Gravitation,

Quanta & Quantum Gravity

On Transcending Tautology &
The Question of Reality and Knowledge
in Theoretical Physics

and on

Solving the Cosmological Constant Problem
by

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Content

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Chapters:

I: Kepler & Newton
The tautological relationship between fundamental concepts in Newton's axioms, as used in his synthesis of Kepler's laws to obtain his law of gravitation, is made clear. How to avoid this is developed. Consequences for the relationships in the mathematical symbolism between the concepts of mass and energy emerge. This leads in equations (12.4) - (12.7) to the precise meaning of the Planck length in a non-circular context. The significance of transcending the Newtonian tautology with respect to the formalism of general relativity is stated at the end of that chapter.

II: Existence of Quanta & Implications for Theoretical Physics
This is probably the most challenging chapter of this book. Requirements are developed for creating a quantitative structure, isomorphic in some sense, but transcending the Newtonian tautological one, based on using interconnected quantum properties of particular classes of quanta as standards. This leads to the concepts of ontological symmetries and ontological dimensions.

III: $\mathfrak{P}$ -space, relating the standards of $\mathfrak{A}$ and $\mathfrak{A}_*$.
In this chapter consequences of the dimensionally homogeneous nature of related symbolic terms and the invariance of this language under changes of units (standards) are investigated in relation to the concept of physical dimension.

IV: Riemann
I translate Riemann's famous 1854 lecture after a brief discussion on the relationship between Euclidean and Riemannian spaces and quantified concepts.

V: Space – the canvas of polyadic relationships
I side with Russell and Whitehead regarding mathematical symbolism and its symmetries as defining a particular canvas on which we encode quantitative knowledge. I illustrated this using the formalism of general relativity to show the Schwarzschild solution simply encodes conservation of relativistic energy-momentum conservation on a space-time canvas.

This chapter presents my translation of Einstein's 1919 paper in which he introduced the cosmological constant. This is prefaced by some remarks regarding the cosmological constant problem as currently viewed.

Here, the pieces finally come together to solve the cosmological constant problem. This leads by necessity to relationships among some fundamental constants and quantum properties of the quantum standards used in this analysis. At the end of this chapter, in § 47, I perform a 2nd order calculation on $\mathfrak{A} \cap \mathfrak{A}^*$ which shows the effect of the Earth on the proton-electron mass ration. For readers who understood the comments at the end of chapter I, regarding the paradigm of GR, the results and comment following (47.8) may be relevant for the CERN-OPERA neutrino experiment. It does not violate Einstein's theory. Neutrinos may not see what we call the gravitational potential of the Earth.

The relationships and concepts developed in this essay are now used to develop some of the specific solutions implicit in the methodology of this analysis, such as relating the cosmic background temperatures to the properties of quanta, the relationship between proton and fermion masses, calculating Newton's gravitational constant from quantum properties and, most importantly for the veracity of this analysis, the relationship between proton and electron magnetic moments.

IX: Epilogue
The epilogue is still being written. I would appreciate feedback from philosophers with some competence in mathematics and theoretical physics before completing this part.