

The key to the Resolution of 20th Century Physics

Before he died, Einstein had found the key to the answer he had been seeking for so long, possibly without realising it.

In 1952 Einstein added Appendix V to his book on the special and the general theory first published in 1916. This appendix is vital to the understanding of Einstein's ultimate views on the subjects of space and time. This is demonstrated by this note in the preface added at the same time:

“NOTE TO FIFTEENTH EDITION

In this edition I have added, as a fifth appendix, a presentation of my views on the problem of space in general and on the gradual modifications of our ideas on space resulting from the influence of a relativistic view-point. I wished to show that space-time is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality. Physical objects are not *in space*, but these objects are *spatially extended*. In this way the concept of “empty space” loses its meaning.”

It would, I think, have been helpful if Einstein had added the words, 'as some *thing*', because 'spatial extension' of 'physical objects' necessitates spatial extent of each physical object. In the absence of field, what is between the spatially extended (separated) objects with extent, is then the absence of anything that exists. Without this, 'with extent' can have no meaning. In Appendix V, on page 155, Einstein says:

“If we imagine the gravitational field, i.e. the functions g_{ik} to be removed, there does not remain a space of type (1), but absolutely nothing, and no “topological space”.

But what may confuse those people who have read this, is that Einstein goes on to say:

“There is no such thing as an empty space, i.e. a space without field.”

and then, crucially:

“Space-time does not claim existence on its own, but only as a structural quality of the field.”

So it is the difficulty in removing the field, and I would say the concept of it, that caused Einstein to say, “ There is no such thing as an empty space..” rather than the impossibility of imagining empty space, which he clearly did in Appendix V in imagining field to be removed. This is important in realising that Einstein was not ruling out empty space as 'nothingness', which we might say is the lack of anything that can claim existence, only as reality in his theory.

But Einstein's theory was incomplete. If it turned out that quantum mechanics could be explained by the action of very tiny, solid particles that comprise the type of (local) field not produced by accelerated motion, the motion of such particles would only be possible if they had space in which to move. Such space would not *exist*, but represents only the adjacent absence of other particles.

It is vital to realise that Einstein conceived of more than one type of gravitational field. At the end of Chapter XXII we find the following statement after the conclusion that the general law of the gravitational field must be satisfied for all gravitational fields obtained as the result of accelerated motion:

“Even though by no means all gravitational fields can be produced in this way”

He makes a similar statement in Chapter XX (page 69) in clarifying that it is not always possible to choose another reference body such that no gravitational field exists with reference to it:

“This is by no means true for all gravitational fields, but only for those of a quite special form. It is, for instance, impossible to choose a body of reference such that, as judged from it, the gravitational field of the Earth (in its entirety) vanishes”

My interpretation of the general theory is that Einstein demonstrates the equivalence of fields produced in different ways. Many seem to have wrongly interpreted this to mean that there are no gravitational forces, and that some “thing” called space-time is distorted in the presence of mass. Einstein provides two clues as to why this is not the correct interpretation by referring to “pure gravitational field” and clarifying in adding Appendix V and a note to the 15th edition that includes:

“Space-time is not necessarily something to which one can ascribe a separate existence, independently of the actual objects of physical reality”

Which, as I point out is crucial, and I thus repeat, he states more positively on page 155 in Appendix V:

“Space-time does not claim existence on its own, but only as a structural quality of the field.”

In Appendix V, page 141 he had concluded:

“It appears to me, therefore, that the formation of the concept of the material object must precede our concepts of time and space”

This last statement reflects my conclusion that until matter exists with some regularity of motion, the concept of time has no meaning. So it is apparent that the idea that space-time is an entity that can be affected when matter (with mass) is added, is inconsistent with Einstein's eventual conclusion. Space-time then is the relative motion of matter. Einstein was also happy to resolve Descartes' dilemma about the concept of space having existence, not by ruling out the possibility of empty space, but by preferring the concept of spatial extension and the qualification that the existence of field meant that there was no space empty of field and thus no empty space. This should not be interpreted as meaning that Einstein could not conceive of the notion of empty space because at the start of chapter XVII he had said:

“Space is a three dimensional continuum”

But what further confuses people is then what 'curvature of space-time' can possibly mean, because they speak of space being curved and time being distorted, views that clearly must be questioned in the light of the above. The thing to never lose sight of is that relativity is about relative motion. And I suggest, therefore, that the answer lies in relative curvature of *motion*, not space, and not time as an 'entity', because of the philosophical problems that Einstein refers to regarding their independent existence. Einstein mentions not only Descartes, but problems throughout history regarding the problem of considering empty space to have 'existence'.

Gödel, of course, working with Einstein at Princeton not long before Einstein died, showed that a rotating universe satisfied the field equations of general relativity¹. But whether or not that is the answer, or part of the answer, we know that the solar system lies within a rotating system – our

galaxy. And Hawking and others may have been too quick to rule out a rotating universe because we now have several indications of an axis in the wider universe. Put together with recent concessions and observations re emissions from 'black (now 'grey'?) holes', that may have implications for background radiation, Hawking's reason for ruling out a rotating universe, as evidence of the big bang, reconsidering a rotating universe may soon be inevitable.

The point is, of course, that straight line motion must appear curved relative to everything else that is rotating. And mass makes things stay put relative to everything that is rotating, increasing relative curvature. Space is not curved by rotation, and plays no part in the rotation (as some people ponder). The illusion of curved space is created in the context of Newton via the absence of any force.

So is curvature of motion, as opposed to curvature of space, the key to resolving the unification of relativity and quantum mechanics?

It is not a new idea. Epicurus, a Greek philosopher who lived 341-270 B.C., gave to Democritus' atoms (atomos, a = not, tomos = cut) a curious, internal, spontaneous power to swerve. And Titus Carus Lucretius (95-55 B.C), a Roman philosopher, also endowed the atoms with a voluntary power to swerve.

Democritus explained the origin of the universe as follows. The original motion of the atoms was in all directions: it was a sort of 'vibration', hence there resulted collisions and, in particular, a whirling movement, whereby similar atoms were brought together and united to form larger bodies and worlds.

Compare that with this extract from my first book², published five years before I read the above in an Email of 22/1/10:

“Supposing we start with a Universe consisting of fundamental particles (the smallest and most basic that can exist) which have no spin but only straight line motion of various speeds (individually indeterminate of course because there is no spin to give any concept of time) in any and all directions. There are a finite number of identical particles so they must have a finite kinetic energy. Eventually there must be collisions, many of which will be oblique and thus imparting spin (assuming that the particles are not perfectly hard and smooth). In the vacuum of space no sound would be generated and the particles have no heat to gain or lose. Those particles now spinning have energy of spin in addition to their translational KE.

If Newton's Laws of motion are to hold, those particles not involved in any collisions must continue to move with the same velocity, so conservation of energy demands that the particles now spinning must move more slowly and the faster they spin the slower they must move. It thus appears that mass, in terms of a tendency to stay put, and spin are equivalent, and that the convertibility of mass and translational kinetic energy is then just a natural consequence of conservation laws.”

So also before knowing about Epicurus and Lucretius, I too pondered that tiny spinning particles may follow a curved path, purely based on general relativity. But I was also able to link this back to special relativity via the implication identified by Einstein, that the value of pi in a rotating disc increases by virtue of the shrinkage of measuring rods placed around the circumference as compared to those placed radially. I realised that if a spinning disc (or particle) follows a curved path in the plane of spin, a point on the circumference will follow the longer hyper-cycloid than the cycloid of straight line motion, which is equivalent to the value of pi increasing, without the problem of how the disc or particle might distort. So we can consider curvature of motion of spinning objects to be a relativistic effect. And this is also indicated by the fact that in Appendix II,

Einstein says that the Lorentz transformations correspond to a “rotation” of the co-ordinate system in the four dimensional “world” (end of page 122).

The implication is that the faster a tiny particle spins, the greater its mass and thus curvature of motion, but also depending on its relative translational motion in the plane of spin, i.e. total mass energy and momentum present, which gives us quantum general relativity.

So this idea is looking promising, and VERY promising for those able to realise that particles with similar rate, direction and plane of spin will have similar orbits and thus can combine into rings; and that if the particles happen to touch, they must bounce off each other, exchanging spin energy and resulting in the ring having many frequencies of vibration, and spread out pattern of orbits that would be very difficult to predict except in terms of probability of the position and velocity at any time of the individual particles. So not only does this idea seem to fit with quantum mechanics, but string theory also. And I will explain how a great deal more of quantum mechanics, including its most eerie quirks, and a great deal of particle physics (including quarks) or more significantly, the higgs boson, follow from the implication that if mass increases in the plane of spin, it reduces along the axis of spin.

The latter is not just my speculation, but clearly implied via the work of Laithwaite, DePalma and others with gyros and spinning balls, where both increased mass in the plane of spin and decreased mass along the axis of spin are indicated, as discussed in my NPA paper of 2007³. This gives us a mechanism for both the containment and release of the rings of particles. As the particles are free to move along their axis of spin, so the rings are free to so move unless contained by a larger ring at right angles. So rings within rings present themselves as candidates for a sub-structure of electrons and quarks, and for anti-matter equivalents via simply all the spins being in the opposite direction.

And pairs of the gyroscope-like constructions can either exist together like interlocking gearwheels or break up with a release of energy if brought together too fast. But it is apparent that matter/antimatter annihilation is not complete, but that after the release of photons, which I will also explain as constructions of rings within rings, many tiny particles remain, with the potential to reform into larger particles (out of the quantum foam?).

If the outer, containing ring revolves uniformly about an axis through the orbiting particles (R), groups of inner rings can be released via the tendency of the next ring in to move freely along its axis of spin (at right angles to R). But this ring will be released progressively as the outer ring rotates (R), to give a helical spiral, which is then de Broglie's accompanying, pilot wave, guiding the internal 'particle', which must be two internal rings at right angles to explain plane wave polarization.

The driving 'force' behind radiation (and force carrying particles) is then the convertibility of angular and linear momentum, with spin (mass) reducing to allow incredible acceleration to c (and beyond?). Thus the eerie quantum phenomena of particles disappearing and re-appearing in another location is simply explained by spin energy being transformed into translational energy and back again.

Force carrying particles, *including gravitation*, are then single rings emitted as helical spirals, though in the case of gravitation, the chirality is always the same, and the spiral is hugely extended. The strong nuclear force (gluon) is simply explained as a ring linking the outer ring of quarks, which acts like an elastic band, thus explaining increasing force as the 'band' is expanded; and the weak nuclear force is a helical spiral of short turn in which less spin is converted to translation, which links aligned rings in the two up quarks of the proton. W^\pm bosons have high mass because their high rotational energy is conserved in spirals of short turn, which gives a stronger pulling force

than the more extended spirals of the electromagnetic force. And the clear implication re what gives larger particles mass, is that a ring of tiny particles is the higgs boson.

I have shown diagrammatically how spirals linking shared electrons through the rings of the two up quarks in the proton explain exclusion principle, and thus also quantum entanglement via the chirality of the spirals determining spin up and spin down.

This is all expanded upon, and experimental confirmations provided, in my paper of 2012⁴. And very significantly, this included recently found experimental confirmation of my prediction that photons can split and recombine⁵, which computer simulation⁶ had previously indicated to be possible via the properties of tiny particles that I theorise. So finally, double slit experiments can also be explained via this interpretation, which I am sure would give Einstein immense satisfaction if he were here, justifying his final remarks in Appendix V:

“The conviction prevails that the experimentally assured duality of nature (corpuscular and wave structure) can be realised only by such a weakening of the concept of reality. I think that such a far-reaching theoretical renunciation is not for the present justified by our actual knowledge, and that one should not desist from pursuing to the end the path of the relativistic field theory.”

I wonder if he had realised that Appendix V held the key, in the less than three years left till his death? Please God, that he knows it now.

Robert F. Beck

8th February 2015

- [1] Kurt Gödel, “Rotating Universes in General Relativity Theory” General Relativity and Gravitation, Volume 32, Number 7, 1419-1427 (2000), DOI: 10.1023/A:1001911308752
<http://www.springerlink.com/content/np67m0m438431367/>
- [2] Robert F. Beck, “The Special Theory of Reality” (Einstein’s Revolution,2004/5), e-book and paperback
<http://www.einsteins-revolution.com/storeality.html>
- [3] Robert F. Beck, “An Heuristic Paper on the Nature of Mass”, Proceedings of the NPA 4 (1): 2-15 (2007). (minus appendices)
<http://www.einsteins-revolution.com/Papers/NPA%20UConn-Storrs%20Paper%20-%20Mass.pdf> (full version)
- [4] Robert F. Beck, “The True Meaning of Einstein’s Relativity” General Science Journal (Feb. 27, 2012)
<http://gsjournal.net/Science-Journals/Essays/View/4032>
- [5] Miles Padgett & L. Allen, “Light with a twist in its tail”, Contemporary Physics, 2000, volume 41, number 5, pages 275± 285
<http://people.physics.illinois.edu/Selvin/PRS/498IBR/Twist.pdf>
- [6] Craig W. Reynolds, “Cylinder Avoidance Test” in computer simulation of a flock of birds (1986), as shown in “The Science of Special Effects”, Discovery Science Documentary first seen by me in early 2004 (Rubin Tarrant Production, produced, directed and written by Wayne Ewing). Background info in <http://www.red3d.com/cwr/boids/> but Reynolds’ explanation in the documentary makes the relevance clearer.