TITLE: Gravity Probe B and the Rañada-Milgrom Effect

Consider the MILGROM DENIAL HYPOTHESIS: The main problem with M-theory is that M-theorists fail to realize that Milgrom is the Kepler of contemporary cosmology.

What does the Milgrom Denial Hypothesis have to do with the Gravity Probe B space mission? First, entertain a speculative hypothesis. Combining Fernández-Rañada's analysis of the Pioneer anomaly with MOND suggests that the -1/2 in the standard form of Einstein's field equations should be replaced by -1/2 + dark-matter-compensation-constant. This constant is approximately sqrt((60±10)/4)) * 10**-5 — I call this modification using the dark-matter-compensation-constant the Rañada-Milgrom effect. I claim that the Gravity Probe B science team erroneously assumed that their 4 super-accurate gyroscopes did not function within design specifications, and this erroneous assumption prevented what should have been the empirical confirmation of the Rañada-Milgrom effect. If the Gravity Probe B results refute the Rañada-Milgrom effect, then there might be a Milgrom field which explains how Milgrom's acceleration law is compatible with M-theory. If the Gravity Probe B results confirm the Rañada-Milgrom effect, then for virtual mass-energy the equivalence principle might be wrong , with far-reaching implications for the foundations of physics.

"The MOND paradigm posits a departure from standard Newtonian dynamics, and from General Relativity, in the limit of small accelerations. The resulting modified dynamics aim to account for the mass discrepancies in the universe without non-baryonic dark matter. … What is left for MOND to explain on a large scale is a little in comparison, and has to await a full-fledged MOND theory." — Mordehai Milgrom

M. Milgrom "MD or DM? Modified dynamics at low accelerations versus dark matter", Jan. 26, 2011, Proceedings of Science, http://arxiv.org/pdf/1101.5122v1

http://fqxi.org/community/forum/topic/1282 "Does Milgrom's Acceleration Law Imply That the Equivalence Principle Is Wrong?"

By carefully studying the paper by P. Kroupa, B. Famaey, K.S. de Boer, J. Dabringhausen, M. Pawlowski, C.M. Boily, H. Jerjen, D. Forbes, G. Hensler, M. Metz, called "Local-Group tests of dark-matter concordance cosmology. Towards a new paradigm for structure formation", http://adsabs.harvard.edu/abs/2010A%26A...523A..32K A&A 523, 32 (2010), one can learn that something is seriously wrong with the standard model of cosmology.

The Gravity Probe B (GP-B) science team seems to have ignored the issue of dark matter and its possible effects on the Gravity Probe B gyroscopes. NASA's Gravity Probe B mission used 4 nearly perfect gyroscopes to test 2 predictions of Einstein's general relativity theory; the predictions were modeled by a formula derived by Leonard Schiff. The geodesic effect due to curved spacetime and the frame-dragging effect due to torques from planet Earth's gravitational waves were verified by the GP-B mission. However, there were two surprises due to what the GP-B science

team claimed to have determined to be “electrostatic patch effects” that caused misalignment torques in the gyroscopes.

http://en.wikipedia.org/wiki/Gravity_Probe_B

HYPOTHESIS: The unexplained torques on the GP-B gyroscopes are not “misalignment torques” but instead are highly accurate evidence that the Rañada-Milgrom effect is empirically valid; the Rañada-Milgrom effect states that the -1/2 in the standard form of Einstein’s field equations should be replaced by -1/2 + dark-matter-compensation-constant, where this constant is approximately sqrt((60±10)/4) * 10^ -5 so that the effect, if true, is highly relevant to the experimental accuracy of the Gravity Probe B results. Is the equivalence principle valid for virtual mass-energy? Under the assumption that Newton’s law of gravity and Newton’s laws of motion are accurate FOR BOTH REAL AND VIRTUAL MASS-ENERGY for non-relativistic velocities to an accuracy of more than 1 part in a million for gravitational accelerations, the most likely explanation for the unexplained torques is that electrostatic patches caused systematic malfunctions in the GP-B gyroscopes. The GP-B scientists seem to have assumed for the purposes of gyroscopic calibrations that Newton’s second law of motion is 100% accurate at non-relativistic velocities. However, according to Milgrom’s Law, which is a fact of observational astronomy, there is some likelihood that Newton’s second law is significantly inaccurate at non-relativistic velocities under low gravitational accelerations. M-theory predicts a quantum gravitational correction to general relativity theory, and the modified field equations yield Milgrom’s Law as an approximation. According to my theory, M-theory predicts surprising torques to gyroscopes that are in the range of accuracy of the GP-B gyroscopes.

http://en.wikipedia.org/wiki/Modified_Newtonian_dynamics (MOND)

In M-theory with neutralino physics, a bizarre Fermi pairing of neutralinos across alternate universes could perhaps explain how dark matter in the form of neutralinos might appear as an apparent, but not real, failure of Einstein’s field equations; thus the Rañada-Milgrom effect would be an approximation that might fail badly under some circumstances. If nature’s model consists of modified M-theory with Wolfram’s mobile automaton, the failure of the equivalence principle would be real and the Rañada-Milgrom effect would be 100% correct. On the basis of empirical evidence, MOND requires modification of the foundations of physics. M-theory might be the only plausible way to achieve such modification.

http://en.wikipedia.org/wiki/M-theory

I conjecture that modified M-theory with Wolfram’s automaton is the limit of some form of M-theory with neutralino physics as the neutralino mass approaches zero; therefore, the validity of “A New Kind of Science” Chapter 9 might be closely intertwined with the validity of M-theory.

http://en.wikipedia.org/wiki/A_New_Kind_of_Science

If the GP-B science team is basically correct about the electrostatic patches, then the GP-B findings would be a strong argument against both my physical interpretations of M-theory — although in M-theory with neutralino physics, the modification with the dark-matter-compensation-constant might be a somewhat crude approximation. However, the Rañada-Milgrom evidence leads me to believe that the GP-B science team is wrong and I am correct about the unexplained torques.

According to the Gravity Probe B website, "June 11, 2007 — Two Surprises and Their Underlying Causes

TIME-VARYING POLHODE MOTION IN THE GYRO MOTORS

The gyroscope's polhode motion is akin to the common "wobble" seen on a poorly thrown (American) football, though it shows up in a much different form for the ultra-spherical GP-B gyroscopes. While it was expected that this wobble would exhibit a constant pattern over the mission, it was found to slowly change due to minute energy dissipation in the spinning gyro rotors caused by interactions of electrostatic patches on the rotor's surfaces and patches on the metallic surfaces inside the housings. The polhode wobble complicates the measurement of the relativity effects by putting a time-varying wobble signal into the data. …

CLASSICAL MISALIGNMENT TORQUES ON THE GYROS

After months of research and analysis, our GP-B science team has determined that electrostatic patches are also the cause of the small torques we have observed on the gyroscopes when the spacecraft's axis of symmetry is not aligned with the gyroscopic spin axes. Torques cause the spin axis of a gyroscope to change orientation, and in certain circumstances, this effect can look like the relativity signal GP-B measures. Fortunately this change in gyro spin axis orientation due to these torques has a precise geometrical relationship to the gyro spin/vehicle symmetry axis, and thus effects of these so-called misalignment torques can be removed from the data without directly affecting the relativity measurement. …

PATCH EFFECTS — THE UNDERLYING CAUSE OF BOTH SURPRISES

Perhaps the greatest and most important challenge embraced by the GP-B team during the data analysis period has been to determine the underlying causes of both the unexpectedly changing polholde paths in the GP-B gyros and the misalignment torques. …

We were well aware of the possible ramifications of electrostatic patches on the gyro rotors prior to launch, and we made a thorough investigation of them prior to launch. In fact, a GP-B post-doctoral student carefully studied the effects of the electrostatic patches on the gyro rotors and concluded that if the niobium coatings produced just two large electrostatic patches located at opposite poles of the rotors, this would create a significant, classical torque problem in our gyros. To address this issue and determine the status of the patches, we performed two types of tests: 1) a

visual inspection, and 2) a laboratory measure of the size and magnitude of the patches. …

Thus, once the spacecraft was in orbit and we began observing the changing polhode periods of the gyros and the misalignment torques, we did not initially suspect that patch effects might be the underlying cause. However, having eliminated other causes through all of the tests and calibrations performed during the mission, we have determined that patch effects are, indeed, the underlying causes of our two surprises. …"

http://einstein.stanford.edu/highlights/hl_surprises.html

http://en.wikipedia.org/wiki/Polhode

Why should the unexplained torques, if they are misalignment torques, cause changes in the gyro spin axis orientation that have "a precise geometrical relationship to the gyro spin/vehicle symmetry axis"? In my theory, Einstein's gravitational redshift has an extremely small, systematic increase, but why should misalignment torques cause a precise, systematic distortion leading to a predictable geometrical relation? Is quantum gravitational theory a more likely explanation for the surprising torques than a lucky form of misalignment that allowed good data to be derived from unexpected electrostatic patch effects?

Is Wolfram's mobile automaton the basis for the foundations of physics? Are the ideas of Yoshio Koide, John P. Lestone, Gerald Rosen, and Carl Brannen essential for understanding the foundations of physics? Is Milgrom the Kepler of contemporary cosmology? Is the problem of explaining dark matter closely related to the problem of explaining dark energy?

Why is the % of dark energy in the universe approximately 72.8% of all the energy?

http://en.wikipedia.org/wiki/Lambda-CDM_model

In the Standard Model, there are the following approximations for three important constants:

U(1) gauge coupling: .357

SU(2) gauge coupling: .652

SU(3) gauge coupling: 1.221

Consider the following 4 numerical estimates:

(8/5) * log(1.221/.652) = 1.00381...

(5/3) * log(.652/.357) = 1.00385...

(1 - .728)/.728 - 3/8 = -.001373626...

(sqrt(15) * 10^-5)^(1/32) - .728 = -8.30323... * 10^-6

Are the four preceding numerical estimates merely coincidences?

http://en.wikipedia.org/wiki/Standard_Model

What does Koide's work mean in terms of string theory? By replacing the string theoretical alpha-prime by alpha-prime1, alpha-prime2, and alpha-prime3, can string theorists incorporate Koide's theory into M-theory?

http://en.wikipedia.org/wiki/Koide_formula

Are Gerald Rosen's ideas essential for understanding string theory?

http://en.wikipedia.org/wiki/Gerald_Harris_Rosen

What does Milgrom's MOND mean in terms of string theory?

http://www.astro.umd.edu/~ssm/mond The MOND pages (McGaugh)

http://www.astro.uni-bonn.de/~pavel/kroupa_cosmology.html Pavel Kroupa: Dark Matter, Cosmology and Progress

Is the Gravity Probe B science team correct in their interpretation of their own results? Was it OK for the Gravity Probe B science team to ignore Milgrom's ideas?