Title –
APPLYING FRACTAL GEOMETRY AND ADDITIONAL MATHEMATICS TO THE QUANTUM WORLD, ARTICLE LEADS TO EXTRA EXPLAINING OF THE PIONEER ANOMALY BY REFINEMENT OF GRAVITATIONAL PHYSICS

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Abstract –
I start by pointing out "There is already support for the idea of, as a previous post puts it, "the electronic mechanism of binary digits" - in the Kabbalah (an interpretation of the Scriptures used by some Jews and Christians that seeks to discover mysteries by using special methods of interpretation). **(Besides the Kabbalah, my thanks also go to cosmologist Max Tegmark and his MUH or Mathematical Universe Hypothesis.)** We proceed to supersymmetry - then proposals of antiphotons, antigravitons and negative quantum spin (ideas that may seem preposterous but turn out to be possible, even logical, in a cosmos based on maths) are mentioned. From there, an original suggestion is proposed regarding the nature of magnetism. At the intended end, I mention that string theory is vital to a mathematical universe – which leads to explaining that the "Pioneer anomaly" is due to the warping of space-time by 2.3 times Einstein's estimate, as is the "flyby anomaly" measured for several spacecraft. String theory supports the idea that mathematics itself influences the nature of space-time warps spacecraft travel in. We must not make the mistake of assuming maths' production of matter-forming wave packets is the only way maths influences those travels.

Content –
There is already support for the idea of, as a previous post puts it, "the electronic mechanism of binary digits" - in the Kabbalah (an interpretation of the Scriptures used by some Jews and Christians that seeks to discover mysteries by using special methods of interpretation). According to an email I received from OverLrdLegion - a priest in the USA, "What you have presented is a confirmation of what the kabbalah has within its texts. That there is only nothing (represented by 0) and 1." My viXra article "Basic Blueprint for Making this Universe" (http://vixra.org/abs/1301.0040) represents 0 and 1 as pulses of energy being off or on. It phrases that this way "... positioning of Mobius loops and the flow of the loops' binary digits accounting for the interference between gravitation and electromagnetism". That is: the flow of 0's and 1's (in the 5th dimension) causes gravitational and electromagnetic waves (in the wave packets of the 4 familiar dimensions) to either cancel and produce nothing or 0 (or add up to an electrically neutral particle). Alternatively, the waves can reinforce and produce an "on" pulse or 1 (add up to a positively charged particle). Naturally, gravitational and electromagnetic waves can only cancel and reinforce if they're similar and approximately equivalent. In agreement with the idea that gravitation (the warping of space-time) is the foundation of the universe^; electromagnetism is referred to as modified gravity and things like electric charge/magnetic polarity,

and quantum spin, are the product of gravitational and electromagnetic waves interacting in wave packets. Since the flow of binary digits – base 2 mathematics - is a purely mathematical concept, it's obvious that the G and EM waves – being ultimately composed of 1's and 0's – don't have to result in a positively charged particle. Their maths can result in a negative charge.

^ Actually, gravity is only the apparent foundation of the universe – the cause we can detect, and see the effects of. It'd be more accurate to call gravity the universe's middleman. It's the cause of things like electromagnetism, the nuclear strong and weak forces, wave packets, repulsion, and attraction (see "Dark Energy, Dark Matter, New Gravitation and New Higgs" in http://vixra.org/pdf/1210.0108v3.pdf) But gravity is also an effect – of mathematics generated in a 5th dimension. The true foundation of the universe is maths.

"In the case of the force-carrying particles (such as photons and gravitons), the antiparticles are the same as the particles themselves." - p. 68 of "A Brief History of Time" (written by Stephen Hawking – published 1988 by Bantam Press). Photons and gravitons are massless and chargeless, so their matching partners – according to this and later parts of this article, antiphotons and antigravitons – would be the same (massless and chargeless), only differing in spin. The following couple of paragraphs were also inspired by that book –

(Undiscovered) gravitons are described by ordinary (or "real") numbers which, when multiplied by themselves, result in positive numbers e.g. 2 x 2=4, and -2 x -2 also equals 4. They are anticipated to have spin 2 (quantum spin has mathematical similarities to familiar spin but it does not mean that particles actually rotate like little tops). And antigravitons would be described by so-called imaginary numbers that give negative results when multiplied by themselves e.g. i multiplied by itself gives -1. If the graviton exists and is, as expected, massless and chargeless; it and its antiparticle ("the same", massless and chargeless) could not be opposite in possessing positive and negative mass or positive and negative electric charge; but they could be opposite in that their math descriptions give positive and negative results. If supersymmetry is valid when it says "every particle has a matching partner differing from it only in spin" and the partners have an opposite property; one must have positive spin, 2, while the other has negative spin, -2.

Gravitons (the hypothetical carriers of gravitational force) and **photons** (the observed carriers of electromagnetic force) create what we call electric charge. Is it possible that **antigravitons** and **antiphotons** create magnetic polarity? It seems so, since these antiparticles are identical to their corresponding particles except for the property called spin. There is no rotation in the manner of little tops here. Spin refers to how the particles look from different directions. The Ace of Spades card must be turned a complete revolution of 360 degrees to look the same as it did originally. If its original position is called north, rotating it 180

degrees takes us to the south. Continuing another 180 degrees in the same direction returns us to where we started. Therefore, we can say its spin gives it a north and south pole. You might say comparing a playing card to a subatomic particle is a very crude analogy; and that saying the card has north and south poles in no way means particles have poles, too. But look at this sentence in "Fractals" at http://vixra.org/pdf/1212.0096v2.pdf - "Dr. Harris and Dr. Sagan remind us, respectively, of quantum effects at cosmic scales and cosmic effects at quantum scales (they both remind us that the space warping in General Relativity extends to subatomic particles)." Gravitons and photons can produce a negative known as electricity. Anti-gravitons & anti-photons can produce a negative known as magnetism.

The usual explanation for magnetism is that it's produced by moving electric charges (it says neutral neutrons are magnetic because they're formed of charged quarks). These moving charges are said to result from the property of spin. All this implies a belief that electrons, for example, are indeed little spinning tops (a classical, as opposed to a quantum, concept of spin). This article presents quantum spin, electric charge and magnetism – indeed, particles themselves – as consequences of the mathematical Mobius strip, with gravitation and modified forms of gravitation (electromagnetism and the nuclear forces) accounting for all the properties of particles. It says goodbye to the last remnants of classical spin (the electron would need to spin faster than the speed of light if spin really was a classical, little rotating top phenomenon – this was first noticed by the quantum-mechanics pioneer, Wolfgang Pauli) and hello to quantum spin, which suggests that any and all particles are magnetic – including the neutral neutrino, which is elementary (not composed of tinier particles). Supporting this conclusion, Wikipedia's "Neutrino" article says "The discovery of neutrino oscillations – one type of neutrino changing into another type - implies that neutrinos have mass. The existence of a neutrino mass strongly suggests the existence of a tiny neutrino magnetism."

Importantly, recall this sentence from earlier – "Slight imperfections in the way the Mobius loops fit together determine the precise nature of the binary-digit currents and therefore of exact mass or charge." This sentence is reminiscent of string theory's statement "Standing currents (combinations of clockwise and anticlockwise currents in a four-dimensional heterotic superstring) generate the four-dimensional properties of familiar space-time" – p.84 of "Workings of the Universe", Time-Life Books 1991. **This means mathematics itself influences the nature of space-time warps spacecraft travel in. We must not make the mistake of assuming maths' production of matter-forming wave packets is the only way maths influences those travels.**

There's evidence to support my idea of the "Pioneer anomaly" requiring the amount of refinement to Einstein's theories that I suggested. This evidence comes from the "flyby anomaly" (gravitational slingshot or gravity assist - the use of the gravity of a planet to alter the path and speed of a spacecraft). My

information comes from http://en.wikipedia.org/wiki/Flyby_anomaly but if you prefer a more "scientific" reference, try http://arxiv.org/abs/astro-ph/0608087 (Wikipedia obtained the data from arXiv, so the only difference would be in the way it's written). The data is the best possible - but I couldn't say it's precise since it contains points where data is missing, as well as approximations.

"The density of matter in our Galaxy is about 1 particle/cm³ (in the disk, with the halo being less dense). The density of matter in intergalactic space (between galaxies) is about 2×10^{-31} gm/cm³, mainly hydrogen."

- written by Dr. Louis Barbier at the website Space Physics: Matter in Space http://helios.gsfc.nasa.gov/qa_sp_ms.html#dens

And

"There is also a force like air resistance from the very sparse gas in space, but it will be very, very small, since space is a very good vacuum."

Dr. Eric Christian, "Space Physics: Matter in Space"

So there are matter-forming wave packets in space (where gravitational and electromagnetic waves mix). These are formed by the increase of Einstein's value for the warping of space (30) to the value I propose (69), and account for the "very, very small resistance". For the flyby of Earth of each spacecraft mentioned in Wikipedia/arXiv; I divide the speed at perigee (in millimetres per second) by the observed and unexpected speed increase at perigee (in mm/s), then divide by the spacecraft's mass in grams. The result should be in the ballpark for the increase of warping of space from 30 to 69 i.e. 69/30 or 2.3 - and for 2 of the space probes that I was able to do calculations on, it is:

Galileo 1 = 2.15

NEAR = 2.42

But of course, the average density of matter fluctuates during a space probe's flyby of Earth, and in the case of Pioneer *, during its path through interplanetary space – "Particles in interplanetary space have a very low density, approximately 5 particles per cubic centimeter around Earth and the density decreases further from the Sun." (http://www.universetoday.com/34074/interplanetary-space/)

* "The Pioneers were uniquely suited to discover the effect (the so-called Pioneer anomaly) because they have been flying for long periods of time without additional course corrections. Most deep-space probes launched after the Pioneers either stopped at one of the planets, or used thrusting throughout their mission. The Voyagers flew a mission profile similar to the Pioneers, but were not

spin stabilized. Instead, they required frequent firings of their thrusters for attitude control to stay aligned with Earth. Spacecraft like the Voyagers acquire small and unpredictable changes in speed as a side effect of the frequent attitude control firings." – "Pioneer anomaly" From Wikipedia, the free encyclopedia

Production of wave packets is ultimately mathematical. I believe the maths involved belongs to base 2 i.e. the binary digits of 1 and 0 are the cause of matter, gravity, EM, the nuclear forces, space (whose warps are gravity), and time (which is also warped, and possibly an electronic "clock" measuring the motions of matter i.e. producing frames as in a movie). The mathematical foundations could perform "packet switching" (transforming from the abstract world of maths to the physical world of matter's wave packets).

At the same time; the maths assigns properties to the wave packets that can give the spacecraft various degrees of positive or negative acceleration. A quality like density in space caused by increased warping (producing matter-forming wave packets) and decreased warping (no wave packets) could cause various amounts of acceleration, and various amounts of braking or deceleration too. Therefore, the mathematics and the density of matter combine to produce differing quantities of "very, very small" acceleration/deceleration.

Galileo 1 (studied Jupiter and its moons)
variation from expected speed at perigee of Earth flyby is an increase of 2.56 (according to chart in Wikipedia) or 3.92 (according to text in Wikipedia) mm/s

Galileo 2 (No anomaly was detected after the second Earth-flyby of the Galileo spacecraft in December 1992, because any possible velocity increase was masked by atmospheric drag due to the craft's minimum altitude of 303 km.)

NEAR (Near Earth Asteroid Rendezvous)
variation = approx. increase of 7.21 mm/s

Cassini (or Cassini-Huygens, studying the Saturn system)
Decrease of approx. 1.7 mm/s

Rosetta 1 (Rosetta is a comet and asteroid explorer)
Increase = approx. 0.67 mm/s

Rosetta 2
No significant anomaly detected during 2nd flyby (variation ~0)

Rosetta 3
Negligible decrease during 3rd flyby, approximately = 0.004 mm/s

Messenger (studying Mercury)
Increase = approx. 0.008

Pioneer 10 and 11 (explored outer planets, leaving solar system)
Travelling some 3,100 miles less than expected each year

Background of Pioneer Anomaly

(from http://www.planetary.org/blogs/bruce-betts/3459.html)
"As they traveled away from the Sun, they (Pioneer 10 and Pioneer 11) slowed down. Most of this slowing was expected, a result of the gravitational pull of the Sun and other massive objects in the solar system. But even when everything in the solar system whose mass could have any effect on the Pioneers was accounted for, both spacecraft were found to be slowing more than expected."

(from "Pioneer anomaly" - Wikipedia, the free encyclopedia)

"Since the spacecraft were flying with almost no additional stabilization thrusts during their "cruise", it is possible to characterize the density of the solar medium by its effect on the spacecraft's motion. In the outer solar system this effect would be easily calculable, based on ground-based measurements of the deep space environment. When these effects were taken into account, along with all other known effects, the calculated position of the Pioneers did not agree with measurements based on timing the return of the radio signals being sent back from the spacecraft. These consistently showed that both spacecraft were closer to the inner solar system than they should be, by thousands of kilometres—small compared to their distance from the Sun, but still statistically significant. This apparent discrepancy grew over time as the measurements were repeated, suggesting that whatever was causing the anomaly was still acting on the spacecraft.

"As the anomaly was growing, it appeared that the spacecraft were moving more slowly than expected. Measurements of the spacecraft's speed using the Doppler effect demonstrated the same thing: the observed redshift was less than expected, which meant that the Pioneers had slowed down more than expected.

"When all known forces acting on the spacecraft were taken into consideration, a very small but unexplained force remained."

Thermal recoil
(from "Pioneer anomaly" - Wikipedia, the free encyclopedia)

"In July 2012, Slava Turyshev *et al* published a paper in "Physical Review Letters" that explained the anomaly (abstract):

'We investigate the possibility that the anomalous acceleration of the Pioneer 10 and 11 spacecraft is due to the recoil force associated with an anisotropic emission of thermal radiation off the vehicles. To this end, relying on the project and spacecraft design documentation, we constructed a comprehensive finite-element thermal model of the two spacecraft. Then, we numerically solve thermal conduction and radiation equations using the actual flight telemetry as boundary conditions. We use the results of this model to evaluate the effect of the thermal recoil force on the Pioneer 10 spacecraft at various heliocentric distances. We found that the magnitude, temporal behavior, and direction of the resulting thermal acceleration are all similar to the properties of the observed anomaly. As a novel element of our investigation, we develop a parameterized model for the thermal recoil force and estimate the coefficients of this model independently from navigational Doppler data. We find no statistically significant difference between the two estimates and conclude that once the thermal recoil force is properly accounted for, no anomalous acceleration remains.' "

Mystery Tug on Spacecraft Is Einstein's 'I Told You So'

By DENNIS OVERBYE
Published: July 23, 2012 (http://www.nytimes.com/2012/07/24/science/mystery-tug-on-pioneer-10-and-11-probes-is-einsteins-i-told-you-so.html?_r=0)

"Was there an unknown planet or asteroid out there tugging on the spacecraft? Was it drag from interplanetary gas or dust? Something weird about the spacecraft? Or was something wrong in our calculation of gravity out there in the dark?

"That last explanation would have been big news indeed. Much of what we know about the universe — for example, the existence of dark matter, which seems to swaddle and shape the galaxies, and of dark energy, which seems to be speeding up the expansion of the universe — comes from presuming that Einstein's General Theory of Relativity, which describes gravity as the warping of space-time geometry — is correct over cosmic distances.

"General relativity has passed every test on Earth. Without correcting for it, GPS systems would not work. But some theorists have suggested that if gravity behaved differently over large distances from what Einstein thought, it would relieve astronomers of the embarrassing need to posit that 96 percent of the universe consists of various kinds of unknown dark stuff. A similar, but larger,

kind of deviation from Einsteinian theory could explain the Pioneer anomaly, as it is called." *

Author's note – I suggest this "similar, but larger, deviation" later in this article. Could this mean there is something in my viXra submissions concerning dark matter being ordinary particles travelling through time, and of dark energy being related to gravitation? The relevant articles would eliminate that mysterious, unknown 96% of the universe. However, those other submissions speak of particles in a 5th-dimensional hyperspace – which might bring back the mysterious unknown.

"The real reason why the Pioneer spacecrafts appear to be slowing down" George Dvorsky (http://io9.com/5950466/the-real-reason-why-the-pioneer-spacecrafts-appear-to-be-slowing-down)

"Back in July we reported on a new theory explaining why both Pioneers 10 and 11 were decelerating at a rate that seemed to defy Newtonian physics. The answer, it seemed, had to do with heat from the electrical subsystems and the decay of plutonium which was pushing back on the craft. But now, a researcher from the University of Missouri says this is wrong — and that our unexpected measurements of the Pioneer probes can be explained by taking the ongoing expansion of the universe into account.

"According to Sergei Kopeikin, the previous explanation for the so-called Pioneer anomaly was only able to account for 15 to 20% of the observed deceleration. Kopeikin, on the other hand, devised a new set of calculations which factored in the expansion of the universe — including the way it affects the movement of photons that make up light and radio waves."

Author's note – Both the "thermal recoil" and "universal expansion" theories regarding Pioneer are extremely interesting. However, I suspect the emission of thermal radiation doesn't have a large enough effect. I also suspect the speed of photons in the vacuum of space is constant, and that universal expansion therefore doesn't have enough effect either.

Refining gravitational physics
On September 9th 2012, Pioneer 10 was 9.918 billion miles from Earth. It was launched on March 2, 1972 so it had been travelling for 14,799 days. It's trajectory has not always been a straight line (see image of Voyager and Pioneer trajectories at http://www.google.com.au/imgres?imgurl=http://www.daviddarling.info/images/Pioneer_Voyager_trajectories.jpg&imgrefurl=http://www.daviddarling.info/encyclop

) but let's assume another 820 million miles have been involved in its encounters with planets (including Earth) and moons, plus its course corrections. Then we can make its path a straight line i.e. 180 degrees which is 10 billion miles long. If we also assume exactly 15,000 days of travel (that takes us to late April-early May 2013), the spacecraft travels an average of 10,000,000,000/15,000 or 666,666 miles per day i.e. 243,333,090 miles each year. Since everything in a unified field theory or Theory of Everything is united ** (including spacecraft, miles, and angles), it travels (in a year) 243,000,000 miles in 180 degrees (648,000 arcseconds). In http://vixra.org/pdf/1212.0096v2.pdf I suggested the curvature of space proposed by Relativity is only 43% of the actual figure. In that article, it's said starlight does indeed get deflected 1.75 arcseconds by the sun (as Einstein stated), but that 57% of the light is diverted into the sun's matter-forming wave packets (as $E=mc^2$ implies when it's converted to $m=E/c^2$). But in the present article, the relevant figures (100%, 43%, 1.75 in fractional form) become (100/43 x 7/4) and equal 4.069. The true curvature would be 4 arcseconds or 2.3 times the accepted 1.75. In one arcsecond, Pioneer travels 243,000,000/648,000 = 375 miles. Remembering that my contributions to viXra often describe space-time warps as Mobius warps (you need to travel around a Mobius loop twice to reach your starting point); we must multiply the 375 miles by 2. In one arcsecond, Pioneer travels 750 miles. In 4 arcseconds, three thousand miles. The total shortfall in travel distance (see next sentence) is 3,000 miles per year if Pioneer is traversing space-time that is curved and warped 2.3 times General Relativity's prediction.

** See the content's first and second paragraphs where gravitation is called the universe's apparent foundation and mathematics is called its true foundation. As well, see http://vixra.org/pdf/1301.0040v1.pdf

If it was possible to do, flattening the very small arc formed by introducing 4 arcseconds each year would extend the endpoint of the space probe's travelled distance by 3,000 miles. The probes are travelling some 3,100 miles less than expected each year according to "The Pioneer anomaly - solved?" by Liz Kruesi in "Astronomy" magazine - Nov. 2012, p.20. Did my fondness for approximating, both here and in http://vixra.org/pdf/1212.0096v2.pdf, remove some 100 miles (about 3%)? The Planetary Society comes to my rescue and says, "Each year, they (the Pioneer space probes) fell behind in their projected travel by about 5,000 kilometers (3,000 miles)."