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The Ring Theorem

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ABSTRACT: *The electron is a string particle. To introduce the proposition, it may be helpful to review the principle of the atom as the basic unit of matter, which is universally recognized in the periodic table that arranges all the elements by their atomic number and chemical properties, where each element represents a specific kind of atom*.

KEY WORDS: atom, electron, Planck's constant, and string particle.

INTRODUCTION

To introduce the proposition, it may be helpful to review the principle of the atom as the basic unit of matter, which is universally recognized in the periodic table that arranges all the elements by their atomic number and chemical properties, where each element represents a specific kind of atom.

In other words, elements are names for specific kinds of atoms. The periodic table arranges the elements by the order of their atomic number and chemical properties using a two dimensional array that repeats itself in the length or period of its rows, and hence its name of the periodic table.

The atomic number of an element is equal to the number of protons that are contained in the nucleus of its atom. An element is identified by a count of the number of protons that are contained in the nucleus of an atom, which the atomic number represents.

Atoms are made of three types of particles. These particles are the proton, electron, and neutron. An atom arranges these particles in a structure that consists of a nucleus, and a shell, which is often called the electron shell. Protons and neutrons are found in the nucleus of an atom, while electrons comprise the electron shell.

The atomic number of an atom is also equal to the number of electrons that are contained in its shell, which orbit the nucleus, so that the atomic number counts both the number of protons that are contained in the nucleus of an atom and the number of electrons that comprise its shell.

While the atomic number of an element is equal to both the number of protons and the number of electrons in an atom, the number of neutrons found in the nucleus of an atom along with protons, may vary. As a rule, the number of neutrons in an atom is generally equal to or greater than the number of protons, although the first two elements of hydrogen and helium give exceptions.

Since protons and neutrons are much heavier than electrons, the nucleus of an atom forms a dense, inner core at its center while electrons orbit the nucleus a relatively long distance away, with the space between them practically devoid of matter.

From a mathematical perspective, the protons, electrons, and neutrons that make up an atom are counted in whole numbers, so that an atom represents a discrete set of objects with a specific geometry or structure.

Since the atomic number of an element counts both the number of protons and the number of electrons that are in an atom, an atom may be seen as pairing equal numbers of protons and electrons within its nucleus and shell, separated from each other.

Significantly, protons and electrons each carry an electric charge that is equal in size or magnitude but opposite in value. By convention, a proton carries a positive charge while an electron carries a negative charge. While protons and electrons carry the basic unit of charge, other particles may also carry a charge, and some particles carry a fraction of the charge of the electron.

Since the electric force works where particles of like charge repel each other, while particles of opposite charge attract each other, protons and electrons experience a strong force of attraction with each other at the relatively short distances found within an atom, although protons are located in its nucleus while electrons orbit the nucleus.

Like gravity, the strength of the electric force varies inversely with the square of the distance between two particles of charge. But the force of gravity is much weaker than the electric force at the scale of the atom, and gravity is unipolar or one sided, which means it only measures the force of attraction between two objects or masses or that gravity is only a force of attraction.

From another perspective, where the electric force dominates the structure of an atom and its chemical interactions with other atoms, the force of gravity dominates the structure of the universe on a grand scale where it governs the formation of stars, planets, and galaxies and their interactions, and can bend light.

While a neutron is electrically neutral or carries no charge, it contains a proton and electron within its structure, which makes it highly electrical in nature, although the two particles neutralize each other internally.

Although a proton and electron carry the same amount of electric charge, an electron has a mass that is less than 1,800th of the mass of a proton, making it very light in comparison. This difference in mass may be seen as an indicator for why an electron orbits the nucleus, which consists of protons and neutrons that are much heavier.

Since a proton and electron each carry a charge that is equal in size or magnitude but opposite in value, the nucleus and shell of an atom possess a state of electrical balance or equilibrium with each other. In other words, an atom organizes the force of electric attraction between a proton and electron into a cohesive unit of matter by placing equal numbers of protons and electrons into a nucleus and shell, which balances their charge, and gives it stability.

While an atom organizes its particles into a nucleus and shell, its shell is temporal in the sense that it constantly shifts from the orbit of the electron instead of forming a smooth or consistent surface like a geometric solid.

Electrons are the workhorse of an atom. Chemical interactions between atoms take place among the electrons in the outermost layer of their electron shell, and electrons play a key role in the transfer of energy. When an electron absorbs energy, it moves to an orbit farther from the nucleus. When an electron emits energy, it moves to an orbit that is closer to the nucleus.

While the electron shell is generally stable, an atom may temporarily lose an electron as it forms a chemical bond or absorbs energy from, for example the photoelectric effect. If an atom loses an electron from its shell, it becomes an ion that usually retains the structure of an atom with a nucleus and shell, but possesses a positive charge since it contains more protons than electrons.

Since an ion has an electric charge that is unbalanced, ions tend to replace their missing electrons by drawing them from their immediate surroundings or shuffling them within a larger structure such as a crystal lattice.

Still, as a general rule an atom pairs a proton in its nucleus with an electron in its shell. This paring is illustrated by the common hydrogen atom, which is the most common element found in the universe.

The hydrogen atom has a nucleus that consists of a single proton and a shell that consists of a single electron. Since its nucleus consists of a single proton, hydrogen has an atomic number of one, making it the first element to appear in the periodic table and simplest and lightest of all the elements since it consists of only two particles.

In other words, an atom requires at least two particles, whose electric charge attracts each other within a structure of a nucleus and shell, which gives it stability.

The hydrogen atom also has two other forms, which are called isotopes, where its nucleus consists of one and two neutrons respectively in addition to its proton. An element often represents atoms that have different numbers of neutrons in their nucleus, but possess the same number of protons and electrons.

These isotopes of hydrogen, called deuterium and tritium, occur less frequently than the common hydrogen atom, which has no neutrons. Deuterium has a nucleus that consists of a single proton and a single neutron, while tritium has a nucleus that consists of a single proton and two neutrons.

Deuterium is often called heavy water since it forms a water molecule that is heavier than the usual water molecule. Tritium tends to occurs as a gas and mildly radioactive, which means its nucleus can break apart or decay.

The periodic table was first published in 1869 by the Russian chemist Dmitry Mendeleyev who ordered the elements according to their chemical properties and atomic weight. The atomic weight is an average of the weight of the common form of its atom and isotopes since the atomic number of the elements and structure of the atom and its particles were not discovered until later in the 20th century.

While Mendeleyev ordered his table using atomic weight, he occasionally changed the order of elements to keep them organized by their chemical properties since he realized that their chemical properties are more important in determining their order than atomic weight.

Mendeleyev realized that the chemical properties of an element give a more accurate representation of its order than atomic weight. This is due to how the chemical properties of an element are largely determined by its electron shell rather than the weight of its nucleus, which atomic weight measures.

In other words, atoms interact with each other through their exterior or electron shell like a solid rather than through their nucleus. Since the elements repeat the geometry of their electron shells, which is based on the number of electrons they have, the repetition in the geometry of their shells accounts for the periodic nature of the elements.

Although the atomic weight of an element, which is based on an average of the common form of an atom and its isotopes, indicates the composition of its nucleus and number of electrons in its shell, it does not strictly follow the atomic number due to the varying number of neutrons in its isotopes.

After gallium was discovered in 1875, which was the first new element discovered after Mendeleyev published his table, his periodic table began to win acceptance since it gave a sound prediction of its chemical properties, and it similarly predicted the chemical properties of other elements that were later discovered.

THE ATOM

The common hydrogen atom, whose single proton and single electron gives it a strong force of attraction between its nucleus and shell, models the structure of the atom. Other atoms follow its example of pairing equal numbers of protons and electrons within a nucleus and electron shell to give them stability.

An atom is able to add protons to its nucleus by using the neutron, which is slightly larger and heavier than a proton, as a type of electrical buffer between protons, which otherwise would repel each other.

An atom is able to add electrons to its shell by using the force of repulsion between them to space them apart from each other, even within the same orbit, and by placing them into a series of orbits that lie farther away from its nucleus.

Regarding the nucleus, the common hydrogen atom shows how a single proton can define a nucleus that is complete in itself. A proton does not require the presence of a neutron in order to serve as a nucleus of an atom.

While deuterium, the first isotope of hydrogen, shows how a proton and a neutron can bond together to form a stable nucleus, this bonding is friendly, not required. A nucleus requires only a single proton, although neutrons allow for the addition of protons to a nucleus.

Tritium, the second isotope of hydrogen with two neutrons in its nucleus, shows how a nucleus that consists of a single proton and two neutrons is mildly unstable or radioactive, meaning that its nucleus decays or splits apart over time. While a single proton can bond together with two neutrons, the radioactivity of tritium suggests that there is an upper bound on the proportion of neutrons to protons within a nucleus.

From another perspective, since there is no isotope of hydrogen that has a proton bonding with three neutrons, its isotope of tritium suggests that the proportion of neutrons to protons within a nucleus has an upper limit of two to one.

In other words, hydrogen shows that a single proton can bond with a single neutron and with two neutrons, but not three neutrons. Moreover, the bonding of a single proton with two neutrons appears to be weaker compared to its bonding with a single neutron.

To help understand the bonding of a proton with a neutron, the nucleus of tritium may be seen as having three possible linear arrangements. Using P to represent a proton and N to represent a neutron, its nucleus may be represented by the arrangements of NPN, PNN, or NNP.

Where NPN shows a proton bonding with a neutron on either side of itself, PNN and NNP show a proton bonding with a neutron, and a neutron bonding with another neutron, which suggests two different types of bonds.

To help understand these arrangements, it may help to recall that while neutrons have a mild affinity for each other and two or more neutrons may bond in a structure for a short time, the structures they form are unstable, and break apart quickly.

With this in mind, it may be suggested that PNN and NNP represent arrangements that are relatively unstable compared to NPN since two neutrons are unlikely to bond together in a stable structure, although the structure could be strengthened by the bond between a neutron and proton at one end.

In other words, in a nucleus that consists of a proton and two neutrons, the dominant or most likely arrangement of its particles suggests that a proton bonds with two neutrons in NPN where a neutron is found on each of the proton, instead of bonding with one of two neutrons that have bonded together.

With this in mind, the arrangement of NPN suggests that the bonding of a proton with a two neutrons that are presumably on each side of itself is diluted compared to its bonding with a single neutron, which could help explain the instability of tritium compared to deuterium.

The idea of an upper bound on the proportion of neutrons to protons in a nucleus may be checked by examining a few other elements.

For example, going from the lightest element of hydrogen to the heaviest element found in nature of uranium 238, the proportion of neutrons to protons in the nucleus of uranium 238 may be found by subtracting the 92 protons in its nucleus that is given by its atomic number, from the total of 238 protons and neutrons that are in its nucleus, and given by its atomic weight of 238, which results in its having 146 neutrons and a proportion of neutrons to protons of 146 to 92, or about 1.59. Since this ratio is less than two, it confirms the idea of an upper bound.

Incidentally, isotopes and elements are sometimes described by attaching a count of the number of protons and neutrons that are contained in their nucleus, after the name of the element, a description that is very similar to their atomic weight. Hydrogen is the only element whose isotopes have names.

Another example may be found in radium, which is noted for its radioactivity. Since its nucleus has 88 protons and 138 neutrons, its proportion of protons to neutrons is 138 to 88, or about 1.57, which is close to the ratio of 1.59 for uranium 238, and also less than two. Both samples lend support to the idea of an upper bound on the proportion of neutrons to protons in a nucleus, as suggested by an analysis of tritium.

Regarding the addition of electrons, an atom aggregates or adds electrons to its shell by using the force of repulsion between them to space them apart from each other within the same orbit, and adding layers to its shell in a series of orbits that lie farther away from its nucleus, which are often called sub-shells.

This aggregation of electrons may be illustrated by helium, which is the second element in the periodic table after hydrogen with two protons and two neutrons in its nucleus, and whose shell consists of two electrons that share the same orbit.

The two electrons in helium are able to share the same orbit since the force of repulsion between them keeps them evenly spaced apart from each other. Their orbit represents the ideal orbit of two electrons that are in a state of electrical balance or equilibrium with each other.

Since the two electrons in helium that share the same orbit are in a state of electrical balance or equilibrium, they form a tightly knit shell, which also repels other electrons from sharing their orbit, making helium chemically inert.

In contrast, since the single electron in hydrogen is free to share its orbit with other electrons, which makes hydrogen chemically reactive. The single electron in hydrogen is able to share its orbit since it is electrically imbalanced, so that it wants to interact with other electrons to balance each other in terms of their combined orbital structure.

In other words, hydrogen easily forms molecules, which are combinations of atoms whose electron shells are intertwined with each other to where their combined shells are nearly evenly balanced, making the molecule chemically quiescent.

From another perspective, the single electron in hydrogen orbits the nucleus of its atom as the ideal orbit of a single electron whose distance around its nucleus is defined by the length of its electromagnetic string that absorbs and emits electromagnetic energy as a wave or photon.

When the electron string absorbs energy, it stretches like a rubber band, which moves the electron to a higher orbit, farther away from the nucleus. When the string emits energy, it shortens its length, as it carries less energy, which lets the electron return to an orbit that is closer to the nucleus.

Since the electron string possesses the dimension of length, the energy needed to expand it is quantized as a function of its basic or intrinsic length, so that the orbit of an electron is quantized by the length of its string and energy level.

While an electron string also possesses width, since the electron is such a tiny particle that orbits the nucleus a relatively long distance away, the length of its string dominates its measurement like any piece of string.

Since the electron string possesses length, it is able to absorb an incoming wave of light or photon similar to how a jetty absorbs the energy of ocean waves or changes the motion of water along a shoreline.

The electron string is also flexible, which lets it vibrate, and may be thought to resemble a flexible ring, whose structure lets it orbit around a nucleus. In a sense, an electron is composed of mass, charge, and string.

From another perspective, the orbit of an electron reflects the length of its string. The string requires room or space to unfold and let it operate over its full length rather than being folded or compressed.

As the electron string is energized over its entire length, it is able to release energy as a wave or photon. With this in mind, rather than viewing electrons as tiny particles, which while moving at high speed leave the shell of an atom porous with little physical means to interact with an incoming wave or photon, a string provides a way for the electron to directly absorb and emit electromagnetic energy.

This idea of an electromagnetic string is similar to the explanation of the atom and orbit of the electron the Danish physicist Niels Bohr proposed in 1913. His model of the atom relied on the observation of spectral lines by Johannes Rydberg in the 1880's.

Rydberg observed that different elements emit radiation as spectral lines, or at certain wavelengths. He believed their emission lines varied according to some internal energy level found within an atom.

In other words, since the elements emit light in a series of wavelengths, which are observed as spectral lines as they are energized or heated, it is reasonable to conclude that the emission of light is quantized according to some internal energy level that is found within an atom.

Since the spectral lines showed that an atom releases energy in quantized or discrete amounts, Bohr proposed that an electron gains and emits light as it moves back and forth from different orbits within an atom, and these orbits are quantized like the vibration of a musical string.

In other words, similar to how a vibrating string can form nodes, which split the string into a whole number of vibrating waves at higher energy levels, an electron changes orbit in discrete intervals away from its nucleus, which are quantized.

In other words, the orbit of an electron resembles a musical string. When the electron string absorbs energy, it vibrates. Since this vibration occurs over the length of the string, its energy is distributed over the length of the string, which is directly related to the length of electron orbit.

But where a musical string that is fixed in length absorbs energy and creates a node with the string vibrating in two or more pieces, the vibration of an electron string increases its length, as it absorbs energy. Since the string is flexible, it expands in length much like a rubber band, which moves the electron to an orbit farther away.

A string would help explain why the electron, with a mass that is less than 1800th of a proton, carries the same amount of electric charge, and can absorb and emit waves or photons as it changes orbit.

From a different perspective, an electron may be viewed as a type of anti-proton, a proton that has been turned inside out with its charge reversed, and its structure stripped of mass, converted into a string.

With this in mind, the muon, which is a particle that is 200 times more massive than an electron and orbits a nucleus 200 times closer than it while carrying the same of amount of charge, may be viewed as an intermediate type of anti-proton. It is often called a heavy electron.

In other words, electrons and muons may be viewed as types of anti-protons that have had their mass converted into electromagnetic strings, although the string for an electron appears to be longer and more flexible.

Just as hydrogen is chemically reactive while helium is chemically inert, they lie at opposite ends of the periodic table. Hydrogen is reactive since its single electron has an orbit that is electrically imbalanced, while helium is inert since its two electrons that share the same orbit balance each other with their force of repulsion, and which also repels other electrons from their orbit, creating a tightly knit shell.

In the periodic table, hydrogen leads the column of elements commonly known as the alkali metals, which are chemically reactive, while helium leads the column of elements commonly known as the noble gases, which are chemically inert.

From another perspective, just as the first counting number of one is used to build the counting numbers by the addition of itself, hydrogen frequently occurs in large molecules such as hydrocarbons, which consist of many atoms since it is so reactive.

In contrast, the two electrons in helium are like one and negative one. Their sum of zero represents a point of balance or equilibrium within their orbit that uses the electric force of repulsion between them to space them apart from each other, which also repels other electrons from their orbit.

The two electrons in helium are like two pans in scale of weights, which balance each other. They are like two children playing on a seesaw or teeter totter. As one child goes up, the other goes down as the two children balance their motion with each other at opposite ends of the seesaw.

While the geometry of electron shells is more complex than an even and odd spacing of electrons, it gives a clue. Electron shells seek an internal state of balance that is based on having an even number of electrons that pairs them together within the same orbit like children filling a playground full of seesaws.

From a broad perspective, the elements construct their electron shells in an orderly process, which adds electrons to a new shell that lies atop an existing shell, instead of forming a new shell that spaces all its electrons equidistant from the nucleus.

With this in mind, the electron shell for helium, which forms the first full or complete electron shell of all the elements, appears as an inner shell in elements with an atomic number greater than two.

This process of addition may be illustrated by lithium, the third element in the periodic table with three electrons. Its electron shell consists of an inner shell with two electrons that share the same orbit like helium, and an outer shell that consists of a single electron in its own orbit like hydrogen.

Since the outer shell for lithium consists of a single electron that lies atop of an inner shell that is like the shell for helium, which is complete or ideal, its chemical properties resemble the chemical properties of hydrogen.

In other words, the single electron in the outer shell of lithium dominates its chemical interactions with other atoms since it lies on the exterior of the atom, while its inner shell remains inert.

From another perspective, since the attraction between the nucleus of an atom and its inner shell is stronger than its attraction with its outer shell, as its inner shell lies closer to the nucleus, chemical bonds form along the exterior of an atom, or in its outermost shell or sub-shell, which is often called the valence shell.

Since the electron shell for lithium consists of an inner shell that is essentially the shell for helium, and an outer shell that is similar to hydrogen's, lithium follows hydrogen in the periodic table as the first of the alkali metals, which are chemically reactive.

The process of adding electrons may again be illustrated by beryllium, the fourth element in the periodic table with four electrons. Beryllium has an inner shell with two electrons that share the same orbit, like the shell for helium, and an outer shell that also has two electrons that share the same orbit.

But where the shell for helium is inert, the outer shell for beryllium is reactive since its two electrons lie at a longer distance from its nucleus. Since this gives them more space between each other, it reduces the force of repulsion between them or the tightness of their shell.

However, the outer shell of beryllium is cohesive enough to where it pushes the fifth electron of the next element, boron, into a sub-shell that lies atop of its two inner shells. This process of adding electrons to an outer sub-shell continues until neon is reached, which is the tenth element with ten electrons, and the next noble gas.

Neon organizes its ten electrons into an inner shell with two electrons and a second complete shell that consists of an inner sub-shell with two electrons like helium, and an outer sub-shell with six electrons, or three pairs of electrons.

Regarding the outer sub-shell of neon, a satellite designer might say that the three pairs of electrons are like three satellites in geostationary orbit, which provide complete coverage of the Earth's surface but in atomic theory provide complete electrical coverage of the exterior of the atom, which repels other electrons.

This process of adding electrons to an outer shell or sub-shell continues in an orderly manner throughout the periodic table. However, the rare earth elements add electrons to a shell that is underneath their outermost shell, which gives them similar chemical properties.

As the elements stop at the end of the periodic table, mainly due to the unstable nature of large, heavy nuclei, which are typically short-lived and highly radioactive, the process of adding electrons to an electron shell also stops.

Regarding helium, whose two electrons form the first electron shell that is full or complete, or chemically inert, its nucleus also forms an atomic structure that is unusually stable and is often called the alpha particle since it frequently appears in the radioactive decay of heavy elements.

In other words, when the nucleus of a heavy, radioactive element breaks apart, one of its products is often an alpha particle, which consists of two protons and two neutrons that have bonded together like the nucleus of a helium atom, instead of releasing individual protons and neutrons.

From another perspective, radioactive decay reflects a type of geological fault line within a nucleus that frequently ejects protons and neutrons that are bonded together in an alpha particle like the four corners of a square or diamond.

Where the nucleus of helium, which consists of two pairs of protons and neutrons, or equal numbers of protons and neutrons, is unusually stable, every element after helium in the periodic table either has an equal numbers of protons as neutrons, or has more neutrons than protons in its nucleus.

In other words, the nucleus of helium, which organizes its two pairs of protons and neutrons into a three dimensional array, appears as a type of seed that organizes larger nuclei.

The helium nucleus may be thought to separate its protons from each other by using a linear arrangement of NPNP or PNPN, where a neutron appears between two protons as a type of electrical buffer.

In contrast, the arrangements of NPPN and NNPP involve two protons together that would repel each other, while PNNP involves a bond between two neutrons when bonds between neutrons are short lived, so that NPNP or PNPN may be viewed as being the most likely arrangements for a nucleus of helium.

From another perspective, helium shows that a nucleus that consists of just two protons does not exist. In other words, two protons do not bond together in a stable arrangement, so that a nucleus with two protons needs at least one neutron to separate them as an electrical buffer.

Interestingly, helium has an isotope called helium 3 whose nucleus consists of two protons and a single neutron, and whose single neutron, which apparently lies between its two protons, forms a stable nucleus.

In other words, helium 3 shows how a neutron serves as a type of electrical buffer between two protons, where each proton apparently forms a stable bond with its single neutron.

From another viewpoint, since the nucleus of helium 3 and tritium each consists of three particles, they form a mirror image of each other by having the same number of particles but with the types of particles reversed, as different elements.

Where helium 3 has two protons and one neutron, tritium has two neutrons and one proton. Where the nucleus of helium 3 provides a stable structure, the nucleus of tritium is mildly unstable or radioactive.

From another perspective, the stability of helium 3 compared to tritium is apparently based on the stronger bond between a single proton and a single neutron than the bonding between a proton and two neutrons. The second neutron in tritium appears to weaken or dilute the bonding of its neutrons with its single proton since a single neutron by itself is unstable.

THE NEUTRON

In one of the wonders of nature, a single neutron that is by itself, or a single particle, without being bound in a nucleus, breaks apart into a proton and electron, along with the release of a neutrino and a small amount of energy in an average of less than fifteen minutes, where the exact time depends upon the experiment.

In other words, a neutron is a compound particle, which appears to consist of a proton, electron, neutrino, and a small amount of binding energy.

Neutrons are thought to form under the condition of extreme gravity found in a neutron star, which may be viewed as a step away from a black hole in terms of the strength of its gravity. Black holes are thought to form from stars that are more massive.

The neutrino is a tiny "ghost" particle with very little mass that is measured in terms of an upper bound on its content of energy. It carries no electric charge, as suggested by its name of being a smaller version of the neutron. Neutrinos appear in different flavors of electron, muon, and tau.

While neutrinos and neutrons are both electrically neutral, a neutron is neutral as a result of the addition of the opposite charges of a proton and electron within its structure, while a neutrino carries a charge of zero since its tiny mass or structure does not appear to possess any charge.

In other words, a neutron has a net charge of zero by combining the opposite charges of a proton and electron, while a neutrino has a charge of zero since it represents a set without elements of charge, or the null set in terms of electric charge.

Since a neutron breaks apart into a proton and electron and has a mass that is thought to be slightly larger than the sum of their masses, a neutron may be thought to represent the addition of a proton and an electron along with a neutrino and small amount of binding energy since these items are released when a neutron breaks apart.

In other words, a neutron may be thought to contain a proton and electron within its structure. It uses their electric force of attraction to bundle them together along with a neutrino and small amount of energy to complete the binding.

This assembly of a neutron requires a neutrino and small amount of binding energy as a type of atomic scotch tape since the electron is an energetic particle that is nearly always in motion, and has a string, which is long and flexible.

Since an electron is lightweight while a proton is large and massive, it may be thought a neutron is assembled by wrapping an electron around the surface of a proton, and adding a piece of atomic scotch tape at the end of its string to keep it from unfolding.

This assembly of a neutron from an electron and proton would let them retain their individual identities. While it requires an electron to possess a flexible structure that can wrap around the proton, an electron string would seem to satisfy this condition since the string would presumably be long and flexible.

The electron string would presumably be long since it forms an integral part of an electron's orbit, and it would be flexible since it vibrates at electromagnetic frequencies.

In other words, under the extreme gravity found in a neutron star, the compression of an electron onto a proton to form a neutron could take place if the electron string is wrapped around the proton, which could give a way for their opposite charges to balance or neutralize each other.

Alternatively, a neutron could be assembled by mixing together the components of a proton and electron so their charges balance or neutralize each other, and adding a piece of binding energy to complete the process. While this requires their disassembly when extreme gravity is thought to compress, extreme gravity could perhaps disjoin components.

Alternatively, a neutron could be assembled by a proton that swallows or absorbs an electron like a video game character. Under extreme gravity, the proton absorbs or opens itself up to receive the electron to where their charges balance or neutralize each other, and binding energy is applied like a band-aid.

From another perspective, if an electron is viewed as incorporating a string, the disassembly of a neutron when it is by itself or outside the nucleus of an atom may be seen as representing the efforts of an electron to wriggle out of the neutron in order to unfold its string.

In other words, extreme gravity is thought to form a neutron by compressing and wrapping an electron string around the proton. But since an electron wants to unfold its string by wriggling out of a neutron, a neutron does not remain stable by itself but by bonding with a proton inside the nucleus of an atom.

From another perspective, if an electron is found to wrap around a neutron, a neutron could have a tendency to associate with a proton from the residue of the electron's charge on its exterior, while two neutrons together within an atomic structure would tend to disassociate as has been observed.

PLANCK'S CONSTANT

In 1900 Max Planck discovered how electromagnetic radiation is emitted in discrete packets of energy where the energy of an individual wave packet or photon is equal to the product of a constant, called Planck's constant and usually represented by ħ or h bar, multiplied by the frequency of the wave.

In other words, Planck discovered that $E = ħ \times ν$, where E stands for the energy of a wave packet or photon, ħ is the physical constant that bears his name, and ν or the Greek letter of nu is equal to the frequency of the wave, which is basically the reciprocal of its wavelength.

Regarding the reciprocal of the wavelength of light, it is commonly assumed that a light wave or photon propagates at the speed of light, often denoted as c. This assumption lets the frequency of the wave, usually expressed in cycles per second, be determined by dividing its speed of propagation at c by its wavelength.

In other words, where c stands for the speed of light, ν stands for the frequency of a light wave or photon, and λ, the Greek letter lambda stands for its wavelength, $ν = c / λ$, $λ= c / ν$, and $c = ν \times λ$.

In other words, the frequency of a light wave is equal to its speed of propagation at the speed of light, which is usually expressed in meters per second, divided by its wavelength, which is usually expressed in meters, so the units of length in meters cancel each other. This lets the identity of the wave be expressed in terms of cycles per second, or the number of times it appears each second.

In other words, the frequency of a wave measures how many times it appears within a given interval of time, typically measured in cycles per seconds. Measurements of other types of waves such as ocean waves may use other intervals of time to measure their frequency or rate of appearance.

Since the wavelength of light and other forms of electromagnetic radiation is commonly expressed in meters, the wavelength of a light is equal to the speed of light in meters per second divided by its frequency in cycles per second. Writing out the units, Wavelength = c meters per second / ν cycles per second, or

Wavelength = (c / ν) x (meters / second) x (seconds / cycles), or

Wavelength = (c / ν) meters since the cycle of a wave may be seen as being synonymous with its identity.

Since the speed of propagation of a wave is used to determine its frequency, Planck's constant implicitly includes the speed of propagation of a light wave or photon at the speed of light within its value and units.

In other words, Planck's constant implicitly includes the value of the speed of light and its units of velocity in addition to the value and units that describe the inner workings of the atom, and particularly the electron, which emits and absorbs electromagnetic radiation in discrete packets.

Using Planck's discovery and the earlier work of Rydberg, Niels Bohr thought that the emission of an electromagnetic wave is quantized by discrete changes in the orbit of an electron, which may be viewed as representing an electromagnetic string that emits and absorbs energy as a wave or photon.

However, since one of the characteristics of a wave is its speed of propagation, whether as an ocean wave breaking along a shoreline, or wave of light traveling through space, it could be thought that Planck's constant should be refined to account for the speed of propagation of a light wave or photon by dividing ħ by c or the speed of light.

The measurement of the speed of light and discovery of its uniform nature throughout space formed one of the major advances in science that occurred during the late 19^{th} and early 20^{th} centuries.

Recognizing how light propagates through space at the speed of light, astronomers typically measure distances in interstellar or galactic space based on the light year, which describes the distance that a wave of light travels in a year.

Geologists recognize the speed of a wave as they study the Earth's interior using seismometers. Surfers constantly observe the speed of ocean waves, and even weather forecasters may predict the occurrence of rouge waves by timing their speed of propagation from distant storms at sea.

The speed of a wave reflects the energy that it carries. For example, the sonic boom that follows a jet aircraft that reaches supersonic speed demonstrates the energy that a sound wave can carry through the atmosphere. In other words, waves carry energy based on their speed of propagation as well as their frequency or amplitude, and medium of propagation.

With this in mind, the energy that a wave of light or photon carries may be viewed as reflecting its speed of propagation through space at the speed of light, in addition to its frequency and source of origin from within the atom, which Planck's constant may be viewed as describing.

In other words, Planck's constant may be viewed as describing the changes in the internal energy levels of an atom that are quantized by discrete changes in the orbit of an electron as their source of origin.

Bohr's focus on the source of origin in the orbit of the electron to account for the quantization of energy Planck discovered should include the speed of propagation of a wave of light or photon in accounting for its source of origin within the atom. This refinement would let his constant represent its source.

This accounting would divide Planck's constant by the speed of propagation of a light wave or photon so that the resulting constant can focus directly on changes in the orbit of an electron instead of including the speed of light in its value and units.

From another perspective, an electron string may be seen as the source within an atom that translates changes in the orbit of an electron into a wave or photon based on its rate of vibration, which presumably affects the frequency of light it emits.

As the string stretches or relaxes, its length may be thought to affect its frequency of vibration, while its energy density or the content of energy it possesses over its length remains constant.

In other words, it may be thought that an electron string possesses a fixed density or content of energy so that changes in its length or tautness affect its frequency of vibration and the frequency of light it emits.

With this in mind, the energy released by an electron string may be thought to equal the product of the density of energy it carries over its length, multiplied by the frequency of light it emits further multiplied by the speed of propagation of a light wave or photon at the speed of light.

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In other words, when an electron string is plucked it emits a wave that travels through space at the speed of light, so that a description of how an electron string operates should reflect how it emits a wave packet that propagates through space at the speed of light as well as its frequency.

With this in mind, the proposed refinement of Planck's constant may be expected to express the energy content of an electron string in units of Joules per meter as a reflection of its length, multiplied by units of seconds squared to account for the time that the string takes to impart its energy to define the frequency of a light wave of light and propagate it through space at the speed of light.

In other words, the tiny interval of time that it takes an electron string to operate with a snap or pluck to emit a light wave defines the frequency of the wave, and propagates it through space at the speed of light requires two operations in the dimension of time, which should be reflected in its units.

In other words, the units of operation for an electron string requires the units of seconds squared to accomplish the two tasks of imparting energy to a wave or photon that defines its frequency and propagation at the speed of light.

From another perspective, it may be thought that the speed of propagation of light wave at the speed of light affects the energy it carries just as the velocity of an object or mass is one of the factors that determines its energy of motion, whether measured in terms of momentum or kinetic energy.

Since the mass of an object is tends to be fixed and independent of its velocity, its momentum is usually expressed as the product of its mass times velocity. Using p for momentum, m for the mass of the object, and v for velocity, $p = m \times v$, or
$p = m\,v$, where the multiplication sign is implied.

The kinetic energy or KE of the object is obtained by taking the integral of its momentum with respect to velocity, or

$$KE = \int p\, dv = \int m\, v\, dv = m \int v\, dv = m \times (1/2\, v^2) = ½\, m\, v^2$$

While kinetic energy applies to an object with mass, its idea of how the energy of an object is related to velocity is similar to how the energy of a wave may be seen as being related to its speed of propagation as well as its frequency, which may be seen as an analog to the mass of an object.

This proposed refinement to Planck's constant may express ħ with an r as a subscript, or $\hbar_r$, which stands for a refined Planck's constant.

Using $\hbar_r = \hbar / c$, and $E = \hbar \times \nu$, this refinement results in $E = \hbar_r \times c \times \nu$, or $E = \hbar_r c \nu$, where the multiplication sign is implied.

From another perspective, Planck's constant is given as 6.626×10^{-34} Joules x seconds. Dividing Planck's constant by c, which is about 3×10^{8} meters per second, gives:

$\hbar_r = (6.626 \times 10^{-34}$ Joules x seconds) / (3×10^{8} meters per second) =

$((6.626 \times 10^{-42}) / 3) \times$ ((Joules x seconds) / (meters/second)) =

2.209×10^{-42} (Joules / meter) x seconds^{2}

In other words, the division of Planck's constant by the speed of light results in an expression of energy divided by length or Joules per meter multiplied by seconds squared, which may be ascribed to the operation of an electron string.

Since this proposed refinement to Planck's constant results in an accurate expression for the units of operation of an electron string, it may be viewed as confirming the idea that an electron includes an electromagnetic string.

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