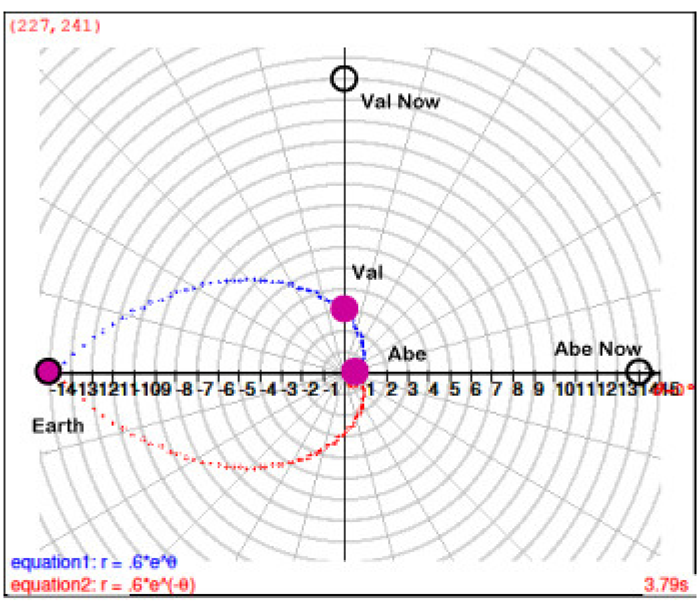
Structural Evolution of the Universe

A little over a hundred years ago, physics took a very unfortunate turn. It went from being a physical science, as the name implies, where it was couched in terms of how nature worked, to being mostly mathematical, with almost no regard for how nature behaves. A new theory, the gyroverse, takes physics back to the physical, thereby modifying many aspects of current accepted physics, explaining nature better.

Whereas the gyroverse is described in a book, available through all booksellers, I will be discussing here one of the most important aspects of this theory, Structure and Evolution of the Universe. Understanding it will go a long way in understanding everything else about the theory. Starting from the big bang, I will progress through the expansion of the universe to the present time.

In short, the universe is on the surface of a four-dimensional ball expanding at the speed of light. To aid the discussion I am using the following illustration. The illustration depicts the universe from the big bang to the present. While it's drawn in two dimensions, it represents the four space dimensional view of the universe. The revelation that the universe has four space dimensions is new to this theory. Each of the concentric circles represents the universe at billion light-year intervals. The circle labeled 14 depicts the universe today, 14 billion light-years after the big bang. The one labeled 1 represents the universe, as it was one billion light-years after the big bang...and so on. As the universe expands galaxies get further from each other in proportion to their distance apart, making it appear that empty space is being created, as assumed in current theory.



The entire universe is on the surface of the expanding four-dimensional ball, called a 3-sphere. The expansion direction represents one space dimension, and each circle, one billion light years apart, represents the three-dimensional universe as it was in its respective epoch. The expansion velocity “c” gives all matter the kinetic energy, mc^2. Matter just moving in the radial direction is at its minimum kinetic energy level, or at its rest state. Hence, matter, itself, is not intrinsically energy in another form. If the expansion ended there would be no energy in the universe, since the expansion energy is what fuels all forms of energy in the universe. For example, the changed total mass, in any chemical or nuclear reaction, moving at the speed of light with the surface of the universe, is the source of the energy for that reaction. All energy is kinetic.

This illustration can be viewed as a time slice of the universe. It depicts not just the universe today, but also it’s form way back to the big-bang. The center of the concentric circles is where the big-bang happened 14 billion years ago. Interestingly, the site of the big-bang is made up of 4 space dimensions of sub-atomic proportions, which is very roomy even though it is tiny. Strange as it may seem, every atomic particle in the universe could have occupied that tiny original space with no two touching each other, but that needs to be covered in another day.

For now focus on the three objects depicted on the blue dotted line. On the far left is Earth now, 14 billion light-years after the big-bang. Just above the center of the chart is the galaxy Val, shown when the universe was only 3 billion light-years old. And to the right of the big-bang location is the galaxy Abe, showing where it was about 6 tenths of a billion light-years after the big-bang. The blue dotted line is the path of light coming from Abe and Val to Earth. The look back to Val is approximately 11 billion years ago, and to Abe it is approximately 13.4 billion years ago. The light from Abe reached Val about 11 billion years ago, and then together with light from Val continued to Earth.

Notice that the red dotted curve connects Abe to Earth. In effect light from Abe reaches Earth along the red line as well as the blue line. In other words it is possible to see Abe from opposite directions. In fact any galaxy, old enough, on the other side of the universe can be viewed from opposite directions, maybe even from multiple directions. Abe and Val are also shown on today’s sphere, where it is 14 billion years after the big bang.

Interesting, in principle, it should be possible to prove the theory using that fact that galaxies could be seen from multiple directions. But, an object that far away is very faint, and not easy to identify especially viewing it from different directions. In addition, the distortions caused by lensing, necessary to view such a distant object, would make it look very different from different directions. There would have to be something very unique about the galaxy or its cluster to be able to identify it from different directions. The path that light took was determined, on the one hand, as photons traveling on the surface of the universe shell at the speed of light, and on the other hand, as the surface of the shell is likewise expanding at the speed of light. When both items are added to the fact that the universe is presently 14 billion years old, the equation for the path of a light-beam can readily be derived. On the left bottom of the chart are the resulting logarithmic spiral equations for the red and blue light-beams.

Notice that if those equations were continued back in time, they clearly would circle the universe many times. So in the earlier years, all radiation circled the universe much more often. For example, when the universe was just one hour old, radiation from anyplace would have gotten everywhere else in less than 25 hours. Or similarly, when the universe was one thousand years old, it would have gotten everywhere else in less than 25 thousand years. So, unlike current theory, it isn't strange that the cosmic microwave background from all over the universe is the same. There was ample time for the temperatures throughout the universe to stabilize, prior to the formation of atoms, some 400 thousand years after the big-bang, when the cosmic microwave background originated. Gravity, for the most part acts orthogonal to the expansion speed. So that the center of mass does not change as matter congeals. If matter started out uniformly distributed, it maintained its uniformity as the universe grew. Consequently, inflation theory is not needed to explain the uniformity.

The speed of light on the surface of the ball, or universe, is the same as the expansion speed. Just as with special relativity, the speed of matter is also restricted to the speed of light. It is the universe's expansion speed, which is the underlying limiting factor. Why that is the case is not obvious and will be discussed in subsequent papers. A photon is actually made of matter, whose rest mass is very tiny, but dispatched with a relatively large amount of energy to have it bump up against the light-speed barrier. In other words photons don't quite travel at the speed of light. The lower frequencies travel slower, but the speed difference is not yet measurable. If it were, the photon's rest mass could be calculated.

Notice that the path that light takes is curved, hence longer. That is the reason far-off galaxies appear fainter than expected, which is mistakenly suggestive of an accelerating expansion. Because gravity between objects happens orthogonal to the expansion direction, gravity did not slow the expansion. This enabled the expansion to be more gradual and uniform, and less of a bang. All the particles tended to stay on the surface of the sphere for two reasons. First the mass of expansion is the same as the mass of inertia, so that the expansion speed for all mater was the same. In addition, if any strayed, the gravity of all the others would pull them back onto the surface. Consequently, the expansion is self-correcting.

An interesting digression is the attempt to unify the forces of nature that was made by Theodor Kaluza in 1921, possibly building on an idea from Nordström. He showed that starting with a theory of general relativity in five space-time dimensions, a four-dimensional theory of Einstein's general relativity plus Maxwell's electromagnetic theory would result. Oskar Klein made an important modification to the five-dimensional theory in 1926. He postulated that the extra dimensions are physically real, and that they could lead to the observed forces beyond gravity when looked at from our four-dimensional world. For many years, Klein attempted, in different ways, to promote the fifth dimension as a convenient way to introduce the quantum of action into the gravitational field. Despite Einstein's early encouragement and recognition of Kaluza's good idea, it seemed that Einstein was not convinced of the efficacy of the five-dimensional hypothesis, because the extra space dimension seemed contrived, just to get this interesting result.

However, because the gyroverse theory contains a well-defined extra space dimension in its Euclidean view, it would make sense to revisit the Nordström and Kaluza-Klein Ideas, especially since time in GR when multiplyed by c is the analog of the gyroverse's expansion at the speed of light. This could be a steping stone to the development of the gyroverse theory.

To summarize: The universe started as a microscopic four-dimensional bag of atomic particles that fit easily into it. The bag expanded, eventually hugging the surface reaching the speed of light. Gravity insured that all the particles would remain on the expanding surface, because it mostly acts orthogonal to the expansion. However, if some strayed away from the surface the majority pulled it back to the surface. During the 400 thousand years before atoms were formed, all the particles were in close enough contact to have equalized their temperature. Both of these factors kept matter uniformly distributed. The energy attributed to matter is kinetic, which fuels all energy of the universe. The universe is finite, and just about totally visible. The expansion is not accelerating, but light from celestial object take curved path to us making it dimmer than expected. Once atoms were formed, slight density variations allowed matter to congeal into galaxies with large voids between them. Galaxies that formed less than about .6 billion years after the big-bang can be seen from anywhere in the universe, and perhaps from more than one direction. The speed of matter is limited to the universe's expansion speed, but that requires understanding the 12 dimensional outside view of the universe. And light is just a very small particle dispatched with a relatively large amount of energy, with its velocity limited to the speed of light. While dark matter is as compatible with this theory as with relativity, MOND is much more compatible with this theory, and is the preferred explanation. Interestingly, the same particle that causes gravity also causes the expansion, entanglement, and the strong force. But again, in order to explain it requires understanding the gravitational mechanism, which also needs the 12 dimensional view of the universe.