The OPEN FORUM

Several questions and comments regarding the "single field theory" (SFT) proposed and described in the article "TOEs, fingers and the nose on your face" have been forwarded to the editor. This article appeared in issue four of the *Yggdrasil*. In a note on 5 April, Ron B., a professor of Physics, wrote that

> **I have one technical comment. You write "The neutron consists of an electron and a proton stacked in the fifth dimension." Physicists assumed this in the early years of this century, but, as I am sure you will recall, later experiments showed that this could not be the case because: (1) the neutron is a (spin 1/2) fermion, ruling out the proton-electron combination as it would constitute a boson. Early experiments on the nitrogen-14 molecule showed it to be made of two N-14 bosons, not two N-14 fermions, which would be the case if the neutron were a bound proton and electron. Also the magnetic moment of an electron is far greater than that of a proton, their being roughly in the inverse ratio of their masses (the Bohr magneton), so if a neutron were to consist of an electron plus a proton, then this neutron would have a magnetic moment a thousand times larger than the measured value. (2) By the Heisenberg Uncertainty Principle, an electron confined to a radius as small as a neutron's would have momentum, and thus kinetic energy, in the 100 MeV range, which is clearly not the case. For example, if the neutron in deuterium were to consist of a proton and an electron, then the electron would have of the order of 100 MeV kinetic energy, whereas we know that the neutron and proton are bound by just 2.2 MeV.**
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> **If we are to believe Quantum Chromodynamics (which most physicists do), then the neutron consists mainly of two down-quarks and one up-quark, held together by many gluons. Indeed, the gluons seem to contribute most of the spin. The proton consists mainly of two up-quarks and one down quark, plus the gluons. (There is evidence of a small component of anti-quarks in the nucleons as well.) The well-known decay of the neutron is "n > p + e + anti-electron-neutrino."**
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> **The half- half-life is about 15 minutes.**

To answer the first comment, that "the neutron is a (spin 1/2) fermion, ruling out the proton-electron combination as it would constitute a boson," one need only consider what 'spin' really is. 'Spin' has never been defined in physics. At times, some speak as if 'spin' was just that, the classical spin or turning motion of an elementary particle. At other times, the term is criticized as a ‘misnomer’ that has no real physical counterpart. In that case, 'spin' just signifies some vague physical, although mathematically specific, property of elementary particles. But we do not, ultimately, know what 'spin' is.

The same is not true in SFT. In SFT, the axial A-line of particles must circuit the fifth dimension and close on the particle in the four-dimensional space-time 'sheet.' The fifth dimension can be characterized by a single polar Riemannian geometry which guarantees that the axial A-line will close twisted by 180^{o}. In other words, it would take two complete circuits of the fifth dimension for the axial A-line to return synchronized to the particle. So a single transit yields a half 'spin' or twist. It is sort of like connecting a paper 'Moebius' strip to a point on a sheet of paper, with the other end of the strip wrapping around and connecting to a corresponding point on the underside of the sheet of paper.

Under these circumstances, the axial A-lines of a proton and electron of the same spin would just slide together, yielding a neutron of the same spin, just as two different 'Moebius' strips with the same directed twist would parallel each other and could then be glued together to form a single two-parted strip. In the case where a proton and electron are coupled together to form a single particle called a neutron, the 'Moebius' strip-like axial A-lines would lie parallel to each other, but so infinitesimally close that they could be effectively considered overlapping as the single axial A-line of a neutron. The coupled axial A-lines would constitute the single axial A-line of the neutron except under special conditions which would cause the neutron to decay and the component axial A-lines to split and manifest their own individual characteristics. Under the proper physical conditions, the neutron could thus decay into a proton, electron and an "anti electron neutrino." The decay could only proceed under the special conditions that would split the single axial A-line into its constituent double axial A-lines. However, the physical conditions would be such that a third particle, the neutrino, would be created for purposes of physical conservation.

After Ernst Rutherford determined the basic form of the nucleus and the existence of neutrons was predicted, he and others thought that a neutron consisted of a combined proton and electron. These speculations occurred in the second decade of the twentieth century, well before quantum mechanics and the Heisenberg uncertainty principle were initially developed. However, this was a purely three-dimensional structure that was later demonstrated as false. The present neutronic structure is five-dimensional and therefore quite different. Also, the fact that a 'free' electron has a far larger magnetic moment than the proton does not guarantee that an electron bound in the manner described in the SFT would retain that same magnetic moment. As long as the conservation laws are obeyed during the decay process of the neutron, and they are, then the discrepancy between individual magnetic moments poses no problem for the five-dimensional theory of neutron structure.

In his second comment, Ron noted that the Heisenberg uncertainty principle would not allow an electron to exist within the boundaries of a neutron. In his note of 21 April, Sam S., another professor of Physics, raised essentially the same question.

> **We know how "big" (radius) a neutron is. It cannot contain an electron. The uncertainty principle forbids it. If the electron is crushed to such a small size the uncertainty in its momentum is so huge that the neutron will break up in far less time than the known lifetime of the neutron. The decay of the neutron is a weak interaction decay process and as such is quite slow. The electron and neutrino are created out of the potential sea of W bosons. The reason that a proton or neutron can be this small size is that they are 1800 times heavier than the electron.**

However, the Uncertainty principle doesn't apply to the fifth coordinate of the space-time manifold. This fact is very easy to explain and visualize. The Uncertainty principle only forbids that the electron occupy the same three-dimensional volume as the proton or neutron, it says nothing whatever about "stacking" in the fifth direction. For example, if I was locked up in a three-dimensional cell with no doors or other openings to exit and I had access to the fifth dimension, I could escape from the cell without passing through its

walls. This is a well-known property of a higher-dimensional space. Quite a bit has been written on this subject and it is mentioned in the original *Yggdrasil* article. Felix Klein and Simon Newcomb discovered a geometry exhibiting this and other seemingly fantastic properties in the 1870s. F.W. Frankland also discovered and wrote about such a geometry at the same time, but he has never been given credit for his co-discovery of this strange hyper-spatial geometry.

Newcomb worked out and published accounts of these strange properties in two different articles. He demonstrated that passing through such a higher-dimensional space would rotate objects by 180^{o} upon their return to normal three-dimensional space. A ball could actually be turned inside out without stretching or tearing when it transits a four-dimensional space and returns to normal three-dimensional space. These properties were so generally known and accepted that Edwin Abbott based his famous book *Flatland* on such a geometry and H.G. Wells based a short science fiction story, "The Plattner Story," on this geometry more than a decade later in 1897. These properties follow the same principle by which a knot tied in a three-dimensional string is not a knot in a four-dimensional space. P.G. Tait described the mathematical properties of knots in his own geometrical study of knots during the same time period. Given these strange properties of hyperspace, you could only say that I am 'inside' the cell from the four-dimensional perspective. From the five-dimensional perspective, I am not exactly 'inside' the cell although a portion of me passes through the inner volume of the cell because I could leave the cell without passing through its three-dimensional walls. In like manner, the uncertainty restrictions on the existence of an electron 'within' the confines of the neutron are meaningless from the perspective of a five-dimensional space-time continuum. What appears to occupy the same three-dimensional volume does not occupy the same space or position in five dimensions. The nice thing about this discovery is that the production of electrons and other particles at a nuclear boundary during a decay event (even though they cannot exist in the nucleus according to the uncertainty principle) is rendered intelligible.

Andrew M., a Nuclear Physicist, has expressed different yet related concerns about the SFT model of the nucleus. On 17 February, he wrote

> **I just finished the articles. While I disagree with many of the things you write, I like the way you think. You are doing in 5-D what I have been attempting in 4-D. (Your "folds" in 5-space are my displacements into time.) I am suspicious of higher dimensional models because "any data set can be fitted with a curve, if enough variables (or powers) are introduced." If the proper function is chosen, the same data can be fitted with only a few variables. I am looking for "internal" structure to explain the effects that the higher dimensions are now used for.**
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> **In your attempt at using 5 dimensions to create a TOE, you have provided material for thought on some of the conumbra that I have encountered in 4-D modelling. In particular, the concept of decon/recon is new to me. Is there any background in this area that you could reference or have produced (or did I just overlook it)? The term "entanglement" could provide an answer, rather than the problem that it was in my model.**

Regarding Andrew's first point, his suspicions of the "5-D hypothesis" are well founded. While any data for individual events or phenomena can be fitted to some curve (by Fourier analysis or other methods) the trick is to find the single 'unique' curve which allows for unification and explanation of all data for all matter, events and phenomena in the universe simultaneously. The Riemannian curvature expressed in general relativity fulfils this role for gravitational phenomena only. The Kaluza theory, upon which SFT is based, extends the relativistic framework to include electromagnetism. It is still the 'only' theory that successfully unifies electromagnetism and gravitation, in that the correct Einstein-Maxwell equations have been derived from the theoretical structure established by Kaluza. From this basis, a new and more comprehensive structure can account for many other events and phenomena in nature, including those in the quantum realm. At each step or extension of the theory, the 'unique' character of the curve becomes fixed to a greater degree so there is less of a possibility of finding alternative curves to fit the data. In SFT, the internal structure of the nucleus is also being considered. However, the "internal" structure, in this case, is based upon the Kaluza "5-D" framework.

And finally, regarding Andrew's second comment, the decon/recon process is completely new to this theory. If it is expressed in any other theory or concept, or if it is similar to any other account, I do not know of them. The SFT description of decon/recon is an attempt to account for the quantum mechanical version of the natural physical process that we perceive as the flow of time. The field concept does not require a decon/recon process; it is required by the quantum theory, which must account for the simultaneous "collapse" of wave functions at specific points in space-time that altogether constitute the present moment of universal time. In classical quantum mechanics, the "collapse" requires or is otherwise associated with consciousness. This notion led to EPR and similar criticisms because it allowed no physical reality beyond the individual "collapse" of wave functions. It also led to the 'many worlds' hypothesis, which is no more than science fiction. The 'many worlds' solution to the fundamental quantum dilemma has no physical basis other than either the overactive imagination of scientists, scholars and writers or the inability of science to reasonably cope with the problems raised by EPR.

If the Copenhagen Interpretation of quantum mechanics is taken seriously and consciousness is required for "collapse," then either a universal consciousness must exist to guarantee an underlying physical reality, there is no underlying physical reality and we merely create physical reality from nothing before we choose to "collapse" the wave function, or the 'other worlds' hypothesis is true. All three possibilities are completely without physical basis and therefore ridiculous. The EPR argument demonstrated that quantum mechanics is incomplete under these circumstances, but EPR was not able to resolve the quantum mystery.

Recent concepts of quantum 'entanglement' go a long way toward bridging the gap between quantum mechanics and physical reality, although they are not there quite yet. 'Entanglement' in quantum theory is normally taken to mean the physical conditions present at the time of "collapse" that are not associated with the consciousness causing the "collapse," but still affect the "collapse." This form of 'entanglement' is severely

limited and over-restrictive. It still depends upon a conscious act to initiate the "collapse" of the wave function and create the present moment in time.

However, entanglement is an ongoing process independent of the individual acts of consciousness. It is a higher order of Newton's third law of motion that guarantees interaction between physical bodies as opposed to the mere action-reaction sequence of consciousness "collapsing" the wave function. This new variation of the purely quantum mechanical form of entanglement bridges the gap between continuous space-time and the quantum mechanical moment-by-moment description given by the decon/recon process. At any given moment, each and every particle in the universe is 'entangled' with every other particle in the universe and this entanglement "collapses" all of the wave functions simultaneously to cause each moment of time in the decon/recon process. Although a conscious decision can alter the physical conditions to initiate a "collapse" and the results of that "collapse" may differ from that required by entanglement alone, consciousness is not a 'necessary' cause of "collapse" although it is a sufficient cause within the limits set by entanglement. Consciousness is not necessary in each and every "collapse" which forms our physical reality, although entanglement is required to explain the underlying physical moment of reality and strictly limit the possibilities that consciousness has in "collapsing" the wave function. This form of entanglement also comes as close as is possible for quantum mechanics to make a definitive statement regarding the relativity between the different pieces of matter and photons that constitute our physical reality.

In this new form, entanglement also denies the possibility of the 'many worlds' hypothesis. Entanglement guarantees that the moment-by-moment "collapse," which is independent of conscious intervention, establishes a set of conditions that allows only one possible result until the intervention of consciousness. But even then, consciousness cannot cause just any result by forcing a "collapse." It can merely choose those particular "collapses" which conform to the requirements of universal entanglement and the choice is restrictively limited. Yet this form of entanglement is not the final physical reality. It is merely the quantum mechanical interpretation of the physical reality that has been necessary to develop an extremely useful mathematical model of a physical reality that is at least five-dimensional and far more fundamentally characterized by the single field than the quantum. This negates the possibility of infinitely 'many worlds' coexisting in an infinitely dimensioned universe. Any given moment in time conforms to only one possibility that fits the physical pre-requisites of the rest of the entangled universe. Conscious intervention can change that and leads to choice, will and free will, which ultimately have nothing to do with the 'many worlds' interpretation of quantum mechanics. While the decon/recon process and entanglement deny the 'many worlds' interpretation, they lead directly to a worldview which is remarkably like David Bohm's holographic universe of implicate and explicate orders.

Last Updated 21 June 1999
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