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String Experiments for the Nuclear and Particle Sciences and Non-Physics Disciplines

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Abstract

A method for inducing string vibrations in Hydrogen (Tahan 2014, 2015b) permits access to a fifth dimension of gravitons and superparticles (Tahan 2011, 2012, 2013). The technique can be used for nuclear and particle science studies generally, particularly for investigations of membrane (brane) structures including SU(3) work.

Keywords: Brane, string, string experimentation, QCD, axion, superstring black hole

1. Introduction

Nuclear and particle researchers are reliant on accelerators to study structures and discover particles. The method for finding sought-after particles or to understand the credibility of beyond Standard Model theories has been to wait for the increasing of energy at which particles are collided (Chalmers, 2014) or to propose the building of new accelerators (Reich, 2013b; Gibney, 2014; Wyatt, 2014). The dependence can be frustrating especially considering the resources including time required for projects (Weinberg, 2012) involving what may be an increasingly outdated technology; recent collider work has suggested that the technique may be limited to Standard Model discoveries (Wolchover, 2012). Researchers thus are risking concluding that certain legitimate theories are invalid if accelerators do not present evidence (Brumfiel, 2011) while the notion that a collider may not be the best method for investigating particular ideas has been rarely communicated because options have been non-existent.

Strings have been proposed as the underlying structures of all particles. String theory is a polarizing topic since scientists have believed that laboratory work with strings is impossible due to energy level requirements. Therefore, supporters of string theory mainly are the researchers in the field, who are not overwhelmingly expecting strings to be discovered at colliders.

An invention has permitted research with strings (Tahan, 2011), allowing explorations beyond the Standard Model. The innovation sources energy for string studies from the string vibrations of the body being investigated. Use of the instrument with Hydrogen led to the conclusion that the proton is a rectangular brane structure with tension that can be affected with a magnetic field. Altering of the proton brane tension allowed for a symmetry breaking and thereby access to a fifth dimension, evidenced with the emergence of gravitons and superparticles to the visible sector of the Standard Model.

Graviton and superparticle appearances in the lab have permitted observations of black holes and D-branes and have allowed for the conclusion that spacetime is a distinct medium (Tahan, 2015a). For instance, a D-brane with an open string for laser light that was incorporated with the device was recorded due to fifth dimensional access (Tahan, 2011). The laser (Quartet Standard Laser Pointer) was included with the set-up to observe possible altering of the path of the light due to particles arising from the apparatus; it was not part of the method.

The ability to use strings through the technology has emerged as the field of string experimentation, which should not be thought useful only with Hydrogen. The tool can be applied to other string structures, particularly branes, for research in and beyond the Standard Model. The innovation is inexpensive, portable, and an easy set-up that can allow for nuclear and particle studies--including the discovery of new particles. This manuscript should encourage use of string experimentation in the nuclear and particle sciences and in other concentrations for the advancement of the disciplines. The method should be appreciated practical for daily studies and not only for visualizing D-branes with open strings. Furthermore the fifth dimension can be viewed as a particle energy supply--the technology allowing for mining, e.g. gravitons, gravitinos, graviphotons, graviscalars, etc--that can be sourced for specific applications. The fifth dimension is synonymous, as has been in all string experimentation papers, to the area addressed in literature as the bulk (Tahan 2013, 2015b).

Use of the word brane is to allow for the consideration of higher dimensional strings. D-branes should be comprehended as branes on which open strings can end. In this work if a body is named a D-brane and elsewhere a brane, the object should be understood a D-brane with strings.

2. Particle Discoveries Using String Experimentation

Performing nuclear and particle science with the innovation relies on accepting the string to be synonymous to energy and that growing string vibrations are equivalent to an increase of energy (Scherk & Schwarz 1974; Tahan, 2015b). Understanding that the proton is a brane structure allows the thought that for any inserted SU(3) brane, i.e. a brane involving QCD, the apparatus should permit explorations through altered tension and increased string vibrations.

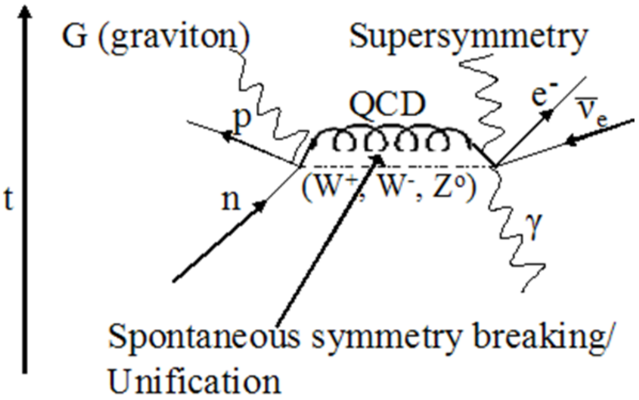

Figure 1. Use of string experimentation with the neutron

String experimentation has been used for Hydrogen, though the method can be utilized on other SU(3) structures. The neutron can be inserted in the device to study if particles can be detected by stimulating string vibrations and for examinations beyond the Standard Model. The photon represents the frequency and particular amplitude of the string experimentation technique.

In a SU(3) brane, the primary string influenced with string experimentation is the gluon field string. String experimentation with Hydrogen led to deconfinement, emergence of the glueball, gravitons, and superparticles (Tahan, 2012), which was understood to have occurred in trials each time a superstring black hole appeared (Tahan, 2015b). Figure 1 is an example of use of the string experimentation technique with a brane other than Hydrogen; nucleons are accepted to be D-branes. The simplest understanding from the diagram should be that the string experimentation method stimulates reactions to occur. Reaching the required energy level for symmetry breaking is gradual so that the diagram only represents the chief bodies involved in the process including the main results. Primarily Figure 1, as with the diagrams for the string experimentation method with Hydrogen (Tahan 2012, 2015b), illustrates experimental procedure.

Apart from Figure 1 showing the emergence of gravitons and supersymmetry due to the technique, typical neutron decay is drawn. A Ge detector incorporated with the string experimentation set-up presented data suggesting a faster rate of decay for neutrons that emerged from use of the technique with Hydrogen, which should be investigated further. Accordingly, though Hydrogen isolated from sulfuric acid (H_2SO_4) was used as the initial structure for all trials resultant bodies could be affected by the string experimentation method, supporting use of the technique with different string structures. The conclusion should not create the assumption that other bodies in the acid were influenced. The string experimentation method involved altering the tension of the Hydrogen D-brane with the magnetic field so that a frequency could serve as a resonant frequency (Tahan, 2015b). Use of the string experimentation technique is understood effective on free, singular D-branes--not bodies, e.g. atoms, comprised of multiple branes though a Hydrogen being a singular D-brane while attached to a molecule may be influenced by the same frequency. The brane of a bonded atom may not have the properly altered tension to allow use of the specific frequency for Hydrogen, though other frequencies could be studied for particular branes. This manuscript suggests investigating use of the method on string structures generally; though symmetry breaking and access to the fifth dimension may not be achieved, the work may be useful particularly for particle observations.

Unification may be suggested should be removed for the diagram since the U(1) contribution from the electron does not exist as in Hydrogen work. However, U(1) should be understood inherent to the D-brane (Dai, Leigh, & Polchinski 1989, Leigh 1989, Witten 1995, Arfaei & Sheikh-Jabbari 1998, Sheikh-Jabbari 1998). Additionally, the contribution of photons of specific frequency and amplitude for the technique should be remembered (Tahan 2015b) so that the components U(1), SU(2), SU(3) exist for unification, i.e. a region in which U(1), SU(2), SU(3) are indistinguishable.

When string experimentation studies were being conceived, the photon was considered the main U(1) contributor. The original thought of symmetry breaking only involved the proton so that Figure 1 could be rearranged similarly to β^+ decay while still including the graviton and supersymmetry. The electron was accepted primarily to contribute to weak boson strings being part of the resultant unified area of strings (Tahan 2012, 2015b), though contribution of the electron as U(1) for unification later was included since it could not be ignored in Hydrogen. Incorporation of the Ge detector with the set-up supported electron capture in Hydrogen (Tahan 2012) since neutrons were understood to be appearing in the holding vessel, and isotopes were resulting from neutron capture.

The electron being on the brane would have been influenced by the resonant frequency supplied to the Hydrogen source, increasing in energy thereby leading to electron capture (Tahan, 2012). Figure 1 suggests the electron string and weak boson string to be part of the unified area due to the illustrated emergence of the electron. In other words, the unified region equivalent to a superstring black hole (Tahan, 2015b) contains the strings of the bodies due to the unification process of deconfinement, which supports the string as the unification of the strong and electroweak interactions (SU(2) x U(1) x SU(3)) and to explain the mass gap (Tahan, 2015b). The location is a combined area of strings including gravitons and superparticles. The region is indistinguishable from other superstring black holes until bodies emerge; for instance, the superstring black hole would contain strings as it did when the initial body was the Hydrogen. The unification area does not occur naturally with neutron decay. But Figure 1 involves the resonant frequency for the brane so that again a process of deconfinement due to gluon string vibrations as occurs with Hydrogen (Tahan, 2015b) should happen since the neutron is a free, SU(3) D-brane structure. The string for the electron, having been observed for the photon (Tahan, 2011), necessitates defining elementary particle to mean directly due to an underlying string.

2.1 Materials and Method

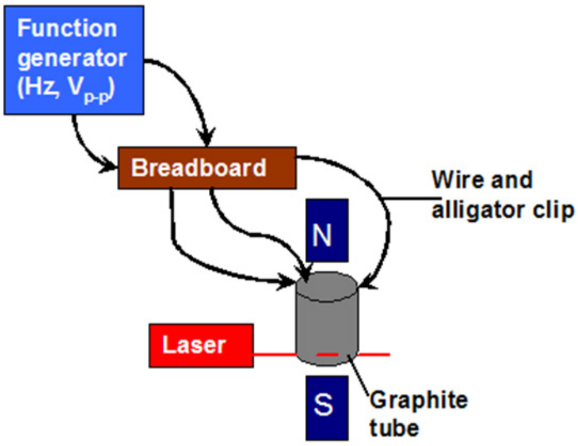

Figure 2. Set-up

The set-up requires a specific frequency and amplitude, a holding vessel for the string body, a constant magnetic field strength (≈2000Gs), and the source of the string structure--e.g. a neutron supply. Alternate ways for providing the parts can be tested, e.g. a distinctive Hydrogen source, but changes to the components may be needed. For example, the amplitude may require modification. N and S are the poles of a gap magnet.

Approximately 2Hz (2.000-2.012Hz) with V_{p-p}=4.312-4.437, predominately 4.375, was supplied to a graphite tube (Crucible, Saed/Manfredi G40, 1.5"OD x 1.25"ID x 3.75"DP) through wires from a breadboard to which a function generator was attached to a LED. The breadboard, not required for the string experimentation method, was incorporated since multiple wires could carry the function generator frequency from it. The blinking of the LED due to being connected to the function generator permitted visualization of the supplied frequency. An oscilloscope was used to confirm the specific frequency and amplitude during trials.

H_2SO_4 (typically 20.mL, 96% concd. Mallinckrodt Analytical Reagent, ACS) was in the graphite tube for each experiment since it was the Hydrogen source. Approximately 99.7kPa and 98-100% were the barometric pressure and relative humidity (Boston, MA, CW1378) during the largest laser light D-brane trial (Tahan 2011, 2015a). The tube was clamped in an ≈2000Gs, static magnetic field. The graphite tube and acid supply were changed occasionally to avoid variables, for instance impurities in the acid or deformation of the tube due to the acid that could have prevented regular frequency conduction. The acid was replaced in the graphite tube for each experiment.

The focus of string experimentation is to alter vibrations of the component strings of the body under investigation, which should remain aligned in the magnetic field. The low frequency would be the resonant frequency for the brane, not the resonance frequency of an atom as in Nuclear Magnetic Resonance. 2Hz (2.000-2.012Hz) and $V_{p\text{-}p}$=4.375 were used specifically with the graphite tube and Hydrogen source to study Hydrogen, which caused the periodic appearances of superpartners and gravitons in the typically one hour trials that can be presented as a reaction: gluon, gluon, gluon, gluino, gluino, gluino, photon, proton, electron, W^- boson, Higgs boson, Z boson, axion, dilaton→graviton, gravitino, neutron, electron neutrino, graviscalar, graviphoton, photon, photon, photon, sneutrino, selectron, saxion (Tahan, 2012). The reaction should be improved by using detectors with the technique.

The reaction may be confusing since it presents superparticles or bodies that are not in the Standard Model visible sector on the left side, which should be understood an attempt at illustrating the bodies more associated with the symmetry breaking--particularly involving the Higgs boson. On the right side are particles that surface from the fifth dimension due to the symmetry breaking, apart from the photons or bodies that would result from the electron capture process when studying Hydrogen: neutron and electron neutrino. The particles on the left side that are not typically in the Standard Model visible sector would appear with the graviton.

Different particles than what is presented in the reaction would emerge depending on the string structure placed in the graphite tube; again the reaction resulted from consideration of Hydrogen. Particles may appear simply by stimulating strings with the string experimentation process, i.e. strings emerging from strings; symmetry breaking and unification need not occur. Specifically, use of the technology for D-brane structures particularly involving SU(3) need not progress to symmetry breaking. An examiner may wish to observe particles due to increasing or decreasing the rate of string vibrations, e.g. underlying gluon strings. String stimulation may cause the emergence of as of yet unseen particles or combinations of particles; however, the result may simply be the bodies typically seen in a common process, for example decay of a structure.

All particles that can materialize are unknown. Also, the string experimentation process could promote the reaction of multiple structures that are concurrently in the magnetic field by stimulating the strings of the bodies. Different structures may emerge depending on the rate strings are vibrating, apart from different particles appearing from string vibrations due to the initial string body. Black holes could occur (Tahan, 2015b) and would be unique string structures (Lunin & Mathur 2002a; 2002b) depending on the original string body being examined.

The understanding is that bodies involving SU(3) are 2-branes as Hydrogen; the string experimentation process should not be restricted to SU(3) structures. The 2Hz with the specific amplitude and magnetic field strength should be tried with strings generally or other SU(3) bodies than nucleons, but a change in the frequency, amplitude, or magnetic field strength may be required. What should be understood is that a 2-brane will deform in the magnetic field thereby altering the tension of the structure. The technique was ineffective without the magnet; altered tension was required for a resonant frequency to be found. However, care should be taken if wishing to change the magnetic field strength. Excessive deformation or reduction of tension would occur with too strong of a magnetic field and tension may not be influenced sufficiently if the magnetic field strength is too low; both scenarios would reduce the ability of a frequency with a particular amplitude to increase vibrations.

2.2 Primary Theory

String experimentation takes advantage of the quantum nature of the frequency in that the correct energy is absorbed by the brane and consequently increases the vibrations of the underlying strings. Success of the process is evidence for the quantum nature of QCD. The notion that the radio wave quantum affected QCD supported the existence of unification due to strings; the fundamental property of all theories is the string. Fields including quantum mechanics are emergent from underlying strings.

String experimentation is a reflection of Yang-Mills theory, a quantum gauge theory with the gauge group SU(N) corresponding to a string theory with 1/N as the string coupling constant (’t Hooft, 1974; Maldacena, 1998). For Hydrogen, again the 2Hz mainly influenced the gluon field string: a strong force string underlying a uniform field of quanta (Yang & Mills, 1954). The gluon field strength (coupling constant) between quarks was consistent (Mills, 1994); as energy increased the coupling constant decreased (Aharony, Gubser, Maldacena, Ooguri, & Oz, 2000). The required energy for the symmetry breaking can be visualized to have been sourced from the structure under examination since again growing string vibrations are equivalent to an increasing energy (Scherk & Schwarz 1974). The strong force coupling constant steadily reached a vibration limit (Aharony, Gubser, Maldacena, Ooguri, & Oz 2000, Tahan 2015b) because of the continuous 2Hz quanta, resulting in deconfinement and symmetry breaking (Tahan 2012, 2015b).

Stimulation of a symmetry breaking should not be thought will always allow for access to the fifth dimension of gravitons and superparticles. Involvement and breaking of a D-brane structure is required since the D-brane is a separation between the Standard Model visible sector and the fifth dimension (Tahan 2015a; 2015b). Detection of a graviton and superparticle would be the simplest indicator of having gained access to the fifth dimension. Again symmetry breaking need not emerge for particles particularly in the Standard Model to be generated.

The D-brane with an open string for the laser light having been recorded (Tahan, 2011) might be thought to have been indicative that access to the fifth dimension can occur with any D-brane. If sufficient vibration of the brane structure cannot be achieved due to altered tension and a resonant frequency, the fifth dimension would be inaccessible. Use of Hydrogen facilitated access to the extra dimension; the gluon strings served as a means to reach an energy level for entry. The deconfinement permitted emergence of the super-Higgs mechanism (Volkov & Soroka 1973; Schwarz 1980) that represented elimination of the proton structure (Tahan, 2015b).

2.3 Axion

The possibility that bodies can materialize due to string vibrations brought to mind the particles of QCD. The notion of the continuous movement of the gluon strings and the ability to alter the vibrations with the frequency and specific amplitude (Tahan, 2015b) was indicative of QCD being a dynamic field. Again the quantum nature of the field can be understood with the addition of the 2Hz quanta of the radio waves. Knowledge of CP-conservation in the non-abelian quantum field allowed for renewed appreciation for the unusual nature of the symmetry breaking due to string experimentation, permitting emergence of particles to the Standard Model visible sector that have been unobserved due to symmetry breaking (Tahan, 2015b). String experimentation allows for particles restricted from being in the visible sector to appear. For example, the axion has been proposed would exist in an extra dimension (Svrček & Witten 2006). Experimentation supported that the axion might be detected by incorporating a proper instrument with the string experimentation technique (Tahan, 2012); appearance could accompany the graviton to the Standard Model visible sector.

Axion production is not illogical based on the possible mass scale through the string experimentation method (Tahan, 2015b), which would allow for axion consideration as dark matter (Feldstein & Yanagida 2013, Kamada, Shirasaki, & Yoshida 2014) including with regard to low mass gravitino dark matter (Tahan 2013, 2014, 2015b). Experiment results supported the existence of different dark matter bodies (Tahan, 2013). Discovery of the axion with the string experimentation method would advance discussions of multiple particles being dark matter while resolving the strong CP-problem (Peccei & Quinn 1977) and suggesting a connection between Peccei-Quinn symmetry breaking and superstring symmetry breaking, i.e. a consistent underlying symmetry based on the string (Tahan, 2015b).

2.4 Superstring Black Hole

More inclusion of string black holes in cosmological black hole discussions should occur. The initial thought of superstring black holes involved a regular nature when understanding a string to be energy: strings not being different from other strings no matter the initial body under examination. What should be comprehended is that the superstring black holes should not appear dissimilar since the areas are combined regions of strings. Uniqueness would be apparent in evaporation when bodies materialize. Identical evaporations in the Cosmos would be revealing of consistent black hole production.

If access to the fifth dimension due to a symmetry breaking occurs resulting from a typical method of black hole formation in the Universe, superpartners should be detectable from the associated black hole in consideration of superparticle string inclusion. Therefore, categories of string black holes can be imagined: superstring black hole, string black hole, etc. In other words, strings are appreciated to underlie all particles so that evaporations from cosmological black holes would be particles due to strings. In this manuscript, superstring black holes have been described to contain fifth dimensional strings.

Evaporations should not transpire dissimilarly for superstring black holes in the Cosmos than has been proposed for black holes generally (Hawking 1974, 1975), except for information loss not occurring for any black holes. Trials showed that evaporations occur without singularities (Stephens, ’t Hooft, & Whiting 1994). Results supported AdS/CFT correspondence (Tahan, 2015a); experiment observations suggested singularities need not happen (Tahan, 2015b) particularly in the context of D-branes and the fifth dimension (’t Hooft 1993; Bekenstein 1994; Susskind 1995; Banks, Fischler, Shenker, & Susskind 1997; Tahan 2013), e.g. bodies interacting with the graphite tube resulting in the tube bending spacetime. Yet, differences could exist with the particles that emerge from the black holes; for instance unlike the black holes that occurred in the laboratory, formation of a cosmological black hole may not involve the fifth dimension.

The bending of spacetime by the graphite tube and especially the largest D-brane with an open string in trials (Tahan 2011, 2015a) forced the conclusion that while black hole equations can remain the same, a superstring black hole area should be understood would have more energy due to incorporation of graviton and superparticle strings--including depending on the strings in or near the compact region as seen with the graphite in the acid of the tube during the largest D-brane with an open string experiment (Tahan, 2015b). Gravitons interacting with objects as the graphite tube or directed from the tube to bodies as water drops led to the conclusion that gravitons increased string vibrations, resulting in mass-energy gains (Tahan 2015a, 2015b): observed with the tube bending spacetime. Accordingly entropy for high gravitational regions can be comprehended variable, useful information when manufacturing superstring black holes with the string experimentation method.

Entropy for superstring black holes thus should have separate consideration, though the black hole entropy equation need not be dissimilar (Bekenstein, 1973): S=Asuperstring/4G, Asuperstring=superstring black hole area. Or in consideration of the black hole as an energetic system, S=Esystem/Temperature would facilitate visualization of the string content in that the system is a collection of strings, Esystem=overall energy or strings. The equation is not a novel relation but simplifies understanding of all black holes, not just superstring black holes, as string systems. It can be used in consideration of black holes created with the string experimentation process as useable energy. The rapid evaporations of the micro-sized superstring black holes (Hawking 1975) should eliminate safety concerns while being productive energy sources (Cheung, 2015), particularly if organizing evaporations sequentially. Still, imaginative worries may cause use of the evaporating black holes as power supplies to be outside of Earth--to power stations, vehicles, etc--especially while envisioning the string experimentation method to be contained easily in fuel tanks. Considering the low-cost and facile set-up, optimization of the black holes as energy supplies may occur by incorporating the string experimentation method with a different particle production technique to increase energy output or combining evaporations from multiple black holes, particularly if results or interactions would allow for greater energy yield as with particle-antiparticle annihilation.

3. Conclusions

Nuclear and particle science should continue at accelerators, but the possibility of the technology to be limiting regarding particular studies should be discussed more readily--apart from simply price and portability being motivators for considering alternate forms of colliders (Reich 2013a; Downer & Zgadzaj 2014). Superstring theory is a unifying theory; strings underlie all particles. Scholars should comprehend that the string experimentation technology is being used. This work has proposed utilization for particle and nuclear studies with the thought that string stimulation due to the innovation can progress the subjects. For example, string experimentation can allow for greater insight about diversity of particles as mesons (Novikov, Shifman, Vainshtein, & Zakharov 1981; Schäfer & Shuryak 1998) or lack of bodies including for cosmological issues as baryogenesis (Dasgupta 1997; Bhattacharjee, Sahu, & Yajnik 2004). Well-discussed questions, e.g. as regarding the strong CP-problem, could be resolved.

The conditions U(1), SU(2), SU(3) must be in place or emerge related to the string aligned in the magnetic field for unification to occur through string experimentation, SU(2) x U(1) x SU(3) being the Standard Model description of unification and this manuscript having introduced the superstring black hole as the superstring portrayal: a combined area of strings including graviton and superparticle strings. The superstring represents unification. However, again brane deformation and reactions can happen without the unification. Certain structures naturally will react or decay, e.g. n→p, e^-, ν_e(bar), but the string experimentation method may stimulate processes to occur sooner or allow for reactions or syntheses that could have been difficult to trigger. New particles may appear through string stimulation. The technique can be used in non-physics areas potentially to promote reactions or engineer bodies in addition to novel particles or structures--e.g. use in disciplines as chemistry or biology, for reactions or processes as related to genetics including DNA and related compositions, cell functions, etc. And string experimentation can be used to make or alter synthetic structures.

This manuscript has mentioned primarily SU(3) branes, i.e. 2-branes involving QCD, which should stimulate thoughts for use of the innovation with branes generally--for instance D0-branes (point structures (D-particles)). Again unique particles may be the result of string studies without symmetry breakings. Also, the technique could be used on uncommon string structures as black holes that could allow for particle release. Mention of individual superstring black holes being formed depending on the initial brane structure inserted in the device should create images of specific evaporations--principally due to the observed black hole evaporations in trials (Tahan, 2011)--including manufacturing black holes with the string experimentation method for particular purposes as particle or energy sources. Accordingly, the consistency of the no-hair theorem could be questioned, which should return thoughts to spacetime as a specific medium (Tahan, 2015a)--expressly non-abelian (Greene, Mathur, & O'Neill 1993). More appropriately the no-hair theorem should be refined to include different evaporations since again being combined areas of strings, superficially black holes in the Standard Model visible sector should not be dissimilar--having the usual observable parameters mass, electric charge, and angular momentum (Misner, Thorne, & Wheeler, 1973). Using black holes as energy supplies has been proposed (Penrose & Floyd 1971; Lasota, Gourgoulhon, Abramowicz, Tchekhovskoy, & Narayan, 2014), but producing black holes with the string experimentation technique permits practicality.

Apart from dimensionality the ability to vibrate in a specific manner, to open, or to close due to the nature of the environment--e.g. warped, compactified, dimensions--in which strings exist suggests emergence from a particular structure or order. Specific bodies appearing from a superstring black hole due to the object that led to the compact region is supportive of an underlying symmetry from which the Universe materialized (Tahan, 2015b). Particles being due to particular strings especially in consideration of conservation laws backs existence of the universal, dictating symmetry--providing semblance of differentiating or inherent string character that maintains the Cosmos.

Distinct strings to underlie particles should be remembered have been observed (Tahan, 2011). When appreciating spacetime to be a tangible medium (Tahan, 2015a) a continuous connection to the symmetry can be imagined, which creates the thought that particles can appear or a string may change character as due to a modified environment. Acceptance of an underlying string symmetry in conjunction with the distinct medium of spacetime, a general relativity aether (Tahan, 2015a), thus should simplify long-standing particle discussions aside from presenting superstring theory to be foundational, including for all the sciences.

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