me philosophers never ask unanswerable questions.



To me the answer lies in revisiting the nature of the problem. The 1st and 2nd Dimensions have a real and definable existence because they stack up to form the 3rd, but they cannot be the line and the plane. Nature has merely represented them to us abstractly as the line and the plane because, ***whatever they truly are, in some way they exhibit properties of the line and the plane***. However, if they are not actually the line and the plane… what are they?

The *Principle of Relationship*[a] presents us with a key to understand more about why we see things the way we do. But before we go on to dissect the universe, we need to consider how the Flatlander sees his world.

[a] *The Principle of Relationship:* Whatever is true of the relationship between two adjacent dimensions is true of the relationship between *any* two adjacent dimensions.