(If the ideas here are correct, then Milgrom, Fernández-Rañada, and I might be plausible candidates for the Nobel prize. Professor Fernández-Rañada is a world-class expert on general relativity theory and when he did not immediately reject the idea of the Rañada-Milgrom effect then I felt sure that the idea is valid. Therefore, it might appropriate to regard Fernández-Rañada as a joint author here.)

The OPERA experiment is a collaboration between CERN in Geneva and LNGS in Gran Sasso, Italy, using the CNGS neutrino beam. Protons fired in pulses at a carbon target produce pions and kaons. The decay products of these particles are muons and neutrinos. In 2011, OPERA researchers observed muon neutrinos that seemed, according to data analysis, to travel faster than the speed of light. In February 2012, there were reports that a problem with a fiber optic cable connecting a GPS receiver to an electronic card might invalid the 2011 findings. However, GPS timing assumes that Einstein's general theory of relativity is 100% correct — this is known to be false according to the work of Milgrom on MOdified Newtonian Dynamics (MOND). Is MOND a consequence of a quantum theory of gravity that uses M-theory? Should any quantum theory of gravity explain both dark energy and dark matter? Did Einstein overlook the possibility that alternate universes might have effects that are measurable? On pages 83 and 84 of Einstein's "The Meaning of Relativity", there are 3 fundamental conditions for the components of Einstein's tensor of the gravitational potential. The first condition is the tensor must contain no differential coefficients of the Fundamental Tensor components of greater than second degree. The second condition is that the tensor must be linear in these Fundamental Tensor components of second degree or less. The third condition is that the divergence of the tensor must vanish identically. The first two conditions are necessary to derive Newton's theory of the gravitational potential in the non-relativistic limit. The third condition is necessary to eliminate energy gains or losses from

alternate universes. But does dark matter consist of gravitational energy that seems to derive from alternate universes? Consider the following:

Two Button Hypothesis of General Relativity Theory: In terms of quantum gravitational theory, Einstein's general relativity theory (GRT) is like a machine with two buttons: the "dark energy" button and the "dark matter" button. The dark energy button is off when the cosmological constant is zero and on when the cosmological constant is nonzero. The dark matter button is off when -1/2 indicates the mass-energy divergence is zero and on when -1/2 + sqrt((60±10)/4) * 10^-5 indicates the mass-energy divergence is nonzero.

Why should anyone believe the preceding hypothesis?

Professor Antonio F. Rañada in his Jan. 2005 paper entitled "The Pioneer anomaly as acceleration of the clocks" says that the frequency of photons increases uniformly and adiabatically because of the expansion of the universe and his phenomenological theory; whereas, I say that the frequency of the photons increases uniformly and adiabatically because some quantum theory of gravity implies that the Rañada-Milgrom effect is approximately empirically valid.

Suppose that dark matter particles are the explanation for dark matter. Suppose F is gravitational force and the magnitude of the gravitational acceleration a is large relative to (μ * a(0))/m. Let a(0) be Milgrom's acceleration constant. We have

F = m * a * ((m * a)/(μ * a(0)))) if and only if

F * (1 / sqrt(1 – (2(μ * a(0))/(m * a))^2)) = m * a if only if

Einsteinian-redshift*(1 + dark-matter-compensation-factor/2) = m * a,

provided that 2(μ * a(0))/(m * a) = dark-matter-compensation-factor and we choose physical units in which gravitational redshift = Einsteinian gravitational acceleration due to gravitational force. Therefore, Milgrom's acceleration law indicates that a dark-matter-compensation-factor introduced by replacing the -1/2 in the field equation by -1/2 + dark-matter-compensation-factor/2 might explain Milgrom's Law. The a(0) in Milgrom's Law is about 10^-8 cm/sec^2 and the Pioneer anomaly acceleration is about 8.74 * 10^-10 m/sec^2. Milgrom's Law kicks in precisely one order of magnitude in acceleration below the Pioneer anomaly acceleration — this is what one would expect if the -1/2 in Einstein's field equations is apparently replaced by -1/2 + dark-matter-compensation-factor/2, where dark-matter-

compensation-factor/2 is very roughly sqrt(60/4) * 10^-5. What explains the choice of the value sqrt(60/4) * 10^-5 ?

When all known forces acting on the each of the two Pioneer spacecraft are taken into consideration, a very small but unexplained force remains. It appears to cause a constant sunward acceleration of (8.74±1.33) * 10^(-10) m/sec^2, for both spacecraft. If the positions of the spacecraft are predicted one year in advance based on measured velocity and known forces (mostly gravity), they are actually found to be some 400 kilometers closer to the sun at the end of the year.

According to Turyshev & Toth in their 2010 paper on "The Pioneer Anomaly", "Radio-metric Doppler tracking data received from the Pioneer 10 and 11 spacecraft from heliocentric distances of 20 to 70 AU has consistently indicated the presence of a small anomalous blue-shifted frequency drift uniformly changing with a rate of $\sim$ 6 * 10^(-9) Hz/sec (or cycles/sec^2). Various distributions of dark matter in the solar system have been proposed to explain the anomaly. However, it would have to be a special smooth distribution of dark matter that is not gravitationally modulated as normal matter so obviously is. "

I have suggested that the -1/2 in Einstein's field equations needs to be replaced by -1/2 + FF/2, where FF stands for Fernández-Rañada Factor. Note that, in my theory, the distribution of dark matter is very smooth, because so-called dark matter is really a necessary adjustment to Einstein's field equations or a mathematical artifice that approximately models such a contingency. In particular, I suggest that Newton's force law should be replaced by:

Non-gravitational force = mass times acceleration.

Gravitational force = (mass times Newtonian gravitational acceleration) plus (mass times acceleration due to some unknown dark matter force that INCREASES GRAVITATIONAL RED SHIFT BEYOND EINSTEIN'S RED SHIFT PREDICTION by a very small consistent increase).

According to Einstein's "The Meaning of Relativity", pages 91-92, there is a gravitational redshift precisely calculable in terms of general relativity theory. If receivingstation-redshift(Δ) is defined to be the redshifted gravitational first time-derivative predicted by Einstein at distance Δ from the sun precisely at the site of the receiving station for the Doppler tracking data, then:

FF * (∫ receivingstation-redshift(Δ) dΔ) / (2 epsilon AU) represents the Rañada-Milgrom excess redshift for the Pioneer Doppler tracking data, where the integration is carried out for Δ from 1 minus epsilon to 1 plus epsilon astronomical units. (Almost all of the Earth-caused gravitational red shift for the Pioneer incoming signal occurs near the receiving station. According to my theory, not only does this particular signal have an unexpectedly large gravitational redshift but so do all photons everywhere in our universe in the sense that general relativity theory is slightly wrong.)

THEREFORE, because of the Milgrom-related scaling argument, FF * (∫receivingstation-redshift(Δ) dΔ) / (2 epsilon AU) must equal roughly sqrt(60) * 10^(-5) hertz if my theory has any hope of being correct. This value of FF must explain the vast majority of all the dark matter in our observable universe, or else my theory is completely wrong.

Is Milgrom correct about dark matter? Is Milgrom's MOND wrong? McGaugh and Kroupa started as skeptics against MOND, but changed their minds on the basis of evidence in favor of MOND. The Lambda Cold Dark Matter (LCDM) model is slightly wrong, Newtonian gravitational theory is slightly wrong, and general relativity theory is slightly wrong.

I quote Prof. Dr. Pavel Kroupa from a (Nov. 1, 2011) e-mail,

"My criticism is not based on me not liking dark matter, but is a result of rigorous hypothesis testing such that, from a strictly logical and scientific point of view, LCDM is definitely not a viable model of cosmological reality. I do not write such statements because I do not like LCDM and its ingredients, but because every test I have been involved with falsifies LCDM. At the same time, the tests of MOND we performed were done on the same footing as the LCDM tests. The MOND tests yield consistency so far. I am not more "fond" of MOND or any other alternative, but the scientific evidence and the logical conclusions cannot be avoided. And it is true, I must concede, that MOND has an inherent beauty which must be pointing at a deeper description of space time and possibly associated quantum mechanical effects which we do not yet understand (compare with Kepler laws and the later Newtonian dynamics)."