Minkowski and the Multiverse

Dwight Vincent
Physics Dept
University of Winnipeg

Abstract

In 1909 Hermann Minkowski introduced the idea that a higher-dimensional world where time is interpreted as a fourth dimension, in addition to the normally assumed three dimensions, could be a good descriptor of causal reality. This idea led to Albert Einstein's construction of the four-dimensional gravitational theory of general relativity. General relativity theory was capable of modeling the evolution of the universe in a way that no one had previously anticipated. Initially fuelled by the unfettered imagination of pioneers of scientific thought like Minkowski, Einstein, Friedmann, de Sitter, Lemaitre and others, cosmology has entered into a successful observation-based era that has recently been called the era of 'precision' cosmology. To get an expanded perspective on reality like that of the aforementioned imaginative cosmology pioneers, what if you could take the normal ideas of Minkowski space and extend them within the context of n-dimensional Riemannian geometry --- one step further than the status quo mindset in today's cosmology? Could you use it to make a model of an all-encompassing 'universe' of universes, i.e. - a multiverse?

This talk will discuss the extreme general conditions that any true multiverse model should obey. For instance, without being intrinsically scale-invariant to the point of having no scale at all, how can you have a multiverse that is not itself a part of another 'bigger' multiverse? What are the fundamental physical interpretations of the n-dimensional coordinates being considered for the multiverse? Are the interpretations interchangeable? A possible reconciliation of these multiverse puzzles will be given.

Higher-dimensional Minkowski-like solutions of Riemannian geometry consistent with the aforementioned extreme conditions on the multiverse will be analyzed in a dimensionally-reduced cosmological context. Making use of Einstein's approach from his unified field theory research, we adopt the philosophy that phenomenology should be similarly geometrized in a complete package along with space and time [1],[2],[3],[4]. With this in mind the physical ramifications of specific singularity-free cosmology models will be analyzed with respect to our present universe and especially with respect to the present dark energy equation of state [5].

Can such an esoteric radical approach to cosmological physics have any profound connection with the real world we observe?

[1] 'Einstein's Unification' – by Jeroen Van Dongen – Cambridge U Press (2010), p58-74
[2] D. Topper & D.E. Vincent, Physics Teacher 38, (2000) p278
[3] J.M. Overduin & P.S. Wesson, Phys. Reports 283(1997) p303
[4] R. B. Mann & D.E. Vincent Physics Letters Vol. l07A, (l985) p75
[5] A. Tripathia, A. Sangwana & H.K. Jassal, Journal Cosmology & Astroparticle Physics 1706 (2017) no.06, p12 [arxiv.org/abs/1611.01899]