Chapter 28

The Twin Demisphere Model

Returning to the globe analogy where we thought of light beams as travelling away from the north pole and heading for the south pole along 1D lines of longitude, it should now be possible for us to derive an observer-based shape for the observable universe. To fully appreciate the role of the equator, let's begin by separating the northern and southern hemispheres of the Earth:

As before, let's write down a basic set of statements about these hemispheres which we hold to be true. What do we notice?

1) The shape of each hemisphere is the same.
2) They meet each other at their widest point, the 1D rim.
3) The two hemispheres share the same rim which comprises their 1D equator.
4) Points on the rim/1D equator may be made to touch because they are actually the same point.
5) When joined, the 1D equator has no special significance on the sphere except as defined by the polar antipodes.
6) Antipodean points could be located anywhere on the surface of the sphere.

Now, extrapolating each statement up by one dimension…

1) The shape of each demisphere is the same.
2) They meet each other at their widest point, the 2D surface.
3) The twin demispheres share the same surface which comprises their 2D equator.
4) Points on the surface/2D equator may be made to touch because they are actually the same point.
5) When joined, the 2D equator has no special significance on the hypersphere except as defined by the twin centres, which represent 3D polar antipodes.
6) Antipodean points could be located anywhere on the surface of the hypersphere.

Now let's repeat these results side by side in a grid for ease of comparison:

	3D Globe Analogy:	***4D Hyperspherical Universe:***
1)	The shape of each hemisphere is the same.	The shape of each demisphere is the same.
2)	They meet each other at their widest point, the 1D rim.	They meet each other at their widest point, the 2D surface.
3)	The two hemispheres share the same rim which comprises their 1D equator.	The twin demispheres share the same surface which comprises their 2D equator.
4)	Points on the rim/1D equator may be made to touch because they are actually the same point.	Points on the surface/2D equator may be made to touch because they are actually the same point.
5)	When joined, the 1D equator has no special	When joined, the 2D equator has no special

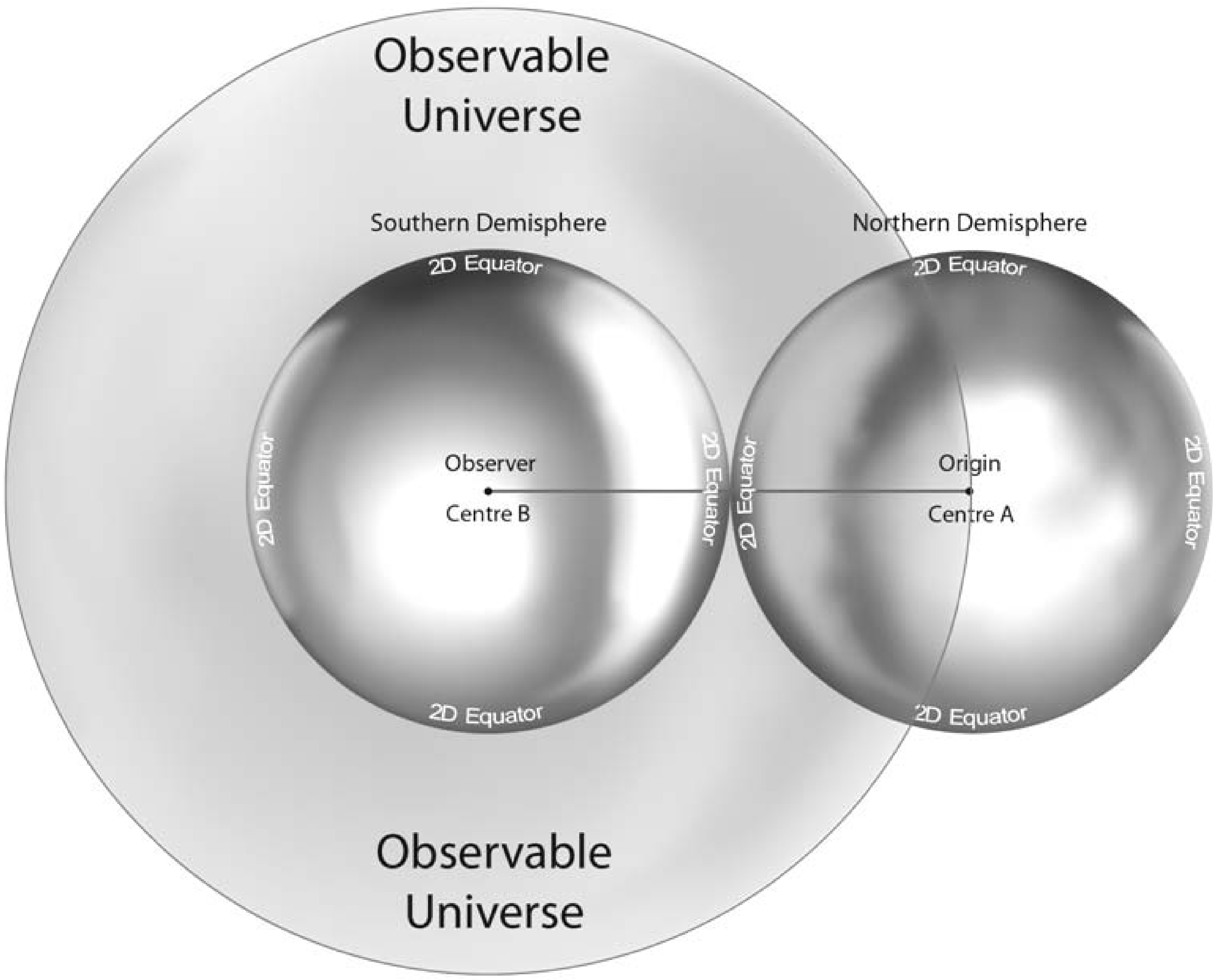
	significance on the sphere except as defined by the polar antipodes.	significance on the hypersphere except as defined by the twin centres, which represent 3D polar antipodes.
6)	Antipodean points could be located anywhere on the surface of the sphere.	Antipodean points could be located anywhere on the surface of the hypersphere.

What we have here is a clear description of what two halves of a hypersphere look like. In *Elementary Topology: A Combinatorial and Algebraic Approach*[a], Donald W Blackett discusses the relationship between the northern and southern halves of the hypersphere, stating that *'the points on the equatorial sphere are left fixed'*. By 'fixed' he simply means Miami to Miami etc, as per the 'rolling balls' of last chapter where each point on the 2D equator has the same relationship to each sphere – performing the 4D 'trick' of joining the equatorial surfaces simultaneously at every point.

These twin spheres are the 4D analogue of the northern and southern hemispheres of our Earth because, if our universe is a hypersphere, they comprise the northern and southern demispheres which divide the *3-Dimensional* surface of our *4-Dimensional* universe. Therefore, taking the observable universe to be a 3D cross-section of the 4D hyperspherical block universe, the illustration on the following page shows the actual shape of the observable universe as experienced by one single observer at *Centre B*.

Although the illustration shows the twin demispheres making contact at only one point, they are actually in contact *at every point simultaneously* on their shared spherical surface. This surface is the 2-Dimensional equator of our hyperspherical universe and is located at a look-back distance of half the radius of the observable universe: by present reckoning, around 7 billion light years. The observer's antipodean point of origin at *Centre A* appears projected across the entire surface of the observable universe at around 14 billion light years, from which the earliest light in the universe – the cosmic microwave-background radiation – is constantly arriving.

[a] Donald W Blackett, *Elementary Topology: A Combinatorial and Algebraic Approach*, Academic Press 1982, P198



The twin demisphere model of the universe. In the illustration, with the demisphere surfaces in full contact at every corresponding point, the lines that radiate away from and into each demisphere connect *Centres A* and *B*. The outer circle represents the distance of *Centre A* from *Centre B*, as viewed by the observer spherically in every direction by the 'Antarctica effect'. [a] [b]

Remember it is not possible to visualise this in reality because our minds can only picture spherical surfaces touching at a single point (as illustrated). However, in the manner of the 'rolling balls' experiment *they touch simultaneously at every point on their shared surface,* which constitutes the 2D equator. Note that, by 'rolling the balls', *Centre A* may be viewed from *Centre B* at the same distance in every 3D direction. This distance is the radius from the observer to the spherical surface of the observable universe.

[a] In mathematical terms, the 'twin demisphere model' describes the observable universe as a 3-sphere, the surface of a 4-ball, consisting of northern and southern 3-hemispheres with origin and observer located at opposite poles (antipodes).

[b] The lines that radiate to join *Centre A* to *Centre B* correspond to the lines of longitude on the Earth, joining the poles. Also, if we are to imagine each demisphere filled with onion skin layers (spheres), these correspond to the lines of latitude around the Earth.

The 4D and 3D Shapes of the Universe

The universe *itself* comprises the block universe (aka the *global* universe or universe *proper*) and is represented geometrically by a 4D hypersphere. However, located at a single space-time event, the observer experiences this as one 3D spherical cross-section: the 'observable universe'. This slice may be further broken down into its twin demispheres (spherical 'hemispheres'). The sum total of all space-time event-centred spheres – i.e. *Centre B*-centred 'observable universes' – constitutes the fully stacked and completed 4th Dimension, or block universe, in accordance with our *Flatland*-derived *Principle of Character*[a].

Of course, the great physicists of the early 20th Century knew nothing of the CMB, but they knew a thing or two about maths. (How long did it take Karl Schwarzschild to figure out black holes?) Before we go on to consider the wider implications of the twin demisphere model for the universe as we observe and experience it, I just want to linger a while in the next chapter to contemplate the views of one of science's greatest authorities...

[a] *The Principle of Character:* Once the stacking of a dimension is complete it assumes a whole new character. Its individual cross-sections fuse together and their discrete nature becomes indiscernible.