Title -

Planck Comes to Einstein's Rescue ... Again

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Abstract -

The first rescue was by Planck the man. Max Planck – who won the Nobel Prize for Physics in 1918, for the “discovery of energy quanta” - was editor of the journal "Annalen der Physik" when Albert Einstein submitted his Theory of Special Relativity. Einstein's paper contained no experimental data of his own, and no references from scientists (on p.191 of his book “Coming of Age in the Milky Way”- published by The Bodley Head, 1988 – Professor Timothy Ferris writes: “The emergence of the special theory of relativity was as unconventional as its author. The 1905 paper that first enunciated the theory resembles the work of a crank …”). The theory opposed accepted thinking and was highly speculative. It would probably be rejected today, and the world would never have known of it. But Max Planck was impressed and saw its beauty. The paper was quickly published without much revision.

The second rescue is by the Planck spacecraft - named after Max Planck and launched in 2009 to investigate the Cosmic Microwave Background (CMB). The craft is currently searching for B-mode polarization.^ Thus I believe it will, when it detects the B-mode, support Albert Einstein's claim that gravitation plays a role in the constitution of elementary particles (in “Do Gravitational Fields Play An Essential Part In The Structure Of The Elementary Particles Of Matter?”, a 1919 submission to the Prussian Academy of Sciences). This is because the B-mode signal, which is produced by gravitational waves, is largely contained within the E-mode signal, which results from CMB photons changing directions as they collide with and then scatter off electrons. Einstein’s paper was the next step after his theory of gravitation proposed in General Relativity - when forced to summarize the general theory of relativity in one sentence, Einstein said: time and space and gravitation have no separate existence from matter.*

^ An online article (“B-mode polarization spotted in cosmic microwave background” by Jon Cartwright - http://physicsworld.com/cws/article/news/2013/jul/25/b-mode-polarization-spotted-in-cosmic-microwave-background) reported on July 25, 2013 that the South Pole Telescope (SPT) has already made the first detection of B-mode polarization - “The CMB does not only contain variations in temperature, however. Its radiation was scattered towards us from the universe's earliest atoms in the same way that blue light is scattered towards us from the atoms in the sky. And in the same way that the blue light from the sky is polarized – a fact you can check by wearing polarized sunglasses – so too is the light from the CMB polarized. Variations in CMB polarization were first detected in 2002 by the DASI interferometer in Antarctica and helped cosmologists understand the

dynamics of the early universe. These polarization variations were known as E-mode or gradient variations because they describe how the magnitude of polarization changes over the CMB. But there are even subtler variations known as B-mode variations, which describe the rotation or "curl" of CMB polarization. The majority of B-mode polarization is produced by galaxies acting as gravitational lenses, twisting the E-polarized light on its 14-billion-year journey from the other side of the observable universe. It is incredibly faint, producing temperature variations of about 0.4 μK and accounting for just one part in 10 million in the CMB temperature distribution. "B-mode polarization is very difficult to measure," says Duncan Hanson, a member of the SPT team who is based at McGill University in Canada."
(Note referring to "Planck Comes to Einstein's Rescue … Again" – 10^24 parts of the 10^25 strength of the gravitational waves is spent producing a particle [in this case, photon or electron i.e. the B-mode signal is largely contained within the E-mode signal]. The remainder is a long-wavelength, very weak gravitational wave that could be misinterpreted as entirely separate from the E-mode [more info about the numbers in "Why Is Gravity Weak?]. Assuming the B-mode polarization has been accurately measured – and it's "very difficult to measure" – the 10^25-10^24 strength of gravitational waves is, since the space-time warps known as gravity waves are composed of binary digits that also compose electromagnetism's bosons as well as matter's fermions [see "Digital String Theory" below], represented as the one part in ten million of the CMB's temperature variation.)

* Suppose Albert Einstein was correct when he said gravitation plays a role in the constitution of elementary particles. And suppose he was also correct when he said gravitation is the warping of space-time. Then it is logical that 1) gravitation would play a role not only in elementary particles and their masses but also in the constitution of the forces associated with those particles i.e. the nuclear strong force and the electroweak force (combination of electromagnetism and the weak nuclear force), and 2) the warping of space-time that produces gravity means space-time itself plays a role in the constitution of elementary particles, their masses, and in the forces. Therefore, if electromagnetism is related to gravitation (see "c^2 and the Atom"), time is unified with the gravitational and electromagnetic fields (overcoming the 50-year-old objection to Einstein's Unified Field Theory which was put forth by England's Professor Penrose).

Earlier in 2013, I tried to promote Einstein's idea during a discussion at researchgate.net. There, scientists told me that Einstein's paper will be regarded as erroneous and useless speculation, some kind of misunderstanding, nothing of interest, and not really useful as long as the Standard Model of interactions between particles and forces dominates scientific thinking. I'll merely say that if I was placing a bet, my money would be on the Standard Model going extinct one day and Einstein then being given credit for a deeper understanding of the relation between mass and gravity.

Content –

WHERE IN THE COSMOS IS B-MODE POLARIZATION?

The article “How Planck Has Redefined The Universe” by Liz Kruesi (“Astronomy” magazine – October 2013) says on p.33 – “People are familiar with polarization in a different form (from the microwave radiation’s)” and “Astronomers think the CMB radiation has two different types of polarization: E-mode, which results from CMB photons changing directions as they collide and then scatter off electrons; and B-mode, which is produced by gravitational waves originating from the universe’s first moments. They’ve found E-mode polarization, but B-mode corresponds to a much fainter signal.”

Also on p.33 - “Finding this B-mode signal is the next big thing in the microwave background,” says (Bruce) Partridge (of Haverford College in Pennsylvania, USA), because it is an absolute smoking gun for inflation.” (I’ll write more about inflation below.) Partridge continues, “Whether Planck will see (the B-mode signal) or not is still an open question …” Jan Tauber, the European Space Agency’s Planck project scientist, backs up Partridge’s doubts about finding the B-mode signal by saying “It’s quite uncertain whether we will be able to find that particular signature.”

I suggest the B-mode signal has already been discovered because it is largely contained within the E-mode signal. 10^24 parts of the 10^25 strength of the gravitational waves is spent producing a particle (in this case, photon or electron i.e. the B-mode signal is largely contained within the E-mode signal). The remainder is a long-wavelength, very weak gravitational wave that could be misinterpreted as entirely separate from the E-mode (more info about the numbers in “Why Is Gravity Weak?)

COSMIC RAYS AND ULTRA-HIGH-ENERGY-COSMIC-RAYS

The binary digits in space-time (assumed by modern science to be “virtual particles”) confer energy (and mass) on a) cosmic rays that travel far through space, turning them into UHECRs (ultra-high-energy cosmic rays); and b) on microwaves plus other electromagnetic photons. Naturally, this process does not apply to cosmic rays that have already been emitted as UHECRs from pulsars, gamma-ray bursts, active galactic nuclei, colliding galaxies, etc. (“Ultra High Energy Cosmic Rays: origin and propagation” by Todor Stanev - 30th International Cosmic Ray Conference, 2007 - http://arxiv.org/pdf/0711.2282v1.pdf). Similarly, the digits give energy to a star’s photons – which has the potential to cause scientific instruments to overestimate the energy released from distant stars. However, this increase in energy of the light photons is balanced by the stretching of space, which causes decrease of energy (as of 21 March 2013, the Hubble constant, as measured by the Planck Mission, is 67.80 ± 0.77 km/s/Mpc –“Planck Mission Brings Universe Into Sharp Focus” - http://www.jpl.nasa.gov/news/news.php?release=2013-

109&rn=news.xml&rst=3739). Thus, the speed of light in vacuum would be a constant. The increased creation of space – to be precise, the law of conservation requires “creation” to be increased conversion of the energy of binary digits into space – accompanying space’s accelerating expansion means the increased energy which digits bestow on light’s photons is necessarily perfectly balanced by the energy decrease which space’s expansion gives to photons. And the velocity of light (and every form of electromagnetism) always remains constant – in the universe as well as all subuniverses (explained later in article).

Why doesn't the stretching of space cause all UHECRs to lose energy and change back to regular cosmic rays? If a UHECR travels through space that is extremely warped (for example, the "coherent space" we call matter, which re-radiates a UHECR as a lower-wavelength cosmic ray upon interaction), it does change. But if its journey is through relatively unwarped and flat space, it remains a UHECR. (Regarding particles as the basis of the universe leads to the interpretation of a UHECR interacting with matter and being re-radiated as a regular-energy cosmic ray. Regarding space-time itself as playing a role in the constitution of elementary particles leads to the interpretation that the stretching of space turns a UHECR into a cosmic ray.)

Einstein’s idea of gravitation (and space-time) playing a role in the constitution of particles means it can be concluded that the Sunyaev–Zel'dovich effect (energetic electrons in the hot gas of galaxy clusters boost the energy of microwave photons) is not merely caused by binary digits in space-time which is usually accepted to be distinct from the matter within it. It is also caused by the electrons being composed of binary digits and space-time (electrons, and all particles, are not distinct from the space they float in or from the time they experience).

GRAVITATIONAL WAVES INDEPENDENT OF COSMIC INFLATION

The gravitational waves may not have originated from the universe’s first moments in precisely the manner which the article in Astronomy states. The magazine suggests quantum fluctuations expanded during the inflationary period and caused the ripples known as gravitational waves (the gravitational waves could exist from the universe’s first moments because binary digits produced them [explained later], not because quantum fluctuations expanded). The idea of quantum fluctuations is valid (a quantum fluctuation is the temporary change in the amount of energy at a point in space). But there is an alternative to quantum fluctuations that mysteriously happen for no reason. Einstein said Hidden Variables should exist which carry extra information about the world of quantum mechanics … and complete it, eliminating probabilities and bringing about exact predictions. In this case, temporary change in the amount of energy at a point in space would not be due to random, probabilistic quantum fluctuations but to the exactly predictable binary digits of 1 and 0 (used in computers and other

electronic devices).

This means the foundation of our universe would be mathematics (specifically, base-2 maths). (See cosmologist Max Tegmark's hypothesis that mathematical formulas create reality, http://discovermagazine.com/2008/jul/16-is-the-universe-actually-made-of-math#.UZsHDaIwebs and http://arxiv.org/abs/0704.0646), plus - In "The Atlantic Monthly" for April 1988, journalist Robert Wright says U.S. computer scientist and physicist "Ed Fredkin thinks that the universe is a computer. According to his theory of digital physics, information is *more* fundamental than matter and energy. He believes that atoms, electrons, and quarks consist ultimately of bits—binary units of information, like those that are the currency of computation in a personal computer or a pocket calculator.") How could this maths be converted into the physical cosmos?

"Digital" String Theory

Let's borrow a few ideas from string theory's ideas of everything being ultimately composed of tiny, one-dimensional strings that vibrate as clockwise, standing, and counterclockwise currents in a four-dimensional looped superstring ("Workings of the Universe" by Time-Life Books – 1991, p.84). We can visualize tiny, one dimensional binary digits of 1 and 0 (base 2 mathematics) forming currents in a two-dimensional program called a Mobius loop – or in 2 Mobius loops, clockwise currents in one loop combining with counterclockwise currents in the other to form a standing current. Combination of the 2 loops' currents requires connection of the two as a four-dimensional Klein bottle. This connection can be made with the infinitely-long irrational and transcendental numbers. Such an infinite connection* translates - via bosons being ultimately composed of the binary digits of 1 and 0 depicting pi, e, √2 etc.; and fermions being given mass by bosons interacting in matter particles' "wave packets" – into an infinite number of subuniverses**, also known as (possibly Figure-8) Klein bottles. Slight imperfections in the way the Mobius loops fit together determine the precise nature of the binary-digit currents (the producers of space-time-hyperspace, gravitational waves, electromagnetic waves, the nuclear strong force and the nuclear weak force) and thus of exact mass, charge, quantum spin. They would also produce black holes - whose binary digits could, in the case of the sun, come from our star being compressed to 2.95 kms, in which case the pressure increase "shreds" the sun into its binary digits (its mass is relativistically converted into the energy of binary digits). Referring to a Bose-Einstein condensate, the slightest change in the binary-digit flow (Mobius loop orientation) would alter the way gravitation and electromagnetism interact, and the BEC could become a gas (experiments confirm that it does).

* If the material and immaterial universe consists of an infinite connection of transcendentals and irrationals, renormalization might be unnecessary in certain circumstances. This mathematical procedure is regarded as prerequisite for a useful theory and is used in attempts to unite general relativity with quantum mechanics to produce Quantum Gravity and the Theory of Everything. Renormalization seeks to cancel infinities – but in a literally infinite universe, retaining the infinite values might point the way to deeper understanding of the cosmos.

** Each one is a “subuniverse” (bubble or pocket universe) composing the physically infinite and eternal space-time of the universe. The infinite numbers make the cosmos physically infinite, the union of space and time makes it eternal, and it's in a static or steady state because it’s already infinite and has no room for expansion. Our own subuniverse has a limited size (and age of 13.8 billion years), is expanding from a big bang, and has warped space-time because it's modelled on the Mobius loop, which can be fashioned by giving a strip of paper a 180-degree twist before joining the ends. (It also has DOUBLE STRANDED, spiralling DNA because the universe is modeled on TWO twisted Mobius loops. Agreeing with a 1919 paper which Einstein submitted to the Prussian Academy of Sciences [“Do Gravitational Fields Play An Essential Part In The Structure Of The Elementary Particles Of Matter?”], DNA is made of remarkably warped space-time / extremely intense gravity). Referring to the universe’s infinity -"The universe IS something" (“Astronomy” magazine – March 2013, p.66) is interesting. This letter and its reply continue on from Bob Berman’s article "Infinite Universe" (“Astronomy” – Nov. 2012) which says, “The evidence keeps flooding in. It now truly appears that the universe is infinite” and “Many separate areas of investigation – like baryon acoustic oscillations (sound waves propagating through the denser early universe), the way type 1a supernovae compare with redshift, the Hubble constant, studies of cosmic large-scale structure, and the flat topology of space – all point the same way.” Support for the article – a) after examining recent measurements by the Wilkinson Microwave Anisotropy Probe, NASA declared "We now know that the universe is flat with only a 0.4% margin of error." - http://map.gsfc.nasa.gov/universe/uni_shape.html;
and b) according to "The Early Universe and the Cosmic Microwave Background: Theory and Observations" by Norma G. Sànchez, Yuri N. Parijskij [published by Springer, 31/12/2003], the shape of the Universe found to best fit observational data is the infinite flat model).

WHY IS GRAVITY WEAK? (C^2 AND THE ATOM)

When Einstein penned E=mc^2, he used c (c^2) to convert between energy units and mass units. The conversion number is 90,000,000,000 (300,000 km/s x 300,000 km/s). Since we'll be dealing with numbers in the trillions of trillions, and since the many particles and atoms require varying amounts of gravity for their formation, a good approximation will be to round up the conversion factor to 10^11. When gravity forms mass (we can say space-time forms mass since gravity is merely space-time’s warping), it loses 10^24 of its energy or strength. Though it starts with a strength of 10^25, it finishes with far less energy, a much longer wavelength, and a strength labelled "1". After the matter is formed, following gravity waves retain their strength of 10^25. Looking at the example of astronomy's gravitational lensing, we can deduce that the amplitudes of the following gravity waves are magnified by the matter's density so they achieve EM's (ElectroMagnetism’s) strength (10^36 times gravity's strength) i.e. 10^25 is

multiplied by Einstein's conversion factor [10^11] and gives us 10^36. Just as visible light can be absorbed by interstellar dust and re-radiated at infrared wavelengths, the following gravity waves are absorbed by the matter and radiated as longer-wavelength EM waves (possibly gamma rays, or microwaves).

What happens when gravity and electromagnetism interact within an atomic nucleus? If 10^2 gravitons interact with each photon (or 100 photons with each graviton), the strong force is produced (it's 10^38 times gravity's strength). There are two ways to produce the weak force (10^25 times as strong as gravity). It could be 1) the normal function of gravity in 10^25 mode when acting over a distance of 10^-18 metres (the weak force's range) i.e. the weak force IS gravity in 10^25 mode, or 2) the result of EM's photons interacting with 10^11 anti-gravitons i.e. 10^36 would be divided by Einstein's speed-of-light conversion and give 10^25. Not only does 2) relate gravity and electromagnetism, but it suggests electromagnetism is converted retrocausally i.e. "backwards" (from 10^36 to 10^25), and also plays a part in mass formation along with gravitation (as Einstein's 1919 paper stated).

DARK ENERGY AND DARK MATTER

The strong force would represent the subatomic attraction of gravity (it's pre-matter-forming strength of 10^25 gravitationally lensed to 10^36 and interacting with 10^2 photons) while gravity's subatomic repulsion could be viewed as the emission of particles in radioactivity (the weak force is responsible for this – and the weak force IS gravity in 10^25 mode). If the universe obeys the laws of fractal geometry*, gravity would also account for repulsion and attraction on astronomical and macroscopic scales (it would account for the dark energy pushing galaxy clusters apart as well as familiar concepts of gravity such as attraction – actually, pushing - of a falling apple to the ground). Dark energy thus has a gravitational explanation – but this explanation is only partial. It must also be remembered that every property of space-time (including dark energy) is produced by binary digits in 5^{th}-dimensional hyperspace (the Law of Conservation requires this "production" to actually be conversion of the digits' energies). Dark matter also has gravitational explanation of tides, orbits, Kepler's laws (for a nonmathematical description that avoids scientific language, see "Unified Field, Relativity and Quantum Mechanics Meet String Theory, Parallel Universes, the Mathematical Universe, and TOE" (http://vixra.org/abs/1303.0218). But it must also be remembered that this partial explanation of dark matter is supplemented by gravity being concentrated 10^24 times in negative hyperspace to form matter with negative mass. As Dr Adam Riess, co-discoverer of the universe's accelerating expansion, writes at http://www.stsci.edu/~ariess/darkEnergy.htm - "Indeed, all incarnations of energy with negative pressure are called dark energy" and "Vacuum energy has negative pressure (you must do work to expand the Universe's inventory of the vacuum), and it is this property which gives rise to repulsive gravity." (In the context of the present article, vacuum energy is the negative energy of

hyperspace and it gives rise to repulsive gravity through its work of transmitting binary digits - frames [comparable to movie frames] are created in the 5th dimension by binary digits and their very rapid display is what we call motion, or transmission.)

*French mathematician Benoit Mandelbrot developed this fractal geometry and coined the word fractal. The diminishing size of spheres may be seen as representing cosmic, galaxy cluster, stellar, quantum-particle scales. We may have varying speed of flow of time during our life because of the accelerating expansion of space-time in the universe. Space is expanding but time is also expanding (and at an accelerating pace). In our youth, it proceeded at a very slightly reduced pace whereas it's going a tiny bit faster now that we've gained experience. So the increased pace is not subjective. If things in space and time were separate, we certainly could never be aware of this accelerating time - the change in our lifetimes is infinitesimal. But things are different if we humans, and the entirety of space-time, are different aspects of the fractal geometry i.e. of the unified field. We are unified with every step of the universe's past and future expansion. Therefore, we can perceive its accelerating expansion ... which we interpret as our having more time in our youth. Our perception of time moving faster will be interpreted by most people as purely subjective and psychological. But in fact, it appears to support the idea of fractals - of gravity accounting for repulsion and attraction not merely on quantum scales but, fractally, also on astronomical and macroscopic scales.

HIGH FREQUENCY, WARM TEMPERATURE, MORE MATTER AND MASS

To sum up in one sentence – The areas of Planck's map of the cosmic microwave background which show the highest frequencies (gravitational waves prior to their formation of matter) not only receive great energy input and warmer temperatures but also produce more matter and mass, to create today's superclusters of galaxies.

REFERENCES

In the spirit of the original paper on special relativity, there is no list of references. There are a number of them in the text of my article, however (but I haven't provided as many references as I could have).