# III. The Hidden Properties of a Four Dimensional Flat Space

Devin Harris

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Fundamental issues related to timelessness and multispatiality are discussed and a theoretical proposal is made toward viewing space-time as a fourth dimension of space. The proposal helps to establish the properties of a four dimensional flat space as containing the whole of all possible space-times. This application of symmetry order explains why the expansion of the universe is accelerating. In summary some general indications of the configuration space model presented previously are discussed.

The last chance to discover a finite Universe likely vanished with the return of data from the Boomerang and Maxima balloon born telescopes [10][11], and the Wilkinson microwave anisotropy probe [26][27] further verified the geometry of deep space is flat, indicating profoundly (with a forgivable suspension of time dilation) that if we could observe galaxies at a common age the universe would extend infinitely in all directions without end. We no longer need question whether the universe is infinite or not. Only now we have arrived at a question that seems less scientific or at least far more difficult to answer. How infinite is the Universe? Is existence bounded in any way? Evidence for an infinity of galaxies or space-time bubbles was not entirely unexpected, but what of the utter chaos of possibilities, all conceivable temporal universes and beyond, the majority completely unlike our own. Are there any identifiable boundaries to what exists?

I would suggest that the physical existence of all possible states may be the extent to which existence is radically infinite, serving as a foundation and limiting the dimensions of temporality to the multiverse of space-time bubbles. The case for a mode of timelessness [28][29][30][31][18][5] is no less compelling than the case for a many-worlds universe, and without question only the profound nature of both positions have delayed their inclusion into science.

In regards to timelessness, a concept that resulted from the theory of relativity was that all of space-time forms a unified four dimensional existence. In regards to Minkowski's space world, in his book Relativity [32], Albert Einstein wrote, "Since there exist in this four dimensional structure no longer any sections which represent "now" objectively, the concepts of happening and becoming are indeed not completely suspended, but yet complicated. It appears therefore more natural to think of physical reality as a four dimensional existence, instead of, as hitherto, the evolution of a three dimensional existence." Einstein's own belief in the unification of time were expressed in a letter to the family of his lifelong friend Michele Besso, who died shortly before his own death. Einstein wrote that although Besso had proceeded him in death it was of no consequence, "for us physicists believe the separation between past, present, and future is only an illusion, although a convincing one." [33] Years later Richard Feynman came to define time as a direction in space [34], and most recently Stephen Hawking has become increasingly adamant in expressing that the universe existing in imaginary time is self contained and has no boundary [35].

It is held here that the foundational matrix of a four dimensional existence doesn't evolve and is even unable to change, it simply is. In this modality, there is no distinction between the words *existence* and *time*. We can refer to this as timelessness or as a primary reference of time which has no beginning, middle or end. I sometimes define this time as one enormous moment. The physicist Julian Barbour named timelessness Platonia in his book *The End of Time* [5], which calls for a timeless perspective in physics. And the philosopher Huw Price refers to a related perspective as *the view from nowhen* [36]. Yet clearly, in a universe viewed from a perspective of timelessness, it is not easy to reconcile how we so convincingly experience a distinct moment of now and clearly perceive change, be it illusion or not.

In any study of space-time, it is self evident that time includes two distinct components, physical existence and change. Any physical system must primarily exist, and so the component of change could conceivably be a secondary component which is no less real than the first component, but merely relative.

Assuming this secondary time is embedded in a four dimensional existence, we have two evident components also. One is the necessity of a linear string-like path extended across the permanent landscape. The path of a dynamic system, like a story in a book, could conceivably be solidly imprinted into a static existence. However, like any story in a book, there must be a sort of binding which fuses the multiplicity of pages. The momentary states of a system must be fused into linear form, that form being at very least our temporal experience. I shall refer to this as the linear component or as *linear time*.

Simultaneously, the time of change requires a transition through unique states or patterns. There must exist differences from point A to B necessarily lateral to the linear evolution of time. Each state must possess a distinct identity apart from others along the linear path. Without an independent identity there could not be the temporal experience of a singular present so there would not be for us the illusion that existence evolves, as is commonly assumed. We can make reference to the necessary transition from state to state as the lateral component of time. It should be noted that like the four dimensional existence itself, each quiescent state is without beginning or end, and is thus unable to contribute any measurable time duration. I shall refer to this as the lateral component or as *lateral time*.

One of the problems with the block universe view [16][18][37][17] or the existence of a multispatiality [38] has been concerned with how it is possible that many individual blocks of space which are necessarily distinct dimensional frames can simultaneously be spatially linked to form a fourth dimension of space which we refer to as time. Any fused series of distinct spaces form a whole space and thus would seem to forfeit the original separateness. If we then maintain each state as an individually distinct dimension, like a series of photographs, there is no indication of why we experience continuity and order between multiple frames of time.

The problem of trying to reconcile the two components and the problem of trying to reconcile our experience of time with a timeless existence is the same paradox faced in resolving the distinction between quantum theory and the general theory of relativity. At the macro-scale we observe objects to move along linear and continuous paths, and in knowing the position and momentum can predict the future or past. At the micro-scale it is not possible to decipher both position and momentum, and we conclude that particles travel as a wave from one position to the next without having a definite position between two definite points A and B [39].

My suggestion here is that the focus should not be upon how such spaces are linked, but instead how such spaces are maintained discretely in nature as individually distinct. If we assume a spatial holism and then ask what separates one state from another, the question is then not unlike other spatial issues regarding the relationship between two locations in space or different references of time. Note that there has never been an intuitive rejection to the integration of two dimensional slices of space into a three dimensional continuum, and likewise there is no reason to expect that three dimensional blocks would not be linked naturally to form a four dimensional spatial continuum.

The last conclusion then from inducting absolute zero into the SOAPS, primarily based on the new construct of symmetry order, is that in addition to all the ordinary expected directions embedded within and constructing the continuity of a three dimensional block of space, there also exists directions in space which travel across or through the existing multiplicity of all possible states. The proposal here is that directions in the fourth dimension travel probabilistically and thus dominantly pass through particular configurations within the set of all possible spaces (SOAPS), forming a four dimensional matrix which we refer to as time or space-time. These directions in space are no less natural and inevitable than those which build a three dimensional continuity, except for the critical feature that each single direction contributing to four dimensional space probabilistically constructs the lateral component of its surrounding conditions relative to itself. In essence, each linear direction in four dimensional space constitutes a unique space-time bubble, and since each observer invariably surrounds a linear path in the four dimensional matrix, the lateral component is composed relative to each observer. This multi-spatial construction could explain why an observer in a four dimensional system simultaneously experiences quantum mechanical and relativistic properties and in that such properties arise from the physics of space

indicates that such properties are not exclusive to observers.

The resulting four dimensional volumes are structured systematically in reference to configuration space, or a superspace [40], and each volume is unique from any contributing three dimensional volume and also unique from the matrix superstructure. Each linear path, rather than traveling freely instead encounters the inherent probabilities that exist within state space relative to its present state. Applying the model of configuration space proposed in previous articles, each linear path inevitably begins confined by grouping order in a state denotable as positive or negative, and in escaping is probabilistically directed toward becoming neutral. The overall cosmology of this model predicts there are two opposing cosmological arrows of time [41], one producing positive volumes of space-time containing matter and the other producing negative volumes containing stable anti-matter, and of course each system is inseparably connected to the evolution of the other and the sum of the pair equals the greater whole zero.

This formula should be particularly enticing because if we can adequately describe space-time as a fourth dimension of space it would explain why we experience physical reality as we do, not from the anthropic premise, but rather because this particular finely tuned universe we live in is the fourth spatial dimension. If proven valid it would reasonably eliminate all the many universes with different constants that otherwise might exist, excepting the fifth, sixth, seventh spatial dimensions and so on. It would reliably indicate the anthropic principle is not a correct hypothesis for why we experience this particular universe. And everything physically would be reducible to directions in a timeless spatial existence.

**Accelerating Expansion**

With cosmological expansion accelerating the outer horizon of the space-time bubble breaks away from time zero and begins to shrink inward until distant galaxies begin to accelerate beyond our time reference. As if the beginning of time were being swallowed by a cold black hole, continued acceleration sucks the majority of galaxies beyond an outer event horizon. Even the background radiation would be stretched flat, dropping the temperature of the collapsing edge of the universe to a once hypothetical absolute zero. Erasing the rich history of the universe we are now so fortunate to enjoy, eventually the volume of space-time shrinks inward to the local group, then collapses inward to the gravitational curvature of our own milky way galaxy.

As to the final fate of the milky way universe, as if the cosmos has a sense of humor, again we find ourselves stonewalled by a deciding critical density, with the universe riding the line between two dramatically different futures. Since the acceleration was discovered it has generally been maintained that gravity would hold off a final collapse to zero for an infinite period of time, in which case the galaxy would survive. In the equation-of-state parameter $w = p/\rho$, describing dark energy, the ratio of pressure $p$ to energy density $\rho$ required for acceleration is $< -⅓$. and has been generally assumed to be $\geq -1$. This modified version of the endless heat death scenario first met direct opposition when Parker and Raval in 1999 presented a new theory to explain acceleration, a simple quantized free scalar field of low mass (VCDM) model [42], and later predicted $w$ is $< -1$ [43]. Discussion on the dark energy density [44] heated up this year with data indicating $w$ is indeed very near -1, culminating in March 2003 when Caldwell, Kamionkowski, and N. Weinberg introduced the Big Rip Scenario [1], where a dark energy density dubbed phantom energy [15] by Caldwell increases with time, and eventually becomes infinite in finite time.

Even if $w$ is only equal to -1 cosmic acceleration is exponential, however if $w$ exceeds the critical value of 1, the future is no longer in question since neither gravity nor any other force will be able to restrain the collapse of the absolute cold event horizon. The density of ordinary matter and energy would exponentially decrease with time, finally becoming zero in finite time. Caldwell indicates the time-scales at which acceleration of phantom energy tears into the milky way, ripping apart the nearby stars and planets, the Earth, and finally all atomic material. Caldwell shares one estimate of phantom energy where the universe as we know ends in 22 billion years, also noting indirectly that the Big Rip scenario may result in time ending at the ultimate singularity [1].

As is presently thought, the source of accelerating expansion is a property of space itself and so not

evident in the probabilities of state space. Some acceleration to expansion is built into the process of convergence occurring as the contrast gradient narrows. However, a fully independent acceleration force occurs more dominantly due to the nature of time itself. If it were not the character of the ultimate singularity to be witnessed relative to present cosmological conditions as a hyper expanding space, the momentum toward zero would be maintained nearer to an ever decreasing rate, and highly organized particle annihilations would be necessary to produce the final equilibrium. However, accelerating expansion demonstrates that from our perspective, the state of absolute zero is the product of all possible directions in four dimensional space, which is also a fundamental prediction of the theory of symmetry order.

Prior to the discovery of accelerating expansion, it was assumed that a state of absolute zero or a perfectly flat space, if entertained as being physically real, would be envisioned simply as a Euclidean space, a static three dimensional block of empty space in which ordinary properties such as distance have no meaning. As I integrated acceleration into this state space model it gradually became evident that we in this discovery are simply witnessing the most innate property of a four dimensional existence. As symmetry order indicates, absolute zero is an integration of all possible states, as well as all four dimensional directions in space, the four dimensional whole, and thus the composite of all possible space-times. With our universe converging toward, joining with, and becoming a part of that matrix, the expansion of the universe is required to accelerate by the conditions which exist at the end of time.

**The End of Time**

With the direction of time following the basin of attraction within the contrast gradient we can expect a more complex scheme for the end of time than Caldwell's Big Rip scenario. The dominant quantity of isotropic patterns near flat space require a gradual and increasingly uniform descent to zero more reminiscent of the beginning of time in reverse than a late-time shredding of whole galaxies. As space-time approaches absolute zero, this modeling indicates that stars and galaxies and all complex atoms will be systematically broken down into a supercooled condensate of protons and electrons stationed in orderly rows and columns.

One of the more interesting spin-offs of this new model is how an inevitable future dictates the past, that being our present. If a single state in the future is probabilistically predestined then that state will shape and focus the probability densities of its own past. Absolute zero is the great attractor in aggregate state space that literally sets in motion the ordered and systematic process of time, different from a universe energetically forced outward from a past event. This leads to discovering several causes located in the future [45]. All dominant trends in nature toward integration, balance, equilibrium, uniformity, any dissolving of grouping order, such as occurs from cosmological expansion, electromagnetism and the weak force, are properly causally associated with the future, rather than any event in the past. From the very outset of time, an inevitable future reaches into its past, fine tunes the universe, in order to bring about itself.

The ease with which the probabilities of this model correlate with each of the forces of nature, indicates that although a general arrow of time is built into the SOAPS, there is no fixed single direction of time. Space-time is a construct of multiple directions of time. The general probabilities of this model indicate that gravitation is time moving backward and expansion is time moving forward. Gravity can be understood principally as a probability attempting to recreate the density of the past. The group of states which are more dense than the average density of the system produces a general measure of probability which inhibits expansion, while the basin of attraction in the contrast gradient determines a specific measure of lumpiness presently in the form of stars and galaxies. Likewise, cosmological expansion can be understood principally as time moving forward along the density gradient. The world around us is built up from the flow of time moving in probable directions. This would seem to eliminate the possibility of temporal paradoxes. If an observer could somehow manage to intrude on a past-like state, all temporal evolution from the instant of the intrusion would proceed probabilistically free from any expected or previously recorded history.

In regards to the role of forces, it is also possible to recognize how forces with a casual relationship to the future are visibly engineered in a way to bring about a gradual breakdown of definition and form in the final transition from grouping to symmetry order. Each force has a specific role in this hidden scheme of nature. The weak force can be seen to have the potential to break down all complex atomic material into protons and electrons with the gradual weakening of the strong force predicted to occur during convergence. This would allow electromagnetism to dominate and spread all proton and electron pairs evenly throughout the greater expanses of space, this occurring as linear gravitation equalizes with Hubble expansion. The final role of electromagnetism will be to produce a symmetry of protons and electrons stationed in orderly rows and columns, such as what is witnessed when cooling gases into Einstein-Bose condensate. In the final moments hyper-expansion stretches all remaining matter and energy flat. Space-time collapses even as the curvature of our four dimensional space is unbent. In that instant our universe completes its integration with all other space-times including its inseparable parallel partner. The two opposite arrows of time become omni-directional and inflated, producing at time's end the ultimate singularity; a oneness of space and time and things, which is simply the native state of the greater Universe.

**Correspondence: e-mail: dh@macrocosmicsymmetry.com**

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