RELATIVITY, GRAVITATION, and RELATIVISTIC ROTATION:
Clarifying some paradoxes of relativity at the extreme

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Front cover: Figure 13 in Chapter 15, p. 324**:** Gravitational exponential potential exp(-1/r) compared to zero potential, by Netsivi Ben-Amots

Back cover: Figure 4 in Chapter 10, p. 178**:** Section through a torus-like ("doughnut"), rotating astronomical gravitational object (like a thick accretion disk), showing sections of surfaces according to *analytical* calculations, by Netsivi Ben-Amots

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CONTENTS SUMMARY (page numbers omitted in this internet file)

DETAILED CONTENTS (page numbers omitted in this internet file)

Note: The page numbers are omitted in this internet file, but appear in the book. There are additional small differences from the printed book: Two pairs of adjacent sections interchanged order, and one line changed.

OVERVIEW (not included in the book) **to the book:**
"RELATIVITY, GRAVITATION, and RELATIVISTIC ROTATION:
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The second famous equation of special relativity is the relativistic addition of velocities $v = \frac{v_1+v_1}{1+v_1v_2/c^2}$. When applying this formula to rotation, the obtained formula is not the classical one $v = \omega r$. P. Franklin (1922) derived a more precise approximate relativistic formula. When applying Franklin's formula of relativistic rotation new implications arise.

Independently, when applying $v = \frac{v_1+v_2}{1+v_1v_2/c^2}$ on Hubble's Law of the expansion of the universe other new implications arise.

According to Einstein's special relativity theory $E = mc^2$, meaning that $m = E/c^2$. Before deriving the general relativity theory, Einstein (1912) considered the rest mass to be constant, i.e., not dependent on the distance to another mass. Einstein's limitation means that the rest mass includes many types of energy, but does not include gravitational energy. However when this constraint is removed, the rest mass will also include the gravitational energy, and is dependent on the distance to another mass. This theory and another theory detailed in this book predict $\beta_{\rm PPN}$-1 accepted criterion different from the prediction of zero by Einstein's general relativity, but below 8×10^{-8} for the perihelion shift in the solar system. Precise observations of perihelion shift in the solar system allow for $\beta_{\rm PPN} - 1 < 8 \times 10^{-8}$.

This book deals with these questions and others by the use of clear and simple mathematical terms. The book leads the reader through step by step derivations, with applications mainly in astrophysics.

From these new theories a new and surprising body of knowledge emerges, one that fits all the present observations and measurements as well as most of the predictions of the theory of general relativity. Moreover, in extreme cases it presents new predictions, including one surprising prediction of a new set of electron orbitals around a proton. This prediction needs verification by observation.

In these new and fresh formulations, the known paradoxes of astrophysics such as black holes, big bang, singularities, dark matter and dark energy do not exist because they are solved without needing any exotic concepts.

In addition, these concepts and mathematical formulations provide explanations to unsolved problems in physics. These include but are not limited to:

a) How imploding supernovae bounce back outward to enormous explosions

b) How thick accretion disks accelerate relativistic jets

c) The structure and stability of quasars and active galactic nuclei and how they produce jets

d) The sources of energy to these phenomena.

Nature has no obligation to conform to existing paradigms. The new theories presented in this book replace a few paradigms. Therefore, this book embarked on an ambitious endeavor.

This book leans on fundamental well accepted and proven components of Einstein's special relativity and Franklin's relativistic rotation. It modifies these concepts to derive new theories to explain phenomena of the universe at extreme conditions. It does this by using the same measurements prevailing in the field, but from them it derives new conclusions which are simpler and devoid of interpretations which are not necessary for science to be complete.

[1] Franklin, P., *The meaning of rotation in the special theory of relativity*, Proc. Nat. Acad. Sci. USA, v. 8, p. 265-268 (1922)

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PART I: RELATIVISTIC ROTATION

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PART II: OTHER RELATIVISTIC MOTIONS

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PART IV: DISCUSSION, PREDICTIONS and APPENDIXES

The publisher of this book is Technology Dynamics, Inc.

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