The Two Particle Model of the Atom and the Universe

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A new physics model of everything from the creation of the first particles to the formation and dynamics of galaxies

Abstract

We have known for over 100 years that charge is quantised. A quantum of charge is real and precisely measured with a known charge of $1.6x10^{-19}$ Coulombs. The new physics in this paper simply acknowledges positive and negative quanta to be the two sole fundamental particles from which everything in the universe is made.

This then provides us with a single rational explanation for everything from neutrinos to galaxies, based entirely upon knowns and observed reality. This contrasts strongly with the current mutually incongruent mainstream models which are based largely upon hypotheticals and complex mathematical realities.

The quanta in The Two Particle Model are the familiar negative and positive points of charge that give the electron and the positron their net unit charge. These two fundamental quanta mutually attract under the influence of the strong positive-negative fundamental force to form tiny net-neutral quantum dipoles. All universal space exists, and has always existed, simply as an infinity of quantum dipoles. Everything from the appearance of the first sub-atomic particles to the formation of stars and galaxies then follows naturally and rationally from this one simple premise.

Contents

About the Two Particle Model

The aim of this paper is to demonstrate that new thinking about the nature of the universe is essential if we are to resolve the current incompatibilities between the Standard Model and General Relativity.

Each of the current established theories was designed, 100 years or so ago, specifically to fit the then observed behaviours of either the atomic or the cosmic universe. One model was designed to describe the very small and the other the very large and each model has been very successful in describing the set of behaviours for which it was designed. However, because each theory is based upon a different premise, not only are their mathematical frameworks fundamentally different and incompatible but also neither successfully describes everything. Adjustments and correcting factors demanded by the mathematical modelling, such as dark matter and dark energy, can only ever extend the degree of overlap between the two models but will never make them congruent. In all likelihood, while the basic premise of each model remains unaltered, that is perhaps the best that can be hoped for.

The Two Particle Model, very differently, is not designed around any pre-existing data or observations. It simply posits that the universe comprises two fundamental particles and one fundamental force. The application of logical process and basic physics to this simple premise then naturally results in explanations for all pre-existing and contemporary experimental and observational data at both the atomic and the cosmic scale. The model explains the universe as being a single, consistent, physical reality rather than a set of mathematical frameworks and, accordingly, is presented in this paper in terms of plain language rather than mathematics.

Because this model works consistently and rigorously at all scales and without the need for any hypotheticals or corrective mathematical constructs, it suggests the possibility, at very least, of a route to a better understanding of the universe. Above all and in the context of the

fundamental issues with the current modelling, the objective here is that it will promote discussion, generate debate and stimulate new ideas.

Because it is inherently different from the current established theories, it does not seek to engage with their bespoke theoretical, mathematical frameworks but only to be measured against the entirety of existing experimental and observational data and, of course, future novel experimentation. **The model makes many assertions which run contrary to current consensus**, all of which are entirely compatible with this vast existing body of observational and experimental evidence.

The subject matter for this paper is huge, everything from the creation of the first particles to the formation, dynamics and stability of stars and galaxies. The sheer scope of particle and cosmic physics makes it impractical to present the complete model within these pages and so aspects such as explanations for emission/absorption spectra, total internal reflection, diffraction at double slits, polarisation through mutually oriented filters, Bell's Test and so-called quantum effects have not been included. However, for those interested, the full scope of the model is accessible via Ref 1 or by contacting the author of this paper.

The two fundamental particles and Quantum Space

The Two Particle Model is based on the simple premise that all universal space is, and always has been, separated everywhere into just two, real and readily measurable positive and negative points of charge. As shown later, these **two fundamental quanta** provide the electron and the positron with their net unit charge. They mutually attract everywhere throughout all infinite space as a result of the positive-negative **fundamental force** and the result is an infinite quantum space filled with tiny net-neutral quantum dipoles, or **quantum pairs**.

These tiny quantum pairs, although net neutral at a distance, have a small positive-negative charge profile close up. This produces an ongoing mutual attraction and repulsion so that they bounce around amongst their neighbours in very close proximity and with mutual changes of orientation and vibration but almost no lateral motion. The total energy of each individual pair therefore fluctuates within a limited range and this general basic energy level for quantum space paired quanta will be referred to throughout this paper as **zero-point energy**.

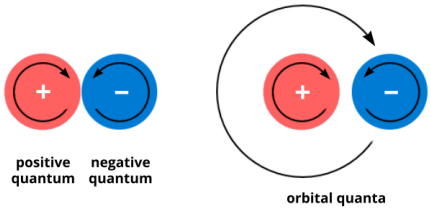
Their very high density and continuing state of close-proximity attraction and repulsion means that, with little or no mutual separation and hence very short mean-free-paths, quantum pairs tend to stay in the same neighbourhood. As a result, any given volume and hence the entirety of quantum space is effectively stationary and forms a stationary frame of reference for anything moving through it. It is essentially a sea of net neutral, near-zero-energy, vibrating and reorienting quantum pairs collectively producing a vast pool of intrinsic energy and it is this energy that ultimately creates stars and galaxies.

The Quantum

A quantum of charge is a point of positive or negative influence and the mutual attraction or repulsion between them is the **fundamental force**. It is identical for all quanta and reduces very rapidly with distance.

The magnitude of the charge of all quanta is a fundamental property. It is fixed and identical for all quanta everywhere regardless of their energy, speed or proximity to other quanta.

Spin is also a fundamental property of all quanta. All negative quanta universally always have the same direction of spin when viewed in their direction of travel and all positive quanta have the opposite direction of spin. Specifically, **positive quanta spin clockwise and negative quanta spin anticlockwise**.



An associated property of spin is that, when within an orbital structure, **quanta orbit 'with' the spin of the central quantum but 'against' their own direction of spin**. This means that, when viewed from any given direction, a quantum with anticlockwise spin adopts a clockwise orbit around a clockwise spin quantum, as in the schematic, and a particle with clockwise spin adopts an anticlockwise orbit around an anticlockwise spin quantum.

Creation of the four elementary particles

The random bouncing and re-orientation of quantum pairs amongst and between neighbouring quantum pairs occasionally results in simultaneous encounters between three or more of their same polarity quanta. This creates a sufficiently strong combined repulsive force to accelerate at least one of them such that, together with its strongly-bound, opposite-charge partner, it escapes the constraining influence of its quantum pair neighbours and is propelled away from the point of encounter. The repelled mass-less and net-neutral pair then accelerates away, in the instant at infinite speed, through what is effectively a highly uniform space comprising huge equal numbers of weak positive and negative charges.

The neutrino: The only possible arrangement for this accelerated pair is orbital and the outcome of the encounter is a high-speed repelled quantum with its opposite-charge paired quantum orbiting around it. This resultant two-quantum particle is the neutrino and its properties and behaviour are explained in detail later. The nature of the weak mutual interaction of quantum pairs that creates neutrinos within quantum space means that all such neutrinos, at the point of creation, are only very weakly energised.

A net neutral neutrino can have either a positive or a negative non-orbital central quantum which, as it accelerates through the uniform quantum space of weak positive and negative charges, starts to resonate. As its energy changes from kinetic to resonant, the neutrino's speed becomes fixed at the speed we call **the speed of light**. It cannot now slow down because, as it dropped out of resonance, its energy would transform back to kinetic, making it again speed up. Neither, with no additional external impulse, can it speed up.

The photon: When three speed-of-light neutrinos are travelling in closely the same direction and hence with near-zero relative speed, if one has a different polarity central quantum from the other two, then the particles strongly interact to form a new particle comprising a positive-negative-positive orbital triplet orbiting around a negative-positive-negative triplet, or vice-versa. This is the net neutral particle we call the photon. The mechanism for its creation is explained later (see Creation).

Because the photon also has a central non-orbital quantum and because all quanta are identical apart from their polarity, it also resonates at exactly the same speed within quantum space and so both the neutrino and the

photon always travel at the same fixed speed, the speed of light, regardless of the orbital energy of their outer orbital structure.

Electrons and positrons: When neutrinos and photons with opposite polarity central quanta are travelling in closely the same direction and hence with near zero relative speed, as soon as they approach to within range of the fundamental force, their central quanta attract. The neutrino gives up all its orbital energy and reverts to a quantum pair whilst the photon is energised. Over time, in the early universe, naturally created photons consequently became progressively energised by the increasing numbers of naturally created low-energy neutrinos. As these photons' orbital energy increased, their triplets' orbits widened to beyond the range of the fundamental force and they flew apart to form two separate triplet particles, which are the net charge electron and positron (see Creation).

Structure of the four elementary particles

Just as neutrinos are naturally created from ongoing quantum pair interactions within universal quantum space, as above, photons are naturally created when neutrinos interact and combine and, if we assume simplicity rather than complexity, we can deduce their structure. Because highly energised net-neutral photons transform, through the process of pair production, into net charge electrons and positrons, we can be confident that photons cannot be the outcome of just 2 combining neutrinos. If that were the case, pair production would result in 2-quantum electrons and 2-quantum positrons that would consequently each be net neutral. However, the next simplest structure, and one that we'll see works perfectly, is for a photon formed from the interaction and combination of 3 neutrinos. The mechanism for this is covered in the Creation section.

This produces a photon comprising 6 quanta which, with 3 positives and 3 negatives, is net neutral. Because a photon transforms into an electron and a positron, these latter particles must comprise 3 quanta each and have net negative and positive charge.

As we will see later, the formation process of non-light-speed electrons and positrons from light-speed photons produces particles whose outer quanta orbit at light speed around the central quantum. Because, as explained below, light-speed quanta are unreactive with quantum pairs and do not contribute to the electrostatic force, the electron's net negative electrostatic charge must come from its low-speed and reactive negative central quantum and the positron's from its low-speed and reactive positive central quantum. This means that, counter-intuitively, the electron's structure is positive-negative-positive and the positron's is negative-positive-negative, each with a central slow-moving (not speed of light) central quantum orbited by two opposite-charge speed-of-light quanta.

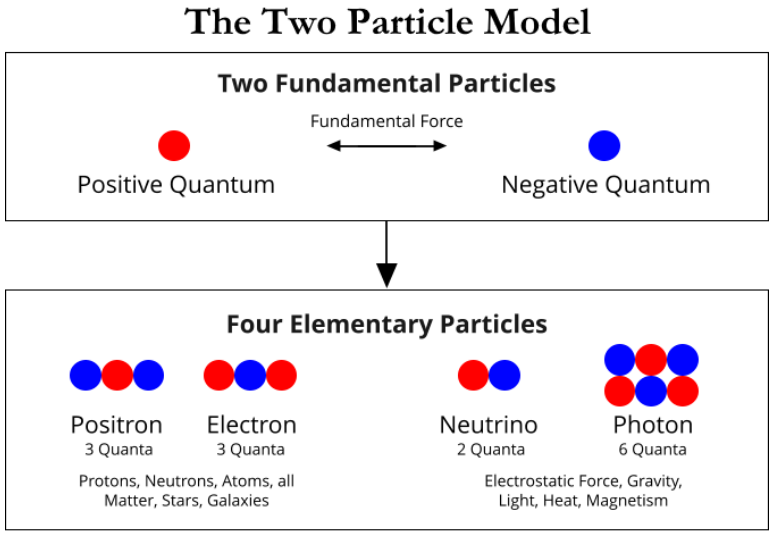
Because, as covered later, only non-light-speed particles can have electrostatic charge and because only particles with electrostatic charge can have inertial mass, this then also explains why net charge electrons and positrons, each with a single central non-speed-of-light quantum, have mass and neutral speed-of-light neutrinos and photons do not.

We can summarise the four elementary particles as follows:

Neutrino: 2 zero mass speed-of-light quanta, 1 positive and 1 negative;
Photon: 6 zero mass speed-of-light quanta, 3 positive and 3 negative;

Electron: 1 massive, low-speed, negative quantum, 2 zero mass, positive, speed-of-light quanta;
Positron: 1 massive, low-speed, positive quantum, 2 zero mass, negative, speed-of-light quanta.

Because the internal structure of each of these particles is strongly bound by the quantum-to-quantum fundamental force, they are elementary.



Neutrinos, photons and the speed of light

Inertial mass: All bodies are made of positive nuclei and negative orbital electrons which means that collisions between them are electrostatic. As the surface orbital electrons in one body are repelled by the other, it produces a cascade of interactions within each body as their internal particles are bounced in multiple directions within them such that the linear kinetic energy of the original collision is dissipated throughout the body. Mass is simply a measure of a body's ability to internally share and dissipate collision energy rather than be accelerated in the direction of the colliding body. We can therefore say that inertial mass is a measure of a particle's resistance to electrostatic deformation. A large particle such as a proton absorbs much of the collision energy into internal deformation of its subatomic particles and so has high mass whereas a small body such as an electron experiences minimal deformation and so has low mass.

The kinetic energy of a particle in either Newtonian or Einstein physics is given by $E=mv^2$ or $E=mc^2$ which means that the velocity of a photon can be expressed as $(E/m)^{1/2}$ where mass, m, is the inertial mass of the photon. For a particle which is unaffected by the electrostatic force and therefore has zero inertial mass, this is not very helpful since we know that the speed of light is not infinite. The slightest of nudges on a photon, such as when it collides with an electron or a neutrino, should send it shooting off at infinite speed and, since it doesn't, there must be some mechanism which limits its speed to a finite value. That mechanism is quantum space resonance, explained below.

Resonance: The random bouncing and re-orientation of quantum pairs amongst and between neighbouring quantum pairs within quantum space occasionally results in simultaneous encounters between three or more of their same polarity quanta. This creates a sufficiently strong combined repulsive force to accelerate at least one of them such that, together with its strongly-bound, opposite-charge partner, it escapes the constraining

influence of its quantum pair neighbours and is propelled away from the point of encounter. The repelled mass-less and net-neutral pair then accelerates away, in the instant at infinite speed, through quantum space.

As will become clear later, the only possible arrangement for this accelerated pair is orbital and the outcome of the encounter is a high-speed repelled quantum with its opposite charge paired quantum orbiting around it. The forward speed of the orbital pair is therefore the same as the forward speed of the central, non-orbital quantum.

This resultant particle is the neutrino. Its formation, structure and behaviour is covered in detail later.

The space through which the neutrino's non-orbital central quantum is now accelerating comprises countless numbers of randomly disposed, more-or-less equally spaced quantum pairs, each with a weak positive-negative local external charge profile. When considered in the context of a substantial volume of quantum space, the rapidly moving quantum is therefore travelling through what is effectively a highly uniform space comprising huge equal numbers of weak positive and negative charges.

Although the high-speed quantum is effectively undeflected in its forward travel by any one of these net-neutral quantum pairs, their weak positive and negative local external charge profiles create a series of almost vanishingly small successive attractions and repulsions as the quantum passes through. The tiny amount of acceleration and deceleration this produces creates side-to-side vibration as it travels forwards. As the quantum accelerates with zero mass and therefore very high speed, a point is almost instantly reached where its natural harmonic frequency resonates with the regularly fluctuating quantum charge profiles within uniform quantum space.

The energy exchange between the rapidly moving neutrino central quantum and each of the quanta within the relatively near-to-stationary quantum pairs it passes by at resonant speed is vanishingly small and close to zero. Over very long distances of travel this inevitably transfers a small amount of energy away from the neutrino but, for all practical purposes in the context of resonance, we can say that the total energy of the neutrino's quantum remains unaffected by these individual high-speed local quantum space interactions.

However, as it starts to resonate, a part of its total energy, which is its zero-point energy plus the energy received from the colliding quantum pairs, transforms into **resonant vibrational energy** and hence its speed becomes fixed. It cannot now slow down because this would take it out of resonance and restore its total energy to kinetic, causing it to again speed up and, without any additional external impulse, it cannot be accelerated to a higher speed. As soon as the neutrino central quantum reaches harmonic resonance, the neutrino itself therefore has a fixed speed.

As the quantum is initially repelled, together with its zero-point paired quantum, from its constrained close proximity bounce state to this fixed resonant speed through quantum space, it has zero inertial and resonant mass and so, since its only possible interim speed as it approaches resonance would therefore be infinite, the transition must be instant.

Resonant mass: In order for any particle to have vibrational energy, it must have mass. Because all resonating quanta have vibrational energy this means that they also have resonant vibrational mass, which is a measure

of their resistance to perturbation from an external fundamental force. This, of course, is very different from inertial mass, which relates to perturbations involving the electrostatic force. The neutrino's central quantum, as we'll see later, is unaffected by the electrostatic force and therefore, although having a tiny fixed resonant mass, has zero inertial mass.

Speed and orientation of neutrinos: As a neutrino travels forwards, its outer orbital quantum must be travelling at faster than first harmonic resonant velocity because its net forward speed through quantum space is the same fixed forward speed as its resonant central quantum but it also has some tangential orbital speed. Also, the orbital quantum cannot at any point be travelling 'backwards' against the direction of neutrino travel because this would reduce its velocity through stationary quantum space, at some point in its orbit, to the point of first harmonic resonance and hence identical velocity to the central quantum, rendering an ongoing orbit impossible. Both quanta must therefore always be travelling forwards at the same speed (identical forward velocity vectors) which means neutrinos must travel forwards rather like transverse discs.

We can therefore say that **the direction of travel of a neutrino is always aligned with the axis of its internal orbit**.

Because the neutrino's central quantum has a fixed forward speed and mass, any increase in the particle's total energy can only come from an increase in its orbital energy. As the neutrino gains energy, the orbital quantum accordingly speeds up and accelerates to a new resonant velocity, this time at the second or higher harmonic. Continuing energising of the neutrino then further accelerates it into increasingly wider, higher harmonic orbits.

Meanwhile, our neutrino particle, which comprises a central and an orbital quantum, continues to travel through stationary quantum space at the fixed resonant speed of its central quantum.

Since all quanta are identical, apart from the polarity of their charge, the central quanta of all neutrinos must have the same fixed resonant energy and hence all must move at the same fixed resonant speed. This, as we'll see later, is the same as for the central quanta of photons and hence this resonant speed is called **the speed of light**.

The outcome of all this is a speed-of-light neutrino particle that has a speed-of-light central quantum and an outer orbital quantum which has a less than speed-of-light orbital speed but greater than speed-of-light velocity through quantum space.

Given the prodigious and uniform density of quantum pairs throughout universal quantum space, the type of simultaneous multiple encounter required to energise a quantum pair sufficiently to form a neutrino probably occurs fairly frequently. This is covered later in the Creation section and suggests that such spontaneous neutrino formation in an infinite universe results in the creation of very large neutrino populations.

Speed of light: As explained later, a photon comprises a pair of orbital quanta triplets, one net positive and the other net negative, with one orbiting around the other under the attractive influence of the fundamental force.

The explanation for photon speed then becomes exactly the same as for neutrinos, except that the outer orbital is now a triplet with faster-than-

light velocity and hence reduced, higher-harmonic resonant mass and the inner triplet travels forwards at the fixed speed-of-light speed of its harmonic resonance central, non-orbital quantum.

Because the quanta in all neutrinos and photons are identical, their central quanta's first harmonic is always reached at the same forward speed regardless of either particles' surrounding structure or orbital energy. The speed of a photon is therefore exactly the same as for a neutrino since it is governed solely by its central triplet's quantum resonance with infinite universal quantum space.

The speed of travel of a high energy gamma ray photon is also therefore the same as for the lowest energy photons and this is the same speed as for a slightly or highly energised neutrino.

This means that, regardless of their energy, neutrinos and photons both move at the same speed, which we call **the speed of light**.

Orientation of photons: In exactly the same way as for neutrinos, a photon's orbital quanta cannot at any point be travelling 'backwards' against the direction of photon travel and so all the photon's quanta must be travelling forwards at the same speed (identical forward velocity vectors). This means that, just as for neutrinos, all photons travel forwards rather like transverse discs. We can therefore say that **the direction of travel of a photon is always aligned with the axis of its internal orbits**.

Also, and again in exactly the same way as for neutrinos, photons pass straight through the weak local charge profiles surrounding net-neutral quantum pairs with no interaction other than that which produces resonance. As a result, as photons move with their transverse orbits through stationary universal quantum space, quantum space also moves through them with no effect on the photons' direction of travel.

Neutrino or photon energy and orbital size: As previously, any increase in a neutrino's or a photon's energy manifests solely as an increase in either particle's orbital energy and hence, with wider orbits, orbital size. The outcome of all neutrino or photon energy exchanges with external particles is therefore an increase or decrease in only their orbital energy and the higher either particle's energy, the wider their orbits become.

Photon energy loss to quantum space: As the central, non-orbital quantum within a neutrino or a photon flies through quantum space in resonance at the speed of light, each of the very low charge profile quantum pairs it passes by at great speed are very slightly attracted or repelled by the fleeting attraction or repulsion, but not sufficiently to accelerate them away from their surrounding environment of similarly weak charge profile quantum pairs. The same is true for the higher harmonic resonant orbital quanta in either particle. Because each resonant interaction of individual quantum pairs with these speeding quanta is so vanishingly small and hence transfers close to zero energy at each encounter, we can say that all speed-of-light quanta are effectively non-interactive with quantum space.

This behaviour is different from that of quanta travelling at lower, non-resonant speeds, such as the central quanta of electrons and positrons (see later), where the much lower relative speeds and consequently stronger interaction with quantum pairs accelerates the quantum pairs away from their neighbours in a process, explained later, that also results in the generation of neutrinos.

Because the successive resonant attraction and repulsion between quantum space's quantum pairs and a photon or neutrino speeding through them inevitably transfers a vanishingly small but nonetheless finite amount of energy to the quantum pairs, we should expect that, over very long distances of travel, this would result in some energy loss from the speeding particles.

Although there is no way to determine the starting and finishing energies of neutrinos and hence no way to measure such a change in them, we can measure this for photons.

Because the emission spectrum for each individual element is identical, we know exactly the starting energy of photons emitted from known elements within stars and galaxies far away and can measure that against their energies as they arrive here on Earth. Observations of the light from stars or galaxies confirms that, the further away they are from us, the more redshift their light exhibits.

This redshift has been interpreted as being related to the motion of all stars away from us and hence to the hypothetical expansion of space itself. However, the much simpler explanation and one that does not require an unexplained singularity and its associated complicated process of cosmic inflation and hypothetical dark energy, is that photons simply lose energy as they travel.

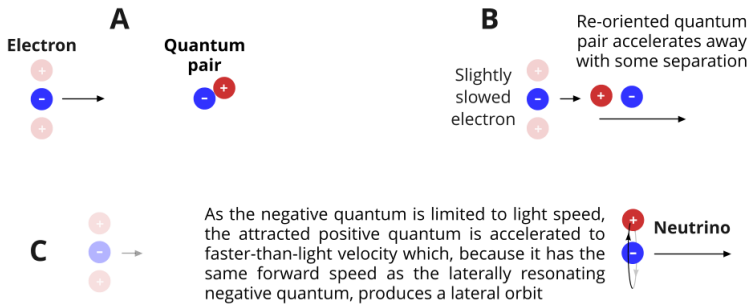
Speed of light in different media: The foregoing also accounts for why photons travel at different speeds in different media.

A photon in a vacuum, which is just quantum space without any electrons, positrons or inertial matter, is influenced only by its resonance with quantum pairs and so has a related 'in vacuo' speed. However, as we will see later, the random motion of electrons, protons and nuclei in a medium such as a gas, transparent liquid or solid, all generate surrounding neutrino clouds and many of the orbital quanta in these randomly multi-direction neutrinos are inevitably, during a part of their orbit, travelling directly or obliquely towards the photons. Their addition into the local quantum space consequently induces harmonic photon resonance at a lower photon speed.

The higher the density of inertial mass particles within the medium, the higher the population of these neutrino quanta and hence the slower the speed of light.

The neutrino - properties and interactivity

As well as being a natural outcome of random quantum pair collisions within quantum space, neutrinos are created when electrons or positrons collide with quantum pairs within quantum space. Electrons and positrons, as explained later, have an orbital structure with, respectively, one central non-orbital low-speed negative quantum orbited by two positive speed-of-light positive quanta and vice versa. Because speed-of-light quanta do not interact with quantum pairs within quantum space, it is only the low-speed central non light-speed quanta of the electron or the positron that are interactive and contribute to the electrostatic force (see later). As either particle moves through quantum space and collides with quantum pairs, the latter are instantly accelerated to the speed of light as net-neutral neutrinos. A detailed description of the mechanism is not included here but the process is illustrated schematically below.



The neutrino's energy when created in this way depends upon the speed of the electron or positron as it collides with a quantum pair and hence the neutrino may be weakly or substantially energised.

Neutrino-electron and neutrino-positron collisions: If a neutrino with a negative central quantum were to **collide with an electron** then the neutrino's local axial negative charge means that it repels and is repelled by the electron's central negative quantum. The higher the energy of the neutrino and hence the wider its orbit, the higher its effective axial charge and so the greater the repelling force. As the neutrino is repelled, its energy is then the same as its incoming energy plus or minus any energy gained or lost to the slowed approaching or accelerated receding electron.

If it were instead to **collide with a positron**, then the two particles' opposite charge quanta mutually attract with a force which, again, is directly related to the neutrino's effective axial charge and hence its energy. As the colliding neutrino slows to non-light speed, it transfers all its orbital energy to the positron. If the positron is near-stationary relative to stationary quantum space or moving away from the point of the encounter, the neutrino reverts to a zero-point quantum pair within the local quantum space. However, if the positron is moving towards the encounter sufficiently rapidly, the resulting quantum pair is immediately energised, as described earlier, and is bounced away as an energised neutrino, but now with a positive central quantum.

In both cases, the positron is attracted towards the point of the encounter with a force directly related to the energy of the incoming neutrino. An approaching or stationary positron is therefore accelerated towards the point of encounter and a receding positron is slowed.

The same happens for electron and positron encounters with neutrinos initially created by positron encounters, but with the polarities reversed.

Neutrino charge profile: Because neutrinos are speed-of-light particles, they cannot speed up or slow down and so any energy they receive always translates into internal orbital energy. As a result, **neutrinos' orbits widen as they gain energy**.

As their orbits widen, so does the spatial separation of their two quanta, resulting in an increased external local charge profile, particularly in an axial direction. A low energy neutrino with a closely orbiting, low-speed quantum has an external charge profile that is both radially and axially weak whereas a higher energy neutrino has a charge profile that, with a higher-speed orbital quantum and increasing radial separation between its quanta, becomes radially slightly less interactive but axially considerably more interactive. In all cases, the neutrino remains net neutral.

This means that neutrinos of all energies are more reactive and produce a far stronger attractive or repulsive force in head-on collisions with an external charge than in side-on, glancing collisions.

Neutrino-neutrino interaction: Because neutrinos are net neutral, they do not mutually interact and so, in the general case, **neutrinos simply pass through each other**.

However, nearly same-direction neutrinos, because they have the same speed-of-light speed through quantum space, are mutually and relatively nearly stationary and so, when very close, their very weak radial local external charge profiles result in a very slight attraction or repulsion. This sustained very weak force consequently either draws them together or moves them apart and so the neutrinos are slightly diverted.

However, the diversion is far greater for minimally energised, same direction, opposite-charge central quantum neutrinos because their low orbit, slow-moving, clockwise-anticlockwise orbital quanta are relatively nearly stationary at the point of mutual encounters. The orbital quanta of more energetic neutrinos are travelling at higher and varyingly different relative speeds and hence are far less interactive with all other neutrinos. Minimally energised neutrinos exist in extremely high numbers and extraordinarily high density within and closely surrounding the surfaces of neutral bodies, as will be covered in more detail later, and the cumulative effect of the resulting very high frequency of successive small diversions results in substantial diversion and hence multi-directional paths. This in turn hugely increases the incidence of same-direction encounters and the net result is that clouds of **weakly energised neutrinos have short mean free paths**.

Neutrino clouds: The small size and high density of quantum pairs within quantum space inevitably results in a high frequency of collisions with any electron or positron moving through them and this produces a leading-edge cloud of energised neutrinos. When combined with the clouds produced by neutrinos arriving from neighbouring electrons or positrons, the result is a surrounding cloud of mixed energy neutrinos which are more energised at the front of a forward-moving electron or positron than behind it.

The low mean-free-path and random bouncing of lower energy neutrinos means that they tend to dwell in one location and hence remain close to the electron or positron. As a result, the clouds around them contain a mix of low energy neutrinos close in and more energetic neutrinos with a longer mean-free-path, further out.

The higher a body's charge and hence the higher the population of electrons or protons (see below) at or near its surface, the higher will be the number of collisions and hence the density and energy of the neutrinos in its surrounding cloud. As a result, the neutrino clouds around bodies with low charge are localised, low energy and slow growing whereas around highly charged bodies they are high energy and rapidly expanding.

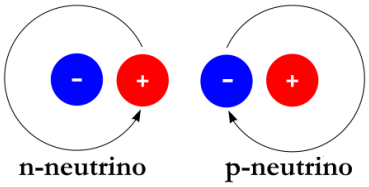
Neutral matter: Because the atoms of neutral matter comprise positive protons and negative electrons, they too have their own neutrino clouds. However, successive collisions with the equal numbers of positive and negative particles within the matter result in neutrinos in its mixed internal neutrino clouds that are continually being slightly energised and then immediately de-energised, over and over again. As a result, all the neutrinos that emerge from the surface into the body's external cloud are in equal numbers of negative central quantum neutrinos and positive central quantum neutrinos and all are only very weakly energised.

Neutrino-photon collisions: When a speed-of-light neutrino collides and interacts with a similar direction, same forward-speed photon, it is either repelled and bounces away or attracted and transfers all its energy to the photon depending upon the respective polarities of the colliding particles' central quanta. When it transfers its energy, the neutrino reverts to a zero-point quantum pair and the photon gains energy. This mechanism is covered later in the Photon section.

Neutrino-proton collisions: Also as we'll see later, protons are particles comprising large numbers of electrons and positrons with an excess of one positron. Neutrino collisions are therefore effectively neutrino-positron collisions, which are the same as electron collisions, but with all directions and polarities reversed.

The n-neutrino and p-neutrino

For simplicity, neutrinos with a negative central quantum will be referred to as **n-neutrinos** and neutrinos with a positive central quantum will be referred to as **p-neutrinos**. Both are net neutral.



We can summarise the behaviour of neutrinos as follows:

- When the central quantum of an electron or positron collides with a quantum pair, the quantum pair is accelerated and transforms into a neutrino. Although a neutrino resulting from a single, low-energy collision may be only weakly energised, due to its orbital structure it now has a local external charge profile which is predominantly axial. This local axial effective charge increases as its increasing energy widens its orbit. Although all neutrinos are net neutral, they all have either positive or negative local effective axial charge.
- Neutrinos with a negative central quantum are called **n-neutrinos** and neutrinos with a positive central quantum are called **p-neutrinos**.
- Electron collisions with quantum pairs produce only n-neutrinos and positron collisions produce only p-neutrinos. Both variants are net neutral.
- A collision between an n-neutrino and an electron or between a p-neutrino and a positron or proton always results in repulsion. The neutrino gains some energy if the particle is moving towards it at the point of encounter or loses some energy if the particle is receding.
- Encounters between n-neutrinos and positrons/protons or p-neutrinos and electrons always result in the electron or positron being attracted towards the point of encounter and gaining energy whilst the neutrino gives up all its energy and temporarily or permanently reverts to a zero-point quantum pair.
- When two neutrinos meet, they simply pass through each other with no interaction unless they are both only minimally energised and moving side-by-side in similar directions, in which case they weakly attract or repel and hence are diverted.
- When a neutrino collides and interacts with a similar-direction photon with an opposite charge central quantum (see Photon section), its orbital energy is transferred to the photon and the neutrino reverts to a zero-point quantum pair.
- Neutrinos and photons are net neutral with zero inertial mass and move at the speed of light within universal quantum space.

- Neutrinos and photons do not interact with quantum pairs except for the vanishingly small resonance interaction as they fly through quantum space at the speed of light.

A neutrino's ultimate energy is related, by virtue of multiple collisions with same-charge particles within a charged body, to the magnitude of the body's charge. The neutrino retains its energy and size until or unless it collides with a nearly same-direction photon or another charged particle.

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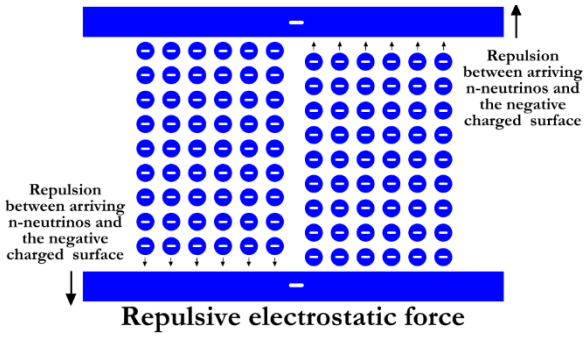
Positrons and electrons have a fixed net charge and they move relatively slowly at speeds dictated by their energy. A same-charge central quantum neutrino collision with either particle produces repulsion and so the electron or positron is consequently accelerated away. An opposite-charge central quantum neutrino collision produces attraction and so the electron or positron is accelerated towards the point of encounter.

The electrostatic force

As a charged body's high surface population of positive protons or negative electrons collide with quantum pairs, the latter gain energy and form neutrinos. The ultimate energy and density of these neutrinos, after successive same-charge bounces amongst the surface protons or electrons, is directly related to the magnitude of the body's charge.

All charged bodies are therefore always surrounded by a cloud of same charge central quantum neutrinos, all of which are net neutral but have a local axial external charge profile in their direction of travel and whose energy and density increases with increasing charge of the body.

Repelling force between charged bodies: If, instead of a single body, we have two bodies with the **same charge**, then, as the oppositely-travelling neutrinos in each cloud pass straight past each other without interaction and reach the opposing body, the colliding same charge central quanta within the neutrinos and within the charged particles in the body's surface mutually repel and so each surface is repelled.



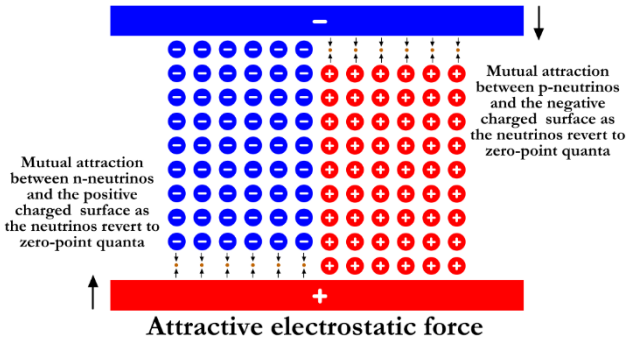
Repulsive electrostatic force

The schematic illustrates how repulsion works and shows the net neutral n-neutrinos travelling between two negatively charged bodies. In reality, the outward-travelling neutrino clouds extend all the way around the bodies. Exactly the same happens for two positively charged bodies, which generate repelling p-neutrino clouds.

Attracting force between charged bodies: For two bodies with opposite charges, the local cloud of neutrinos around one comprises p-neutrinos and around the other comprises n-neutrinos.

As previously, neutrinos with either polarity of central quantum travelling in opposite directions simply pass straight through each other without interaction and so, again, the two clouds extending outwards from the charged bodies pass right through each other.

When the n-neutrino or p-neutrino clouds emerging from one body reach the oppositely charged electrons or protons within the charged surface of the other, the fundamental force attraction of the neutrinos' central quanta means that they immediately give up their energy and revert to zero-point quantum pairs as the attracted and consequently energised electrons or protons in the surface are accelerated towards the incoming neutrinos. Exactly the same happens at the other surface and so the two surfaces are drawn together.



For both attraction and repulsion, the higher the charge of the charged bodies, the higher the number, energy and effective axial charge of the neutrinos created within the surfaces and hence the greater the magnitude and range of the attracting or repelling force.

The lower the charge on the bodies, the lower the number, energy and mean free paths of the resulting neutrinos and so the thinner, more localised and more slowly-expanding the neutrino clouds. This provides a greater opportunity for photon collisions to revert the neutrinos to zero-point quantum pairs. If the charge is sufficiently low, or the intervening space so large that the two clouds dissipate before they meet, then there will be no attracting or repelling force. The high population of photons within universal quantum space means that all the neutrinos around isolated charged bodies eventually revert to zero-point quantum pairs.

If the charged bodies are constrained, then there is a strong repulsive or attractive force maintained between the two. If not constrained, such as with astronomical bodies in space or with subatomic charged particles, the bodies or particles will be accelerated towards or away from each other to a degree depending on their relative charge, size and separation.

The electrostatic force is the sum effect of huge numbers of fundamental force neutrino interactions at the surfaces of charged bodies. It is therefore not itself a fundamental force but rather a result of it.

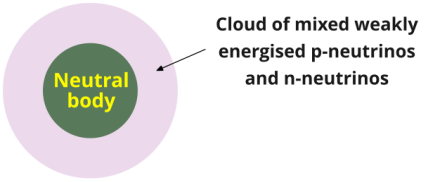
Gravity

Gravity is easily explained as a manifestation of the electrostatic force. It is a result of the mixed fields of p-neutrinos and n-neutrinos surrounding neutral bodies.

Neutral bodies are bodies that have no net external charge. However, their internal structure comprises countless atoms and molecules all made of equal numbers of protons and electrons and the whole structure is immersed in the high density of zero-point quantum pairs that fill the entirety of universal quantum space.

Within the body, electron and proton collisions with these quantum pairs create equal numbers of p-neutrinos and n-neutrinos. Successive internal collisions with the body's electrons and protons then, somewhat randomly, slightly increase or cancel out the degree of orbital energy of these neutrinos so that most either revert to zero-point quanta or are only weakly energised.

At the surface, there will inevitably be a population of neutrinos that, having made unequal numbers of successive electron and proton encounters within the body, emerge as such weakly energised neutrinos. As a result, the neutrino cloud surrounding the body comprises a mixed field of equal numbers of weakly energised n-neutrinos and weakly energised p-neutrinos.



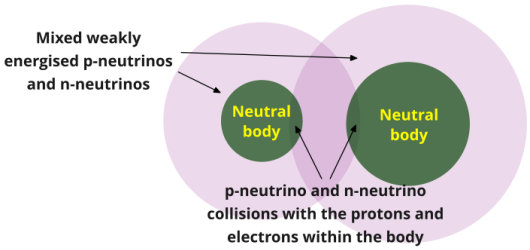
The high density, low mean free path and high collision rate of these low-energy neutrinos means that they bounce around in all directions and so form a multidirectional cloud.

Although most of the neutrinos in this cloud tend to travel outwards, a substantial number within the body and very closely surrounding it, where their density and frequency of bounces is highest, are also travelling inwards and back towards the surface.

All neutral bodies have this surrounding cloud of mixed, weakly energised n-neutrinos and p-neutrinos which are multidirectional very close to the surface and outward-travelling further out.

If we introduce a second neutral body, each is immersed in the cloud of outward-travelling neutrinos from the other.

Because neutral bodies comprise equal numbers of protons and electrons and so generate p-neutrinos and n-neutrinos in equal numbers, the presence of one body generates equal numbers of neutrino-proton collisions and neutrino-electron collisions in the other body.



Half of these collisions are between n-neutrinos and protons or between p-neutrinos and electrons and result in attraction. The other half are between n-neutrinos and electrons or p-neutrinos and protons and hence produce repulsion.

However, the attractive-repulsive behaviour of the two clouds of weakly energised neutrinos means that the two effects are not in balance.

As the weakly energised incoming neutrinos originating from one body pass into the multidirectional part of the weakly energised neutrino cloud very closely surrounding the other body, those that collide with the opposite-charge central quantum, inwardly travelling, and hence similar direction, cloud neutrinos interact and are diverted. As a result, many of the incoming neutrinos collide with the body's protons and electrons at an angle rather than head-on.

This naturally decreases the degree of repulsion or attraction in the 'head-on' direction from both the n-neutrinos and p-neutrinos. However, a difference then arises because, whereas the neutrinos which create repulsion transfer only a component of their energy to the particles as they bounce off at an angle, the neutrinos which create attraction transfer all their energy as they revert to zero-point quantum pairs. For any given angle of random-direction neutrino approach, the component of attraction in the direction towards the other body therefore always exceeds that for repulsion.

The net effect, summed over all the internal electron and proton interactions within each body, is that they are pulled together. **This resulting force, which is <u>always</u> attractive, is what we call gravity.**

Gravity is a thus a particular manifestation of the electrostatic force. It is, as it were, the low level 'background' attraction that always exists between all bodies, whether charged or not.

If one of the bodies is charged, its outward travelling energised neutrinos do not interact with and are not diverted by the second body's weakly energised neutrino clouds. As a result, a charged body's more highly energised neutrinos have no effect on gravity.

Gravity for large and small bodies: All neutral bodies exhibit gravity. Many of the very low energy neutrinos generated within a large neutral body also extend in a cloud outwards for great distances and are the reason it attracts external neutral bodies towards it. The greater the size and mass of the body, the higher the density and population of these neutrinos in the external cloud and hence the stronger the body's gravity. At the same time, the tendency of these low energy neutrinos to bounce off each other means that, where they are densest, close to the body and within the body itself, their very high frequency of collisions and resulting diversions produces the multidirectional neutrino cloud which is responsible for the body being gravitationally attracted by external neutral bodies.

This multidirectional cloud is densest within the body at the point where it has the most surrounding matter, which is its centre of mass. It then extends outwards from this point in ever decreasing density through and beyond the surface, becoming increasing diffuse with distance. As the neutrino population density reduces and mutual interaction consequently decreases, the cloud gradually becomes less multidirectional. A greater proportion of the neutrinos instead then travel onwards away from the body where, should they encounter another nearby or far distant neutral body, they generate a gravitational attraction which is proportional to their density at that point.

Within the somewhat diffuse and relatively extended multidirectional low energy neutrino cloud surrounding our planet, all smaller bodies, including the molecules, particles, objects and structures at and comprising the Earth's surface, have their own surrounding short-range, low-energy neutrino clouds. For such relatively small bodies, the multidirectional part of the cloud extends outwards from their surfaces for only a very short distance and in a steep gradient from high density to low density. This short range multidirectional cloud is why they are gravitationally attracted to other neutral bodies, including the Earth itself, whereas their longer range, outward travelling neutrino clouds are the reason why they attract other bodies. For small bodies, this outward travelling cloud is very thin and so the gravitational attraction they produce is consequently low.

Casimir effect: Two nearby bodies gravitationally attract only because the diffuse low energy outward-bound neutrinos from one interact with the dense local multidirectional neutrino cloud of the other. Should they be close enough for their multidirectional clouds to overlap, the degree of same-direction neutrino interaction would be considerably increased, making gravitational attraction very substantially stronger. However, because all bodies, at the microscopic scale, have a surface texture of peaks and troughs and because the multidirectional clouds around everyday small objects are exceedingly short range, such overlap is possible only at

their surface texture peaks. As a result, unless the small bodies have very high mass, any gravitational attraction is minimal and generally unnoticeable.

However, if both objects are very smooth and flat, then we get large surface areas of multidirectional neutrino cloud overlap which can result in substantial attraction. Even small, low mass objects attract similar objects as long as both are sufficiently flat and smooth and close enough to be within range of the extremely short range multidirectional part of the other's neutrino cloud. If the aligned surface areas are large enough, this produces a measurable force of attraction.

The effect is also greater for denser materials because they produce denser and deeper multidirectional neutrino clouds.

This attraction has been called the Casimir effect and the Standard Model explanation is that it is a phenomenon arising from quantum fluctuations of the electromagnetic vacuum. However, it is simply the result of gravity between small, very close, flat-surfaced bodies.

Should the two surfaces be sufficiently flat to mutually attract to within separations approaching the diameter of a surface atom, the local external n-neutrino fields around the atoms' orbital electrons would become dominant and create repulsion. The separation of the two bodies would then be a balance between Casimir attraction and electrostatic repulsion.

Centre of Gravity: As above, the multidirectional neutrino cloud responsible for one body being passively attracted by another is densest at its centre of mass. Also, the cloud responsible for a body actively attracting another is collectively generated by all the electrons and protons within the whole body. In both cases, this means that gravity between two neutral bodies is related to the separation of their centres of mass whereas the electrostatic force between charged bodies is related to the distance between their surfaces.

Weakness of gravity: Because it is the result of a very small imbalance in the already low level of otherwise balanced attraction and repulsion between neutral bodies, gravity will always be weak compared to the electrostatic force between charged bodies.

This is confirmed by a simple Coulomb's law calculation which tells us that, depending on the criteria used, the ratio of gravitational force to electrostatic force is actually around 10^{-39} :1 for subatomic particles and around 10^{-22} :1 for charged matter. In other words, whichever way the calculation is done, the effect of gravity is tiny when compared to the electrostatic force.

The more matter there is within the bodies, the greater the density of the surrounding weakly energised neutrino clouds and so gravity will be stronger. Also, the closer the bodies are to each other, the higher the density of neutrinos incoming from one to the other and so the greater the effect, which is why more massive and closer bodies exhibit higher gravity.

However, regardless of how massive or close the neutral bodies are, gravity is the result of weakly energised neutrino interactions only and so, because it is unaffected by higher energy neutrinos, will always be significantly weaker than the electrostatic force between charged bodies.

Gravity and light: Because the neutrino clouds around neutral bodies have no effect on the trajectory of photons passing through (see The

Photon section, below), it means that, regardless of the mass of the neutral body, **gravity has no effect on light**.

Gravity and temperature: As a body's temperature rises, the higher kinetic or vibrational energy of its internal electrons and protons generates greater numbers of more energised neutrinos and fewer weakly energised neutrinos in its surrounding neutrino cloud. Because gravity is uniquely related to the interactive behaviour of weakly energised neutrinos only, this means that gravity is lower for high temperature bodies.

One consequence of this is that, as the Earth has internally cooled, its gravity has increased. This may help to explain how, with a lower gravity tens of millions of years ago, the large land animals around at the time were able to thrive despite their enormous size.

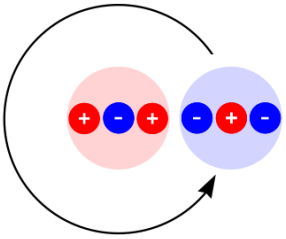
See also **Ref 2**.

Gravity of galactic cores: As we'll see later, a galactic core comprises solely same-charge, highly energetic, small protons and hence all the neutrinos bouncing around amongst them and emerging from the core are also highly energetic. Because gravity exists only as a result of the very weakly energised neutrino clouds which surround neutral matter, **all galactic cores have zero gravity**. Although stars also have protonic cores, the neutral atomic matter in their outer reaches generates weakly energised neutrino clouds and so their very large size and accordingly high peripheral matter content produces a very considerable gravity. The degree of gravity responsible for the inward attraction of a galaxy's spiral dust clouds is the result of the high population density of stars close to the galactic core and is unrelated to the core itself.

On a size-for-size basis, stars and galaxies therefore have much lower gravity than bodies comprising purely low energy neutral matter and for all bodies, the smaller they are, the lower their gravity.

The photon

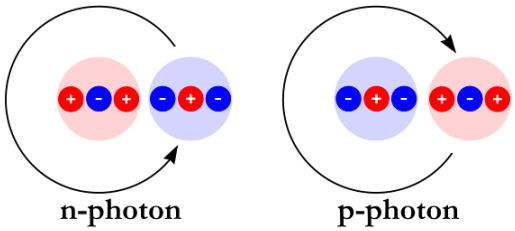
We know that high energy photons transform into electron-positron pairs and that colliding electrons and positrons mutually annihilate into photons. This strongly suggests that a photon is some kind of electron-positron composite arrangement configured in a way that produces a net neutral, mass-less particle. Because electrons and positrons each have a three-quantum triplet structure arranged as, respectively, positive-negative-positive and negative-positive-negative, the simplest and only logical structure for a speed-of light photon is an orbital arrangement of these triplets with one orbiting around the other as shown in the schematic.



This means that the speed-of-light photon is essentially a net neutral orbital doublet arrangement, similar to the neutrino, but with two net-charge triplets instead of two charged quanta. The orbiting triplet and all the orbital quanta have non-light-speed orbital speed but, as below, faster-than-light velocity through quantum space.

In this arrangement, the three quanta within each triplet as well as the two triplets themselves, one net positive and the other net negative, are attracted to each other by the fundamental force. Because all its quanta are bound solely by the fundamental force, the neutral photon is an elementary particle.

Photon variants: A net neutral photon can be created with either the net-positive triplet orbiting the net-negative triplet or vice-versa and hence comes in two variants, one with a negative central quantum and the other with a positive central quantum. For simplicity and consistency, photons with a negative central non-orbital quantum are called **n-photons** and photons with a positive central quantum are called **p-photons**.



In exactly the same way as for neutrinos, any energy that speed-of-light photons receive always translates into internal orbital energy. The resulting increase in radius of orbit and hence spatial separation of the orbiting triplets means that, like neutrinos, they have a substantial axial external local charge profile which increases as they gain energy. However, unlike neutrinos, they have triplets with a balanced two-orbital-particle structure and an overall larger orbital size which results in faster orbital quanta. Their external radial charge profile is consequently far weaker than the weak radial profile of neutrinos, to a degree that it is near zero.

Photon structure: The photon comprises a speed-of-light, net charge, inner triplet plus an opposite net charge outer orbital triplet, producing a net neutral particle. The inner triplet has a resonant mass central quantum and the outer triplet has low, higher-order harmonic resonant mass.

The inner triplet's speed through quantum space is the speed of its resonant mass central, non-orbital quantum, which is the speed of light. Its two orbital quanta must have a faster-than-light velocity through quantum space because they have a less-than-light-speed transverse orbital speed in addition to their speed-of-light forward speed. The orbital outer triplet's velocity through quantum space must also be faster than light because it too has transverse less-than-speed-of-light orbital speed in addition to its speed-of-light forward speed.

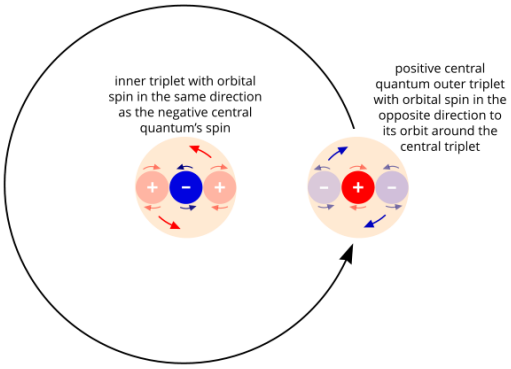
The photon's structure is therefore arranged as a central speed-of-light resonant mass quantum with a series of orbitals all with less-than-speed-of-light orbital speed but greater than speed-of-light velocity and configured as two inner orbital quanta and an outer orbital triplet. The speed of the photon through quantum space, just as for the neutrino, is that of its single resonant central quantum and hence the triplet arrangement which contains it.

As a photon gains energy, both its inner triplet quantum orbits and its outer orbital triplet's orbits widen and, although remaining net neutral, it therefore has an increased local axial charge profile. Conversely, as a photon loses energy, both its inner triplet orbital quanta and its outer orbital triplet move closer to the central quantum. This smaller size then results in a decrease in its effective local axial charge profile and means that a minimally energised photon has nearly zero effective net axial charge.

Photon orbits and spin: Just as for the two charged quanta of the neutrino, the inner and outer charged triplets in a photon obey the same fundamental spin rules. The outer triplet therefore orbits in the same direction as the central triplet's spin but in the opposite direction to its own spin.

The arrangement for a p-photon is exactly the same but with all the polarities and spin directions reversed.

As they travel forwards through quantum space, n-photons therefore always have anticlockwise spin and p-photons always have clockwise spin.



Photon orientation: Because a photon's speed is that of its central resonant mass quantum, all its orbital quanta must be moving at the same forward speed in its direction of travel. Just as we saw for the neutrino, none of the orbital quanta can be travelling 'backwards' through quantum space as the photon travels forwards and so they must all be orbiting in the same plane.

Photons, like neutrinos, are therefore also rather like spinning discs travelling through quantum space along the axes of their orbits and, as they pass straight through quantum space's population of quantum pairs with no interaction, there is no 'resistance' to their motion.

Photon reactivity: Unlike neutrinos, which, with their single orbital quantum, have a weak local radial charge profile, the multi-quanta orbital structure of photons produces a considerably weaker effective radial charge profile. Their local external charge profile, which increases as they gain energy, is almost entirely axial and is the result of the central non-orbital quantum which is negative for an n-photon and positive for a p-photon.

Photon-neutrino collisions: When a neutrino collides with a photon, then just as for photon-electron collisions, below, the outcome is solely the result of the interaction between the two particles' central, non-orbital quanta. In head-on or oblique encounters, the net neutral particles' relative speeds means that they pass straight through or by each other without interaction. However, when photons and neutrinos are travelling in closely similar directions and hence with near-zero relative speed, they interact as follows:

For encounters between p-photons and n-neutrinos or between n-photons and p-neutrinos, in which their central, non-orbital quanta are opposite polarity, a sufficiently close neutrino, with its weak local radial external charge profile, is very slightly attracted towards the even weaker radial charge profile photon and so the two move closer.

As the trajectory of the neutrino's central quantum takes it to within fundamental force range of the nearly same-direction photon's central quantum, it is more strongly attracted sideways and hence changes direction. Because a neutrino can travel only in the same direction as its orbital axis, its new direction means that it presents a much stronger effective axial, rather than radial, charge to the photon and so is increasingly strongly attracted and diverted as it gets closer to the photon's quantum. As it meets the photon's central quantum, it is immediately slowed to zero speed in its new direction of travel and, with consequently zero forward speed and zero sideways speed, the zero velocity neutrino reverts to a quantum pair with all its energy transferred to the photon. The

consequently energised photon flies onwards leaving the zero-point quantum pair behind, now 'stationary' within quantum space.

For encounters between n-photons and n-neutrinos or between p-photons and p-neutrinos, in which the central, non-orbital quanta are the same polarity, the similar-direction quanta and hence the particles themselves weakly repel. Unlike the previous case in which the particles were attracted, this repulsion produces a decrease, rather than an increase in axial interaction and so the neutrino merely slightly changes direction with minimal change in energy away from rather than towards the photon.

Photons, with their six-quanta structure, have an intrinsically higher resonant mass and hence higher resonant inertia than two-quanta neutrinos. As a result, it is invariably the neutrino that diverts towards the photon when they attract rather than the other way around, which is why the neutrino is always the energy donor in such interactions.

This also means that, in attractive or repulsive interactions, the photon's deflection towards or away from the point of encounter is always minor compared to that of the neutrino. Because interaction is only possible when both particles are initially travelling closely side-by-side and in similar directions, this means that the photon's change in direction is very small compared to what is already a very small difference. In encounters where the neutrino had high energy, the photon deflection is therefore slight, but where the neutrino was minimally energised the deflection is close to zero.

Except for the special case of reflection at a surface (see Optics and Quantum Mechanics), which involves huge numbers of successive photon-neutrino encounters in high density and sharply changing neutrino gradients, for all practical purposes we can therefore say that **photons are not diverted by collisions with neutrinos**.

In summary, we can say that for photon-neutrino collisions:

- For opposite polarity central quantum, similar-direction collisions, neutrinos transfer their energy to the colliding photons and revert to zero-point quantum pairs.
- For same polarity collisions, similar-direction particles weakly repel.
- Photons are slightly diverted by nearly-same trajectory collisions with high energy neutrinos but effectively undiverted by similar collisions with individual low energy neutrinos.
- As the angle between the trajectories increases, the ability of the particles to interact decreases, reducing to zero for encounters that are side-on or opposite-direction, at which point the particles simply pass by or through each other.

In opposite polarity central quantum charge collisions, the energy transferred from the neutrino raises the photon's energy in amounts which can be either very small or very substantial depending on the pre-collision energy of the neutrino.

Photon-electron collisions: In the same way as we saw for neutrinos, a photon collision with an electron is effectively a collision between each particle's central quantum. As above, head-on or oblique incoming photon encounters with an electron's opposite direction, outward-travelling cloud neutrinos means that they pass straight through or by each other without interaction. However, as photons subsequently bounce away from the electron's central quantum, both they and the neutrinos are travelling

outwards in closely similar directions and with near-zero relative speed and so they interact:

For an incoming n-photon, the inner triplet's negative central non-orbital quantum is repelled by the electron's central negative quantum and so the n-photon bounces away at light speed from the encounter with somewhat higher energy from an approaching electron or somewhat lower energy from a receding electron. Because the n-photon loses energy to a receding electron and gains energy from an approaching electron, its internal orbit accordingly increases or decreases and so, in the same way as for neutrinos, increases or decreases the effective axial charge profile of its central quantum. As explained in the Magnetism section, this behaviour accounts for the attraction or repulsion between current-carrying wires.

For an incoming p-photon, which has a positive central quantum, the opposite polarity central quanta of the two particles attract with a force that is directly related to the photon's effective local axial charge and hence its orbital size and energy.

The attraction of this axial charge brings the photon's central quantum very close to the electron. However, as the slowed photon transfers most of its orbital energy to the electron as kinetic energy, its inner triplet orbits reduce in size and the photon's net axial effective charge decreases almost to zero. The consequently reduced net attraction combined with the increased local repulsion of the central triplet's two now much closer negative orbital quanta to the electron's negative central quantum means that the photon, having been initially attracted, is now weakly repelled by the electron. This 'bounce' results in the photon immediately accelerating back to light speed, but now with only minimal energy. The net result of the collision is therefore **a small, minimally energised p-photon.**

During this exchange, the electron is attracted towards the point of encounter and gains an amount of kinetic energy equal to the orbital energy lost by the photon which, for a highly energised incoming photon, may be very substantial.

If the collision is with an approaching electron, then as the photon flies away in the same direction and at the same speed-of-light speed as the outward-moving energised n-neutrinos in the electron's front-end neutrino cloud, the resulting photon-neutrino interactions mean that the photon is energised. For a slow-moving electron, the effect is minimal but for fast-moving electrons with highly energised n-neutrino clouds, the increase in energy of the bounced photon may be very substantial. As explained in the Magnetism section, later, the high effective local axial charge of these energised p-photons is why free electrons are attracted into streams and hence why this behaviour plays an essential part in the process of matter creation.

In summary, we can say that for photon-electron collisions:

- P-photon encounters always result in the p-photons giving up (nearly) all their energy to the electron. The p-photons then bounce away with minimal energy from a stationary or slow-moving electron but high energy from a fast-moving approaching electron. The electron is attracted towards the point of encounter, gains energy and experiences an accelerating force towards the incoming photon. For collisions with high energy photons, this force is substantial.
- N-photon encounters always result in the n-photon either gaining some energy from an approaching electron or giving up some energy to a

receding electron. The resulting increase or decrease in their orbits and hence spatial separation from their central quanta increases or decreases their effective local axial external charge profile. The repelled electron experiences an accelerating force away from the incoming photon.

Exactly the same applies for collisions with positrons or protons (which are particles comprising large numbers of electrons and positrons with an excess of one positron), but with all the polarities and directions reversed.

Photon-photon collisions: Because they are both net neutral, p-photons and n-photons do not interact with each other but instead just pass straight on and through with no change to their energy or direction. Unlike neutrinos, because their local external charge profiles are radially close to zero, photons travelling side-by-side or in closely parallel directions do not interact.

Photon mean free paths and trajectory: Because they are effectively undeviated by encounters with individual quantum pairs or by occasional collisions with random direction neutrinos, photons' mean free paths within universal quantum space are infinite and, because their resonance with quantum pairs is uniform in all directions, we can also say that **photons always travel in straight lines**.

Photon mass: As neutral particles, photons are not influenced by an external electrostatic force and so, with our earlier definition of mass, it follows that photons have zero inertial mass regardless of their size or energy.

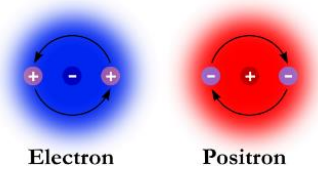
Photon energy and atomic electrons: Depending on the photon's energy, collisions with atomic electrons can increase an electron's kinetic energy and hence widen its orbit around a proton or nucleus either all the way up to a higher stable orbital level (see Optics and Quantum Mechanics) or to a higher but unstable orbit that quickly decays.

Low energy neutral photons, with their low local external net charge profiles, travel great distances through charged or neutral matter without interacting whereas the same matter is opaque to large energetic photons. Highly energetic photons can transfer sufficient energy to electrons to strip them away from their atoms.

Photon relative speed: All photons travel at the same resonant speed everywhere within universal quantum space. This means that a photon generated by or bouncing off a speeding body travels away from the body at the same absolute speed-of-light speed irrespective of the body's speed and direction.

This in turn means that the relative speed between a moving source and a photon is equal to the speed of light minus the source's speed for a forward moving source and to the speed of light plus the source's speed for a photon emitted rearwards.

Photon redshift and blueshift: As earlier, when p-photons collide with the protons or n-photons collide with the electrons within a body, the photons bounce away with increased energy in an approaching collision or with reduced energy in a receding collision. Also, when p-photons collide with the electrons or n-photons collide with the protons in a body then, for a stationary or receding body, the photons give up their incoming energy and bounce away with only minimal energy.



However, if the body is moving towards the point of collision, then because its electrons and protons have more highly energised front-end neutrino clouds, the photons interact with the same-direction neutrinos as they bounce away and become energised. For a slow-moving body, the photons' energy is almost unaffected but for rapidly moving bodies the photons may become substantially energised. The faster the body is moving through quantum space, the more highly energised its neutrino clouds and the more energised the bounced photons become.

This means that whenever ambient photons bounce off the front of a body, or its component particles, moving at a substantial speed through quantum space, the photons are energised and hence **blue-shifted** and whenever they bounce off the rear of such a body they lose energy and so are **red-shifted**.

However, when photons are created by electron-positron annihilation, their energy as they fly away at the speed of light from this source is related only to the kinetic energy of the source's colliding electrons and positrons. Although the electrons and positrons within a fast-moving source are more energised by quantum pair collisions and therefore annihilate to higher energy photons than a slow-moving source, its direction of travel through quantum space is irrelevant. The photons emitted by a source travelling at any given speed will therefore have exactly the same energy when the source is moving towards us as when it is moving away. This means that stars (whose light is the result of an envelope of electron-positron annihilation, see Star Formation section) and other **sources of light do not introduce a red or blue shift** as a result of their direction of motion through quantum space towards or away from an observer.

Photons and Gravity: Gravity is the result of thin clouds of weakly energised neutrinos emerging radially from a body and so only those external photons that have travelled past and away from the body and hence have obliquely similar trajectories, as well as those passing through the diffuse multidirectional neutrino clouds locally surrounding large bodies such as stars, are travelling in similar directions and hence interact. Because these neutrinos are only weakly energised and the clouds are effectively nearly uniform on both sides of the photon, the resulting photon deviation is invariably so vanishingly small as to be considered zero. We can therefore say that **photons are not deviated by gravity**.

They are also undeviated by other photons, which, as explained in the Magnetism section, means that, although low energy photons produce magnetic attraction and repulsion in magnetic materials, the photons themselves are unaffected by magnetic fields.

Photon redshift with distance: Photons travelling through quantum space and resonating with its population of zero-point quantum pairs inevitably and progressively lose a small amount of energy as they travel across great distances. This results in a slight redshift in the light received from distant stars and galaxies and the greater the distance travelled by the photons, the greater the degree of redshift.

Electrons and Positrons

Electrons and positrons are the result of photons being energised to a point where the separation of their orbital triplets exceeds the range of the fundamental force and the triplets fly apart.

Electrons have one central negative and two positive orbital quanta and **positrons** have one central positive and two orbital negative quanta.

Because electrons and positrons are created by the transverse separation of highly energised speed-of-light photons and, as below, can move only in the direction of their orbital axis, they immediately slow to less than light speed at the point of creation. The triplets' orbital quanta, however, remain at light speed because, as earlier, any reduction in speed would take them out of resonance and the resulting shift of energy from resonant to kinetic would make them again speed up. Electrons therefore comprise a central slow-moving negative quantum and two positive, speed-of-light orbital quanta. Positrons are identical except with a positive central quantum and two negative speed-of-light orbital quanta. Because speed of light quanta within elementary particles do not interact with quantum space and so do not generate neutrino clouds, it is only the slow-moving electron's central quantum that generates a neutrino cloud. This means that **the electron's and positron's net electrostatic charge is solely that of its central non-orbital quantum**.

This also means that only the central quantum in either an electron or a positron contributes to its inertial mass.

The electron's or positron's non-light-speed central quantum is held in position by the strong fundamental force attraction of its two oppositely disposed, mutually repulsive, orbital quanta and so, unlike the case with neutrino creation, cannot be accelerated to light speed by encounters with net neutral quantum pairs. It therefore has zero resonant mass, zero resonant energy and zero orbital kinetic energy. As a non-speed-of-light particle, it has inertial mass and its energy is solely that of its intrinsic spin and its kinetic energy of motion as it moves through quantum space as part of the electron's structure.

Because the inner and outer quanta in all electrons are identical to those in all other electrons and because the outer quanta in all electrons always have the same fixed speed-of-light orbital speed and resonant mass, the orbital energy and size of orbit of all electrons must be the same, regardless of the electron's kinetic energy. This means that **all electrons are the same size**.

When an electron is electrostatically repelled by an external negatively charged body, its central quantum and hence the electron itself is accelerated away. As it collides with its immediately surrounding quantum space quantum pairs and hence creates neutrinos at a greater rate and with higher energy, it loses a small amount of kinetic energy as its speed again stabilises. When, instead, an electron is electrostatically attracted by an external positively charged body, we get the same result except that the electron is accelerated towards, rather than away from, the external body. Because in both cases a small amount of the interaction kinetic energy is redistributed to surrounding quantum pairs, it means that, with our earlier definition of mass, **electrons have mass**.

Although electrons are always accelerated or decelerated by an external electrostatic force, this does not change their internal orbital energy since this is dictated by the central quantum's fixed charge and the orbital quanta's fixed charge, resonant mass and speed-of-light orbital speed. All encounters with external forces, including collisions with neutrinos and photons, change only an electron's linear kinetic energy.

Because electrons' outer quanta orbit at the speed of light then, just as for neutrinos and photons, **electrons always travel in the direction of their orbital axis**. They also, therefore, move forwards through quantum space as transverse discs and hence have spin. The electron's spin is the same as

its central negative quantum which is anticlockwise in its direction of travel. All the foregoing applies equally but in reverse for positrons.

As electrons or positrons move through quantum space, they are continually colliding with quantum pairs and so always have a surrounding neutrino cloud and hence are continually losing kinetic energy. Also, when p-photons collide with electrons or n-photons collide with positrons, the photons give up their energy and bounce away with minimal energy. The electrons or positrons accordingly gain kinetic energy.

The three-quanta triplet configuration of electrons and positrons is highly stable and, as explained in the Matter Creation section, they structurally combine to form protons which are at the core of all atoms in the universe.

Although highly stable, **the positron is short-lived** as a free particle because a low-energy encounter with an electron transforms the pair back into a photon through the process of electron-positron annihilation, described later. Electrons are always in abundant supply in the environments in which positrons are created and so, as the energy of the environment and hence of the encounters reduces, such annihilations are highly likely.

Electron orbits: A negative electron is held in orbit around a positive proton by the attractive electrostatic force.

We'll see later that a proton's net positive charge is the result of its single 'extra' positron. In the context of electron orbits and electrostatic attraction, the proton can therefore be treated as being a single positron with the same surrounding p-neutrino cloud as a single positron. This p-neutrino cloud is densest close to the positron, and hence to the proton, and naturally thins further out.

As an orbital electron sweeps through this cloud, the attracted p-neutrinos transfer their energy to the electron and revert to zero-point quantum pairs. This results in an increased kinetic energy and hence higher velocity electron and so its orbit around the proton widens. However, as the faster moving electron then collides with quantum space quantum pairs at a faster rate, it creates more and higher energy n-neutrinos, resulting in an accordingly faster rate of electron energy loss and hence a reduction in the size of its orbit. At a certain point, these two effects create a balanced orbit.

When an atom forms, an electron is only attracted into orbit around a proton if the electron has sufficiently low kinetic energy and speed. If its incoming speed is very low, its trajectory takes it close to the proton where the p-neutrino field is densest and, as a result, it is rapidly energised and speeds up into a wider orbit. If, instead, its incoming speed is high, any resulting wide orbit quickly decays as a result of collisions with and rapid loss of energy to quantum space quantum pairs. As it consequently slows and moves closer to the proton, it loses energy to quantum pairs at a lower rate but then starts to gain energy from the p-neutrino cloud at a higher rate. At some point, the rate of energy loss equals the rate of energy gain and, as above, the result is a balanced orbit.

Multiple discrete orbital energy levels: If a nucleus contains two or more protons then its surrounding p-neutrino cloud is the combined clouds surrounding all its protons. An atom with two protons naturally attracts two electrons into orbit and the above process results in both adopting an equal but somewhat wider balanced orbit as a result of their higher energy in the combined and hence denser p-neutrino cloud.

An atom with three protons has three electrons but, as the atom forms and the third electron is attracted in, it is repelled by the combined n-neutrino cloud surrounding the two existing closely orbiting electrons. The electron accelerates away until, at a certain speed, its rate of energy loss to quantum pairs again exactly matches its rate of energy gain from p-neutrino collisions within the higher density 'three-proton' p-neutrino cloud. The result is then a new stable orbit at a wider radius.

At this wider orbit, any decrease in its speed would move it closer to the repelling inner electrons as well as closer to the proton and into a more dense and energetic part of the p-neutrino field, thereby, in both cases, increasing its energy and speed and hence returning it to the new orbit. Any increase in its speed would move it out into a less dense part of the p-neutrino cloud as well as increase its rate of quantum pair collisions, in both cases decreasing its energy and speed and again restoring it to the balanced orbit.

As long as there are two inner orbital electrons, the third electron's orbit is therefore stable at this second, wider radius.

For larger atoms with larger nuclei and more protons, the number of electrons orbiting in this second wider stable orbit increases in exactly the same way. However, as larger atoms form and the number of protons increases, the population and orbital density of negative electrons within this second level reaches a point where additional incoming electrons are again repelled and forced into a wider and faster orbit. This new orbit, as before, is stable at the wider radius as a result of the balanced higher rate of energy loss to quantum pairs and higher rate of energy gain from the larger nucleus's denser surrounding p-neutrino cloud.

The same process produces a series of possible discrete stable orbital levels around larger and larger nuclei, each containing, or capable of containing, increasingly greater numbers of higher energy electrons. Each level is then filled until the number and density of electrons within the available circumference reaches a maximum, at which point electrons attracted into larger atoms are repelled into the next higher orbital level. The increasing circumference at each successive outer level is therefore capable of accommodating substantially higher numbers of electrons than the level below.

As nuclei become larger and larger, their increasing numbers of orbital electrons progressively fill each orbital energy level from the lowest to the highest and the total population of electrons in the filled and partially filled orbits is characteristic of the number of protons in the nucleus.

Orbital energy and photon collisions: Any of the orbital electrons, at any orbital level, can be energised by a collision with a p-photon, which then reverts to minimally energised and flies away. If the energy received from the photon is sufficient to raise an electron's speed to the required threshold, it will jump to the next level. If that level is empty then, as the now faster-moving promoted electron loses energy to quantum pairs, it quickly reverts back to where it came from. If the level is partially filled then, because the vacated level now contains one less electron, the electrons in the higher level are all less repelled and the orbit of one of them immediately drops back to fill the vacated position.

If an electron in a large atom receives enough energy from the photon to jump more than one level then the same happens except that, as it reaches each next level, it is successively repelled outwards by the electrons in that

level until it reaches an empty or unfilled level. The vacated space, as above, is filled by an electron from its next higher energy level and that electron's position is then filled by one from its next higher level so that all the lower energy levels are rapidly and successively re-filled.

Meanwhile, as the original energised electron is successively repelled outwards, the total energy it gains from each of the successive outward repulsions is equal to the total energy lost by each of the repelling electrons as they move downwards and so the atom's net energy increase and therefore the electron's energy increase is simply the energy gained from the photon. If the photon's energy is too low, the electron will not reach the orbital speed threshold required to jump all the way out to a new stable outer orbit and, instead, 'replaces' a lower level electron whilst an electron in that and each level below moves down to fill the vacated position.

When an atom is energised by photon collisions, its electrons therefore move into higher orbits only if the photon's energy matches the minimum threshold to energise them from one discrete orbital level to any of its higher discrete energy levels. Because these energy levels are characteristic of the size of the nucleus and hence the number of protons and electrons in the atom, only certain specific photon energies produce these transitions and the spectrum of these discrete photon energies is also therefore characteristic of the size of the atom.

In all cases, an atom's energy increase as a result of photon collisions is only temporary because the promoted electrons, as a result of their faster speeds in the wider orbits, always quickly lose energy to quantum pairs and so the number and total energy of electrons in the outer orbital level quickly returns to the pre-collision status.

The number of possible levels for each size of nucleus has an upper limit since, at some point, an electron's increased kinetic energy would place its orbit beyond the effective range of the attractive electron-nucleus electrostatic force and so it simply flies away from the atom.

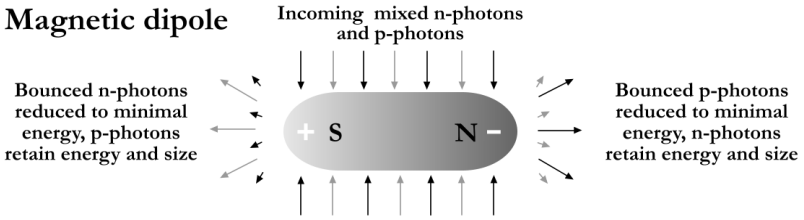
Photo-electric effect: When sufficiently energetic photons collide with the orbital electrons within the atoms of certain types of material, the electrons are energised and their orbits widened to a point where the electrons fly away from the nucleus. Photons below this energy threshold simply excite the electrons temporarily to a higher orbit from which they quickly decay back. This means that a low intensity beam of high energy photons will create the effect but a high intensity beam of low energy photons will not, regardless of the duration of exposure. The effect clearly demonstrates the particle rather than wave nature of light.

Magnetism

Magnets have a molecular arrangement that produces large numbers of embedded molecular positive-negative dipoles aligned, end to end, along one particular axis within the material, usually a metal or metallic compound. In line with the quantum spin convention adopted in this model, the negative ends of molecular dipoles are designated as North and the positive ends as South.

Low energy neutral photons, which are prolific within universal quantum space, travel great distances through magnetic materials and, as they collide with the negative ends of the dipoles, n-photons retain their energy whereas p-photons revert to minimal energy. Both then bounce away from the aligned dipoles in all directions but with the greatest combined flux

density naturally in the same general direction as the dipole alignment. The same happens at the positive ends of the dipoles, but as a vice-versa.



This produces a stream rich in energised (not minimal energy) n-photons emerging from the negative ends of the dipoles, and hence of the magnet, and energised p-photons emerging from the positive ends. The flux density of these very high populations of photons is greatest in the direction of dipole alignment and the stronger and more aligned the dipoles, the greater the effect.

In the same way that the electrostatic force is produced by the interaction of energised neutrinos from one body with the charged surface of another, the **magnetic force** between magnets is produced by the interaction of a p-photon or n-photon stream from one magnet with the N-S aligned charged dipoles in the other.

If the magnets are aligned as South-South or North-North then, as the emerging high density of energised photons with one central quantum polarity meets the same-polarity dipole ends in the opposite magnet, the photons' central quanta repel the same-charge central quantum of the electrons or protons in the dipoles and the magnets are forced apart.

If the magnets are aligned as North-South then, as the energised photons from each magnet collide with the opposite polarity ends of the dipoles in the opposing magnet and revert to minimal energy, the resulting attraction and energisation of the electrons or protons within the dipoles accelerates them towards the opposing magnet and the two attract.

Attraction/repulsion between conducting wires: When a current is flowing in a wire, then, as its electrons move through quantum space, the leading edge of each electron's central negative quantum collides with ambient photons at a higher rate than its trailing edge. As the photons bounce away, an increased proportion will then be moving in a direction which is generally similar to that of the electrons in the wire.

As we saw in the Photons section, these photons are a mix of energised n-photons with substantial effective axial local external charge and, because the electrons which are responsible for currents in a conducting material are slow-moving, minimally energised, axially near-neutral p-photons. In the context of the net attraction or repulsion between the two wires, we can ignore the effect of the relatively insignificant change in attractive force produced by the low energy p-photons.

If we have two parallel wires in which only one has a current flowing, then its energised n-photons bouncing off the other wire's stationary electrons and protons create a balanced equal and opposite attraction and repulsion between the wires, regardless of the energy of the n-photons. However, if a current is also flowing in the other wire, each wire's electrons are moving either obliquely towards or away from each other.

When the currents are in the same direction, the n-photons from one wire bouncing off the receding electrons in the other wire transfer less energy to them and hence produce a lower repulsive force. Because, meanwhile, the attractive force between the wires' n-photons and

stationary protons is unchanged, this results in a net increase in attraction and so the two wires are drawn closer together.

When the current flow in each wire is in the opposite direction, the n-photons transfer more energy and produce more repulsive force as they bounce off the approaching electrons in the other wire. This generates a net increase in repulsive force between the wires, forcing them apart.

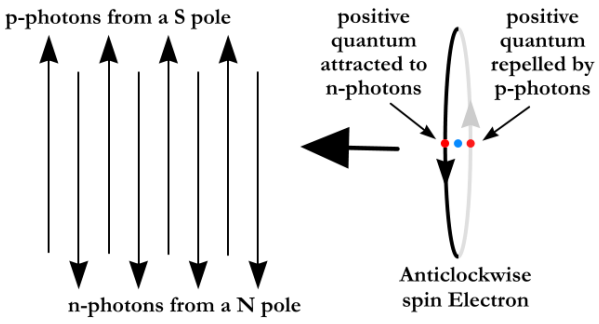
Higher currents, producing a greater density and energy of n-photons, and closer wires, producing less-oblique collisions with the electrons, both increase the degree of attraction or repulsion.

Magnetism and currents in free space: Unlike the slow-moving electrons responsible for the current in a wire, electron streams in free space move very rapidly and produce very substantially energised leading edge p-photon clouds. The higher the current and the faster the electrons, the greater the energy and density of their leading edge p-photon clouds. For two or more electron streams moving side by side, as the p-photons from one stream collide with the electrons in the other stream, the resulting attraction draws the two streams together. The final separation of the two is then a balance between this attraction and the electrostatic negative-negative repulsion of the electrons in each stream.

Path of an electron in a magnetic field: As earlier, an electron travels forwards as a transverse disc in the same direction as its orbital axis and with its outer quanta orbiting at the speed of light around the central quantum. Consequently, as an electron laterally approaches the equal and opposite n-photon and p-photon streams between two magnetic poles, there is a point in the orbit of each of its diametrically opposite speed-of-light orbital quanta where they are travelling parallel to and at the same speed as the photons. If the direction of travel is opposite there is, of course, no interaction but if the directions are the same there will be a weak and brief fundamental force attraction or repulsion, depending on their polarities, between the electron's orbital quantum and the photons' central quanta. This interaction is only brief because the circular electron quantum paths only fleetingly remain nearly parallel.

The schematic shows an electron approaching the combined n-photon and p-photon streams between opposing N-S magnets.

As one of the electron's positive speed-of-light orbital quanta is briefly travelling parallel to and in the same direction as the n-photon stream, it is weakly attracted to the photons' negative central quanta and so, because this happens only on one side of the electron's orbit, the orbit is tilted. Because an electron can travel only in the same direction as its orbital axis, its path is diverted and it is forced to move into the page. At the same time, the positive orbital quantum on the other side of the electron's orbit is travelling approximately parallel to and in the same direction as the p-photon stream, creating repulsion and so, again, the electron is forced to move into the page.



As the electron moves forward and further into the stream, the photon density increases and, with it, the frequency of successive attractions and

successive repulsions, resulting in an increasing degree of into-the-page force and hence diversion.

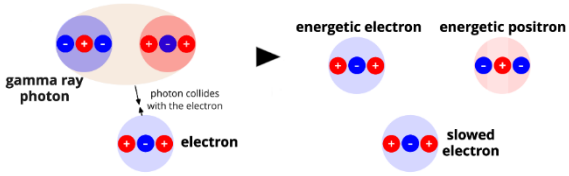
During this process, the electron experiences a very high number of weak fundamental force photon interactions, each of which is only fleeting because of the very short time the forward-moving electron's orbital quanta spend moving nearly-parallel to any particular same-direction and same-speed photon. Although there is consequently little or no effect on each of the high number of briefly-involved photons, the cumulative effect on the single electron of the very high number of successive weak interactions is substantial.

The lateral deviation is always in the same direction in the frame of reference of the incoming electron and so always produces anticlockwise motion, as viewed in the direction of the n-photon stream. Unless the electron has sufficient kinetic energy to fly away, this continuing attraction and repulsion of its orbital quanta to and by the stream maintains this diversion and the electron takes up a circular orbit within and perpendicular to it. The radius of the orbit is then a balance between the kinetic energy of the electron and the diverting force induced by the increasingly higher density of photons towards the centre of the stream.

Pair Production & Annihilation

Pair production: A photon's energy and hence its orbital size can be increased by colliding with nearly same-direction, opposite-polarity central quantum neutrinos or with approaching same-polarity central quantum electrons or positrons. In the latter case, the faster the electrons or positrons, the higher the energy of the bounced photon. In environments where high energy electron densities or electrical currents exist, photons can be very highly energised.

As their orbits grow in size and the triplets move further apart, their mutual fundamental force attraction decreases until a point is reached where a single additional collision with an energising electron or positron increases their separation to beyond the range of the fundamental force.



Pair production following a photon-electron collision

As earlier, the result is an electron and a positron, each of which immediately interacts with quantum pairs in the surrounding quantum space and generates a neutrino cloud. The outer orbital quanta in each of these triplets continue to travel in resonance with quantum space and hence now orbit around the central quantum at the speed of light.

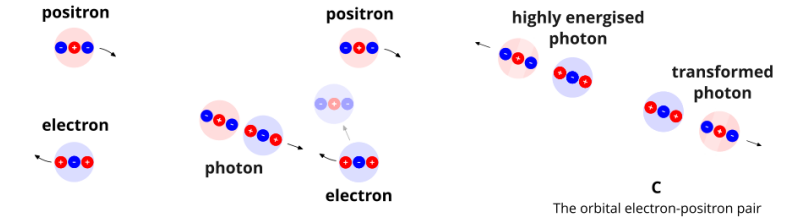
Pair production happens on a huge scale in areas of the universe where extreme electrical environments and currents produce large numbers of energetic neutrinos and electrons which quickly energise photons to their transformation threshold. The process is an essential part of matter creation which is covered later.

Electron-positron annihilation: Each of the abundant electrons produced when such transformations occur has a surrounding n-neutrino cloud and, similarly, each of the abundant positrons has a surrounding p-neutrino cloud so that the two particles are naturally attracted to each other. However, their high kinetic energy in the extreme, neutrino-rich

environments in which pair production occurs means that any orbit resulting from their mutual approach would be beyond the effective range of the electrostatic force and hence impossible.

However, outside of these extreme environments things are different. Electrons and positrons attracted to each other by the electrostatic force may then fall into a mutual orbit. If their energy is sufficiently low and hence the orbit is close enough, a direct hit from an external incoming n-photon on the electron, or a p-photon on the positron, will slow it enough to bring its orbit to within range of the fundamental force. The two separate triplet particles then immediately transform into a single, high energy, triplet-triplet orbital particle and, because this particle, a photon, is now net neutral and hence does not interact with quantum pairs to form neutrinos, it has zero inertial mass and instantly accelerates to light speed.

The now substantially energised triggering photon bounces away in one direction and the newly transformed photon in the other. The combined energy of the two photons is inevitably very close to the pair production threshold, which means that both resulting photons are highly energised.



A
Electron and positron in mutual orbit

B
A photon collides with the electron and is energised. The reduced energy electron moves to a closer orbit within fundamental force range of the positron

C
The orbital electron-positron pair transforms into a high energy photon and the energised incoming photon bounces away in the opposite direction

In environments where the electrons and positrons have low enough energy then, once within range of the fundamental force, they attract and immediately annihilate, without the aid of an intermediary photon. The outcome is then a single photon whose energy may be high (gamma ray) for the highest energy such collisions, or low (radio or microwave) for low energy collisions.

In all cases, electron-positron annihilation is only possible when the two approaching particles have sufficiently low energy. At high energies, they either simply bounce away from each other or fall into a mutual orbit which, until modified by colliding photons, is beyond the range of the fundamental force.

Matter Creation

The basic building blocks of atoms are positrons and electrons.

Both are produced in large quantities as a result of pair production in areas of extremely high electron energy and density in the universe. These areas occur within and along naturally occurring electron streams as a result of a phenomenon electrical engineers call **the 'Pinch' effect.** This happens when natural local variations in the energy of electrons within two or more closely separated streams produces an increased magnetic attraction which exceeds their electrostatic repulsion. The streams, which travel in a corkscrew path around each other (see Magnetism section) in a balance between their magnetic attraction and electrostatic repulsion, are then locally drawn more closely together, or 'pinched', and the resulting electron density at these points can become exceedingly high. Within these pinch points, successive collisions between the enormous numbers of

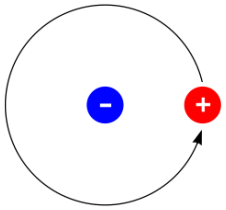
highly energised photons at or near their stable size limit and the now hugely increased density of energised electrons triggers large-scale transformation into electron-positron pairs.

Although the resulting positrons and electrons are attracted to each other, their high energy in the prevailing high energy neutrino and photon local environment means that they do not annihilate. Instead, with the help of 'seed' particles, the electrons and positrons aggregate into clusters.

To understand this, we need to consider the process of neutrino transition.

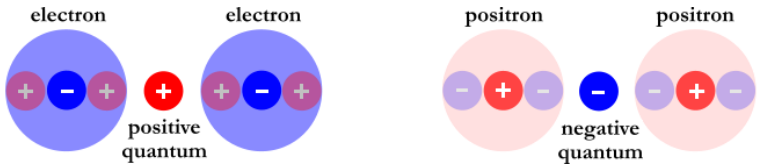
Neutrino transition: In very high electron density or high current environments, as speed-of-light n-neutrinos become increasingly energised by successive collisions with fast-moving electrons, their low-speed (not speed-of-light) orbits increasingly widen and their quanta move increasingly further apart.

Eventually, a single additional energising encounter with an electron widens the orbit to beyond the reach of the short range fundamental force and the net neutral neutrino instantly transitions into two separate opposite charge quanta.



Because the separated quanta are no longer part of a net-neutral structure, their net charge creates a stronger interaction with quantum space quantum pairs and, as both immediately drop out of resonance, they generate neutrino clouds. As a result, both quanta, one with a surrounding n-neutrino cloud and the other with a surrounding p-neutrino cloud, are electrostatically attracted to the prolific electrons and positrons in the high energy environment.

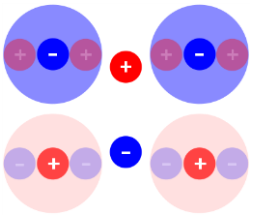
As the neutrino flies apart, the kinetic energy of either separated quantum is far too high for it to be drawn into orbit around any single electron or positron but, in the very high density and consequently close proximity of both, it is strongly attracted to briefly close-together pairs of electrons or pairs of positrons. As the quantum approaches the centre of charge between the two and is electrostatically attracted towards one or the other, it is repelled, when very close, by the fundamental force of the particle's same-charge orbital quanta. As it is propelled away, towards and increasingly electrostatically attracted to the other particle, it is then similarly repelled by that particle's same-charge orbital quanta and so ends up captured between them, bouncing between the two and effectively binding them together, as shown schematically below:



The incoming kinetic energy of the captured quantum therefore translates into vibrational energy as it is electrostatically attracted and repelled back and forth between the electrons or positrons and this vibration maintains an ongoing separation between the particles beyond the range of the central quanta's fundamental force.

In this high energy, high density electron and positron environment, these net positive and net negative triplet arrangements are highly stable and the high number of neutrino transitions means that countless numbers are created.

Cluster formation: Mutual electrostatic attraction between opposite net charge triplets then pulls them together to form the stable structure shown in the schematic:



The triplets are mutually attracted at a distance by their net external opposite electrostatic charge but, as they move closer, the central non-orbital electron and positron quanta within each are jointly electrostatically repelled by the same-polarity central ex-neutrino quantum in the opposing triplet. This electrostatic attraction and repulsion again creates vibration and, as the triplets bounce back and forth against each other, maintains a separation beyond the range of the fundamental force.

Because these structures can form only around the individual quanta from transformed neutrinos which then binds each triplet together, these quanta will be referred to as **seed quanta**.

The kinetic energy of each of the incoming electrons and positrons forming these structures has to go somewhere and it is this energy that creates the internal vibration and hence separation between the particles and so prevents annihilation as they aggregate.

The resulting structure, with all its internal electrons and positrons in a state of vibration, is therefore stable and, although net neutral at a distance, has a weak local external charge profile which attracts further positrons and then electrons towards it and a **cluster** starts to form.

Once the clustering process has begun, clusters continue to grow in size until they reach a size limit, at which point they become fully assembled **protons**. This process and the size limit of protons is explained below, in the Proton Assembly, Size and Stability section.

An explosion of matter creation: The environment which triggers the above process is characterised as follows:

- Extremely high electrical currents producing a high local density of electrons; each electron produces a neutrino cloud and the neutrinos within these clouds, through multiple collisions with neighbouring electrons, become highly energised.
- Huge numbers of resulting neutrino transitions.
- An abundance of increasingly energised photons, produced by collisions of ambient quantum space photons with highly energised electrons. These photons then transition into electrons and positrons as a result of pair production.

This simultaneous appearance of vast numbers of electrons, positrons and transitioning neutrinos, triggers a process of proton formation on a literally cosmic scale.

As more ambient photons collide with the rapidly increasing number of newly created pair-production electrons and positrons, more electrons and positrons are created, which generates more neutrinos and hence more neutrinos transitioning into seed quanta and we have a runaway situation.

Since there will always be overwhelmingly more electrons and positrons than the vast numbers of seed particle pairs produced, the process becomes both unstoppable and rapid. It is limited only by the naturally reducing density and energy of the neutrino clouds with distance from the initiating electrical current or local electron field or as a result of these currents or fields themselves reducing in energy and density.

At that point, any 'left over' electrons and positrons mutually annihilate into gamma ray photons. Any 'free' highly energised neutrinos (at the point of transition into seed quanta) revert to zero-point quanta upon collision with similar-direction, opposite central quantum polarity photons. Any partially assembled protons below the size limit, however, continue to grow into full-size protons as the energy of the environment reduces, as explained below.

The outcome of all this is therefore that, when high electron densities or electrical currents are created and reach a certain threshold, a large proportion of the local universal quantum space environment is progressively and rapidly converted from zero-point quantum pairs and low energy photons into high energy neutrinos and photons and from there to electrons and positrons which aggregate, as above, into embryonic protons. The transition of further neutrinos produced by the process creates a runaway situation producing an 'explosion' of protons and hence a huge burst of matter creation. The protons continue to grow as electrons and positrons progressively aggregate with the clusters and eventually reach a size limit at which point they become atoms, as covered below.

Without the transition of neutrinos into separate quanta, there would be no protons formed and therefore no matter in the universe. Instead, the above environments would merely result in huge gamma ray bursts as soon as the field intensity eventually reduces to a point where the electrons and positrons recombine, or 'annihilate', back to gamma ray photons. It is the transition of neutrinos within high energy electron environments and the consequent seeding of protons that becomes the game changer.

Proton assembly, size & stability

Proton growth: As above, all forming protonic clusters have an internal vibrational energy which maintains separation between the seed quanta and so makes internal electron-positron annihilation impossible.

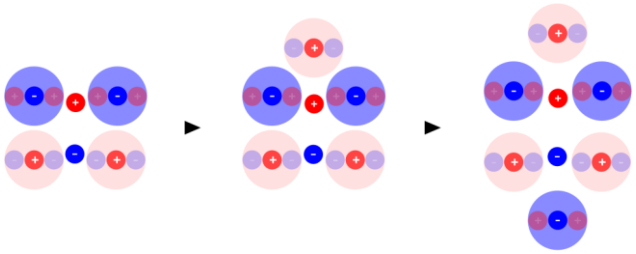
The environment which produces protons inevitably and necessarily includes vast numbers of high energy neutrinos and, as these neutrinos bounce off and are energised by a forming cluster's electrons and positrons, the resulting higher energy surrounding neutrino clouds makes the electrons and positrons more highly mutually attractive and repulsive. This means that the cluster's internal attraction and repulsion is significantly increased as a result of an external high energy neutrino field.

However, because this external field, in the electron rich environment, comprises predominantly n-neutrinos, it increases only the electrostatic attraction of electrons to positrons and the electrostatic repulsion between electrons. This is because, when the n-neutrinos collide with electrons, they are energised, making the electrons more attractive or repulsive, but when they collide with positrons, they simply revert to zero-point quantum pairs. The external field therefore increases the attraction of all the cluster's electrons to external positrons but has no similar effect on the cluster's positrons. This means that the overall local external charge profile of the net-neutral cluster is more attractive to positrons than to electrons.

As a result, the first particle to be attracted to the two-triplet cluster, described above, is always a positron. However, because the cluster is net neutral and hence with only a very weak local external charge profile, only positrons with very low relative velocity are captured, higher speed positrons simply fly on past. The impact energy as the positron aggregates

is therefore very low and means that the internal energy and resulting separations of the cluster's constituent electrons and positrons are almost unchanged. The outcome is therefore a net positive cluster whose internal electrons and positrons have a more-or-less unchanged mutual separation.

However, because the cluster is now net positive, it strongly attracts an electron and the force of this attraction results in a substantial increase in internal energy and hence vibrational separation between all the cluster's particles. This also therefore produces a growth in the size of the cluster.



The addition of the electron means that the cluster is now again net-neutral and again locally more weakly attractive to positrons than to electrons. As a result, another low energy positron is attracted in, making the cluster once again net positive.

This same process then repeats and means that, as a cluster grows by successive positron and electron aggregation, the positrons are always attracted into the cluster and retained, with little or no effect on the cluster's internal vibrational separations, but subsequently aggregating electrons produce successive, incremental increases in these separations. A point is eventually reached where the internal particle separation resulting from one more added electron would exceed the range of the cluster's internal attractive electrostatic force and hence its ability to retain it. Since the electron therefore cannot aggregate, it simply bounces away. As soon as this point is reached, further aggregation ceases.

The cluster then has one extra positron and, while the energy of the external neutrino field remains high, continues to reject further electrons. Although the mutual electrostatic force between the energetic and vibrationally separated constituent electrons and positrons in this high n-neutrino flux environment is weak, the cluster is 'just about' stable and has become a small proton.

Proton size limit: In the prevailing high current and high density n-neutrino conditions of proton formation, this maximum-size state is reached when the proton is still quite small, probably measurable in tens of electrons and positrons rather than hundreds.

As the density of the n-neutrino clouds surrounding the central current naturally diminishes with distance, a point is reached where an additional electron can again successfully aggregate with a proton. This is followed immediately by the aggregation of a positron, making the slightly larger proton again net positive and just about stable in the lower density n-neutrino environment. As the n-neutrino field continues to weaken with radial distance from the central current, positrons and electrons continue to aggregate and the core's outermost protons progressively increase in size. However, a point and distance is eventually reached where, however thin the central current's local n-neutrino density subsequently becomes, the internal energy of the large protons at the growing core's periphery remains too high for additional electrons to be able to aggregate and so they simply bounce away.

The outermost protons have now finally reached a maximum stable size at what has become the outer boundary of a huge protonic mass which is **a star**. Any further reduction in density of the n-neutrino cloud beyond this point now merely slightly reduces the protons' internal vibrational energy and so increases their stability. Electron-positron annihilation within the structure cannot happen because the internal vibration between its electrons and positrons and, in particular, between the positive and negative seed quanta within the proton's central triplets, maintains their separation to well beyond the range of the fundamental force. As long as each proton's minimum internal threshold energy remains high enough to maintain this separation, there is no danger of proton annihilation.

A star is therefore essentially an enormous protonic mass forming around the pinch point of huge initiating electron currents. Where the energy of the initiating current and pinch point is sufficiently high, the result can be a galactic core (see later).

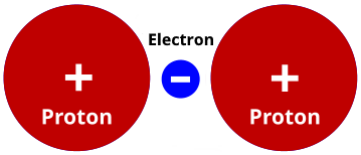
Formation of Atoms: All protons that have reached their 'just about stable' size at or near the outer boundary of a star have one extra positron and so are net positive. Although an incoming electron can no longer aggregate, if it has sufficiently low kinetic energy and some transverse speed, it will be attracted into orbit around the net positive proton.

This is impossible whilst the proton is small because all the electrons, energised by the high population of energetic p-neutrinos in the high-energy protonic core environment, would have an energy that is too high for an orbit. However, as the energy of the environment reduces within the star's outer reaches, the likelihood of an electron achieving and maintaining an orbit progressively increases. Although the initial size of this orbit is related to the electron's incoming direction and energy, it quickly stabilises, as explained earlier in the Electrons and Positrons section, and the result is a stable atom.

Proton structure: As previously, as the energy of the external n-neutrino field reduces to a minimum threshold, the proton finally reaches a maximum size. Since the laws of physics are the same everywhere in the universe, this n-neutrino threshold and associated proton size will always be reached at the same point.

The consequence of this is that all the protons within atoms throughout the entire universe are exactly the same large and stable size and with exactly the same number of constituent electrons and positrons. Apart, of course, from those that are still growing within stars, where they will be varyingly small and less stable.

Heavier atoms: As the energy of the external environment reduces and with a high density and proximity of protons, an electron with too much kinetic energy to form an orbit around a single proton may instead be attracted by the stronger combined charge of a closely neighbouring pair of protons and be captured into a proton-electron-proton arrangement, which is a deuterium nucleus.



As the energy of the external environment reduces further, this net positive nucleus attracts an electron into orbit to form a deuterium atom.

This cannot happen in a too-high energy external environment because the random motion and high relative speed of all the protons is too great for any two to jointly attract an electron and so only single proton atoms

are formed. However, as the protons slow, they increasingly capture electrons into the above arrangement.

As the energy of the environment reduces still further and protons' kinetic energies decrease, the same process progressively binds more and more protons together with electrons acting as the 'glue'. This produces larger and larger nuclei and, depending on how the binding electrons are shared, produces either isotopes or heavier elements. This means that the outer reaches of new stars comprise only the lighter elements but become progressively richer in the heavier elements as the star matures and the environment becomes less energetic.

Proton size: A net neutral neutron, which decays into a proton and an electron, is simply a temporary and unstable combination of a proton plus an electron created when one of the protons in a deuterium nucleus is stripped away. Both the proton and the neutron therefore contain 2 central seed quanta, each of which has the same mass as an electron or a positron.

Putting all this together and given that the experimentally measured mass of a proton compared to that of a neutron gives us a ratio of 0.99862, a simple calculation tells us that **a proton contains 361 electrons and 362 positrons plus 2 seed quanta**.

This is consistent with a proton diameter equivalent of approximately 11 electrons or positrons.

Muons and muon decay: Muons are one of the by-products of proton fragmentation in high energy proton-proton or proton-nuclei collisions. In either case, when the kinetic energy of two protons forces them together, there is a forced proximity of electrons with electrons and of positrons with positrons. In both cases, the n-neutrinos or p-neutrinos bouncing between the two same charge particles become highly energised and hence have a significantly longer mean free path.

As these highly energised neutrinos rapidly travel within the proton's structure, its component electrons and positrons are substantially energised, which significantly increases their vibrational energy and hence their mutual separation. The net result of the collision is therefore a brief but rapid enlargement of the gaps between the electrons and positrons within the local structure and this produces a contained fragmentation of one or both of the protons.

As the triggering highly energised neutrinos created by the impact quickly dissipate, the electrons and positrons re-attract and recombine into a number of smaller and equal size protonic fragments, some with an excess of one electron, an equal number with an excess of one positron and one slightly larger fragment which not only has an excess of one positron but also includes, temporarily, the original proton's seed quantum triplets.

The internal energy and hence inter-particle separations of these smaller fragments is substantially less than that of the original proton because, as they recombine, it does not include the kinetic energy contributed by each aggregating electron as the original proton was formed. As a result, the separation between all the electrons and positrons within the fragments decreases to beyond the point that ensured stability in the original proton.

Within the above slightly larger fragment, the reducing separation between the seed quanta triplets rapidly brings the seed quanta within range of the fundamental force and, as they consequently transform back into a neutrino, their associated triplet electrons and positrons immediately attract and mutually annihilate into photons. The central seed quantum

triplets therefore effectively 'disappear' from the larger fragment so that all the fragments are now exactly the same small size.

As the internal electron-positron gap sizes within the clusters shrink down, a point is reached where each cluster has the maximum possible electrostatic stability as a particle, but is also at the minimum size before the electrostatic force between its constituent electrons and positrons is superseded by the fundamental force such that they annihilate into photons. This transitional state of maximum stability and minimum size may explain why the proton fragments into these particular sizes.

The net negative fragments, each having one more electron than positrons are **muons** and the net positive fragments, each having one more positron than electrons are **antimuons**.

The mass of a muon is experimentally measured to be approximately $1/9^{th}$ that of the proton which is consistent with a proton fragmenting into 4 muons plus 5 antimuons.

The fragments are very short-lived with a lifetime dictated by the time taken for their internal vibrational energies to very rapidly readjust from the triggering high-energy neutrino environment to the new, low-energy neutrino environment. As their constituent electrons and positrons come within range of the fundamental force, they annihilate into photons.

When the muon decays, it therefore produces a number of photons leaving its 'extra' electron as a remaining single charged particle. The observed decay products are therefore an electron, many low energy photons and many neutrinos, generated by the initial collision. The antimuons decay in the same way as the muon but produce a positron rather than an electron amongst their decay products.

The decay products of such high energy fragmentation can therefore include muons, antimuons, electrons, positrons, photons and neutrinos. Events or experiments producing purely muon decays will not include positrons amongst the decay products and, similarly, purely antimuon decays will not include electrons. Higher and higher impact energy experiments will undoubtedly result in greater fragmentation with hard to predict outcomes. However, whenever elementary particles are produced, they will be as above.

Muon lifetime: Muons are also extensively produced when cosmic ray protons approach our planet at very high speed. As they pass through the weakly energised mixed p-neutrinos and n-neutrinos that are responsible for Earth's gravity, the very high frequency of encounters results in the muons' constituent electrons and positrons generating very high density clouds of highly energised n-neutrinos and p-neutrinos at their leading edges.

These highly energised neutrinos produce proton fragmentation in exactly the same way as described for the particle collision process.

However, the time taken for the fragments to decay is much longer than for the particle collision process because, in this case, the drop in the electrons' and positrons' internal vibration energy is not instant. The muon fragment, as it is created, still has very high speed and so, just like the original incoming proton, all its internal electrons and positrons continue to have high energy leading-edge n-neutrino and p-neutrino clouds. However, in generating these neutrino clouds, the electrons and positrons progressively lose kinetic energy and, as they slow down, so the density of their leading-edge clouds reduces.

The net result is that the muon's internal vibrational energy steadily drops, eventually to a point where its internal electrons and positrons move to within the range of the fundamental force and they annihilate into photons.

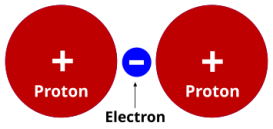
This means that a cosmic ray muon's decay time is purely a consequence of its internal vibrational energy progressively and naturally reducing as it is slowed in the Earth's weak surrounding neutrino cloud. There is no need to introduce complicating notions such as spacetime-related time dilation to account for what is a simple and natural physical process.

The Neutron

The electrostatic field and resulting attracting force between charged bodies provides the explanation as to how and **why protons and neutrons stick together**.

In one of the simplest of all atoms, the deuterium atom, a negative electron is attracted to and between two positive protons. The particles are attracted together until a balance is reached between the electron-proton attractions and the proton-proton repulsion, leaving the electron positioned between each proton.

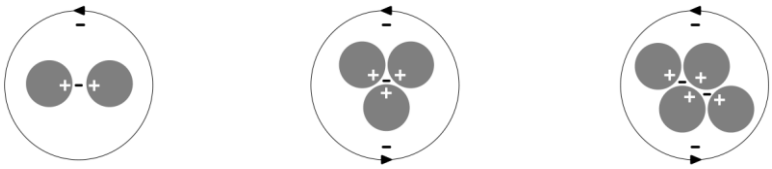
The electron thus acts as a bond between the two protons providing the proton-electron-proton arrangement that conventionally is called a neutron plus a proton. **A neutron is simply a proton plus an electron**.



Deuterium atom

The particles here are held together by the electrostatic force, not the much stronger fundamental force, and so the neutron is not an elementary particle.

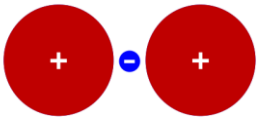
The binding configuration of protons and electrons depends upon the numbers of protons in an atom, as in the examples below:



Deuterium **Helium-3** **Helium-4**

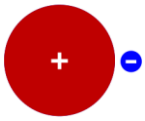
Neutron decay: A deuteron, which is two protons with a shared electron or, conventionally, a neutron plus a proton, is stable because the three particles are held in a balance between the mutual electrostatic repulsion of the two protons and the attraction of the electron to each proton.

Deuteron



The removal of either proton produces a neutron, which is actually a proton plus an electron.

Neutron



This 'free neutron' is not a stable arrangement. The electron is immediately attracted to the remaining proton by the electrostatic force but, as we saw in the previous section, cannot aggregate with it and is instead repelled.

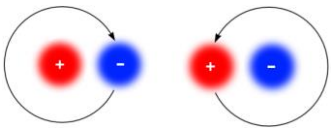
Its energy as it arrives from its standing start close to the proton is low and, as it is locally repelled at the surface with much the same kinetic energy as it arrived, it is again attracted when a short distance away by the net positive proton and pulled back towards it, only to be once again repelled. Because it is travelling through the proton's external p-neutrino cloud, it gradually becomes more energised and so, with each attraction-repulsion transit, its kinetic energy slightly increases, eventually to point where it escapes the proton's attraction and it flies off.

Because the electron arrives more-or-less perpendicularly to the proton surface, it has little-or-no transverse speed and so is highly unlikely to go into orbit. Its back and forth attraction-repulsion transits instead remain perpendicular to the surface.

The time taken for the electron to be finally repelled will be dependent largely upon the electron's initial approach velocity which will undoubtedly be influenced by the experimental method used to strip away one of the protons from the initial deuteron and subsequently monitor the results. However, in all cases the mean lifetime for neutron decay is experimentally observed to be around 15 minutes.

Creation

As quantum pairs randomly bounce around in all directions and orientations within universal quantum space, there are inevitably encounters in which three or more of their same-polarity quanta come together. As explained earlier, the result is the formation of minimally energised neutrinos and the random nature and high numbers of such encounters in an infinite universe means that, across the whole of universal quantum space, both p-neutrinos and n-neutrinos are produced in equal measure and in very large numbers.



A neutrino can only gain or lose energy through an encounter with an electron, positron or photon and so, in the early universe, before the creation and existence of any of these particles, the energy of all the neutrinos remained in this lowest original state. It is highly probable that a large proportion of the early universe comprised such low-energy neutrinos.

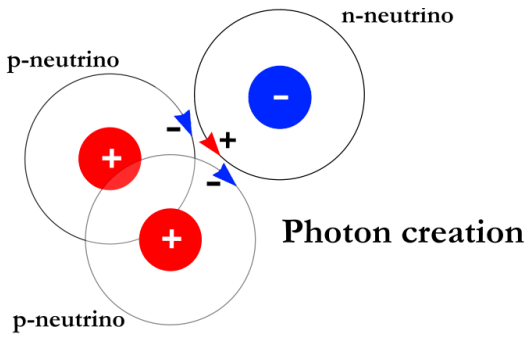
Creation of Photons: Eventually, their increasing population reached a density where, increasingly frequently, there were simultaneous random encounters between three such neutrinos and, if all were travelling in a broadly similar direction and one of the three had an opposite polarity central quantum and hence opposite spin, the powerful attraction of the fundamental force energetically engaging both their component central quanta and their orbital quanta transformed them from three separate orbital doublets into the dual orbital triplet arrangement which is the photon.

The only possible way that this can happen is if all the neutrinos have closely similar energy, so that their orbital quanta have similar orbital speeds and hence are mutually near-stationary within their orbital transits as the neutrinos come together. Additionally, the population density of these same-energy neutrinos has to be extraordinarily high in order to both generate an appreciable degree of random mutual neutrino-neutrino

bouncing and for the resulting bounce-rate to be sufficient to result in high numbers of neutrinos travelling in closely the same direction.

These were exactly the conditions in the early universe where the huge population of same-energy minimally energised neutrinos all had very low mean-free-paths of travel producing very high rates of encounter.

The process is illustrated in the schematic below. It shows two p-neutrinos and one n-neutrino travelling side-by-side into the page, all at the same speed and in closely similar directions. The arrows depict the neutrinos' orbital quanta and their orbital directions.



As the three neutrinos draw close, their outer orbital quanta, all travelling at nearly the same orbital speed and direction and hence with near-zero relative speed, are attracted by the strong fundamental force into a negative-positive-negative triplet arrangement with a positive central quantum.

At the same time, the two positive p-neutrino central quanta attract the negative n-neutrino central quantum to form another triplet, this time positive-negative-positive and with a negative central quantum. The fundamental force then pulls the two opposite polarity net-charged triplets together and, because the triplet with the positive central quantum has lateral speed as well as its speed-of-light forward speed, it goes into orbit around the other triplet to form a photon, in this case an n-photon.

An encounter between two n-neutrinos and one p-neutrino results, in exactly the same way, in the formation of a p-photon.

Although such encounters would have been relatively rare compared to the frequency of quantum-quantum collisions which produces neutrinos, the sheer numbers and density of minimally energised neutrinos meant that photons were created on a colossal scale.

Creation of Electrons and Positrons: Because photons have a virtually infinite mean free path and are energised by collisions with neutrinos, the randomly created photons of the early universe became rapidly energised within and by the huge population of minimally energised neutrinos. With no electrons or positrons in existence to transfer their energy to, their energies quickly reached the point where they transformed into electron-positron pairs.

The resulting first isolated electrons and positrons then collided with quantum pairs and naturally and progressively gave up their kinetic energy as they created surrounding neutrino clouds. This produced not only higher numbers of minimally energised neutrinos, which contributed to further photon production, but also higher numbers of energised neutrinos which contributed to more rapid photon energisation. As the energy of the electrons and positrons diminished, they were all invariably below the pair production threshold and so, whenever they met, they mutually annihilated into photons.

This means that, all over the early universe, electrons and positrons would have been randomly popping into existence and then disappearing.

However, as the population of photons increased, these electrons and positrons eventually started to gain energy from photon collisions at a faster rate than they lost energy to quantum pairs, rendering them 'permanent' and so increasing their population density. As the growing numbers of electrons and positrons collided with more quantum pairs, it produced an increasing population of energised neutrinos which in turn energised more photons which then transformed into more electrons and positrons creating a circular process resulting in localised highly populated regions where the numbers and density of energetic electrons and positrons began to grow rapidly.

Creation of Matter and Antimatter: As the slower electrons and positrons mutually annihilated, the magnetic fields generated by the faster particles drew them into randomly localised electron and positron currents. The neutrino clouds around even the most energetic of these early currents would have had insufficient energy and density to support proton formation and so, as the currents inevitably gave up energy to quantum space, many of their electrons and positrons mutually annihilated, producing more photons and hence more electrons and positrons whilst the currents themselves diminished to low energy streams of electrons and positrons.

However, as the increasing population of higher energy photons energised the electrons and positrons into more powerful current streams, randomly and very infrequently, two or more such streams happened to form sufficiently close together to magnetically attract and form a pinch point. Occasionally, this exceptionally rare coincidental event generated a particle density and surrounding neutrino flux energy sufficient to trigger seed particle formation and proton growth. With equal numbers of electrons and positrons in the environment, there was a 50/50 chance that these initial currents comprised pairs of either electron or positron streams, but due to the sheer improbability and hence low frequency of such an event, as well as their mutual electrostatic and magnetic incompatibility, never both. In our galaxy, these streams happened to be electron currents and, as a result, the protonic cores growing around the pinch point comprised positive protons, each with an excess of one positron. In other words, matter rather than antimatter.

As this positive protonic core grew to a substantial size around the pinch point, its increasingly large positive charge attracted in additional electrons from the external environment, increasing the size of the incoming core current. As the electrons in the incoming current were then energised at the pinch point by p-neutrinos from the protonic core, they were accelerated outwards on the other side of the core despite the cores' local inward electrostatic attraction. This produced equally dense and energetic entry and exit currents regardless of the core's overall inward attraction.

As the core and its feed current both grew, the matter creation process therefore became self-sustaining and the proton core grew to become a star. In all likelihood, in the early universe, the electron availability in the matter creation environment was insufficient for the core current to grow large enough to prevent a supernova. As a result, all such stars would most probably have disrupted into photons and neutrinos plus, importantly, huge additional populations of electrons and positrons. The process would then have repeated until the population density of electrons and positrons in the environment was sufficient to sustain a proton mass and core current large enough to produce a galactic core (see later).

In the extremely unlikely event of a positron current pinch point subsequently forming in the same environment, the high density of energetic n-neutrinos travelling out from the existing electron current would have either prevented or substantially limited electron aggregation into its net neutral clusters. The resulting negative core would then have been too small to sustain an appreciable core current which, as it gradually lost energy to quantum space, would have resulted in the loss of its pinch point and cessation of the proton creation process.

As soon as the formation of a matter galactic core had begun, the appearance of a growing antimatter core in the same environment was therefore impossible. The formation of a second matter galactic core in the same neighbourhood was also impossible because the necessary high densities of electrons would have been electrostatically repelled by the existing current long before they were able to form into a sufficiently large triggering current.

This means that, because either matter or antimatter galaxies cannot form or grow wherever the expanding neutrino cloud from an existing galaxy's core current remains substantial and because the formation of the initiating magnetic pinch point is such a rare occurrence, all galaxies are separated by huge distances. New galaxies can form only when the neutrino density around a distant existing galaxy drops sufficiently and these new galaxies can then be either matter or antimatter. However, while the neutrino density from the existing galaxy is still substantial, as above, these new galaxies are more likely to be the same, matter or antimatter, as the existing one. This means that, although the number of matter galaxies throughout the universe is the same as the number of antimatter galaxies, the two types are likely to be unevenly distributed within regions of either matter or antimatter.

Because both types of galaxy produce n-photons and p-photons in similar quantities, the two types of galaxy are indistinguishable to us as observers. Matter and antimatter galaxies would have opposite direction spirals but, without knowing their orientation within the universe, this would not help to tell them apart. Our observable universe may therefore contain entirely matter galaxies in one vast region, say tens or hundreds of billion light years across, or perhaps a mix of matter and antimatter galaxies within regions of just a few million light years across, or even a random distribution of individual matter and antimatter galaxies.

Matter and antimatter in the universe: The matter-antimatter asymmetry problem in physics is a problem created purely by the notion of a big bang.

In the model of physics presented here, matter and antimatter galaxies exist in equal numbers throughout the infinite universe. This balance of matter and antimatter is both logical and consistent with observation but in complete conflict with the currently popular notion of a universe created by an expanding singularity.

Star formation

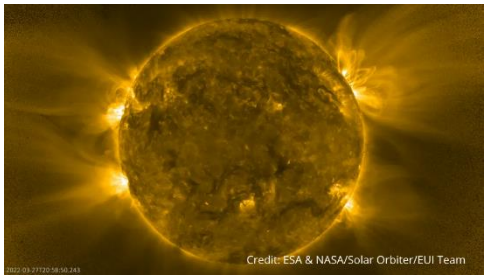
As above, stars are huge protonic cores formed around the pinch points of naturally occurring electron streams within quantum space. Within a star's outermost regions, many of the free electrons this far out now have sufficiently low energy to form orbits around the full-size protons, producing atoms. As the energy of the protons and electrons decreases with distance from the core current, the size and population of these

atoms increases so that the peripheries of larger stars, or of established stars with depleting core currents as they are electrostatically repelled away from the positive galactic core (see later), contain increasingly greater proportions of the heavier elements.

Also within this outermost region of the star, there is a reduced attraction between the negative charge of the star's core electron current and the substantially distanced outermost core protons and nuclei. The smallest of these particles, single protons and helium nuclei, which have lower mass and so are more readily accelerated, are preferentially repelled by their positively charged neighbours and ejected outwards and away from the star's surface. The natural local variability in proton and atom density within the outer region of the core means that these ejections, particularly those of the more massive particles, tend to be somewhat localised rather than uniformly distributed around the star. As a result, the smaller and more energetic particles stream away from these localised areas as somewhat diffuse flares whilst the larger and slower particles magnetically self-attract and form into well-defined streams.

However, these larger and slower positively charged particle streams do not generally travel far because all stars also have a substantial surrounding cloud of negative electrons. This is the result of the huge numbers of energetic electrons, created by electron-positron pair production at the core, which are not involved in the creation of protons as they travel energetically outwards and instead reach and emerge from the star's surface. As they emerge and are no longer energised by the core's internal p-neutrino clouds, they are slowed in the lower energy external environment by quantum pair interaction. Although many of the more energetic of these electrons continue to travel outwards, away from the star, huge numbers are electrostatically slowed or attracted back towards the star and mutually bounce around amongst their neighbours, forming a negatively charged cloud above and surrounding the star's surface.

As the positively charged particle streams are expelled from the surface, all but the most energetic are attracted back towards the surface by this negatively charged surface electron cloud. The overall result for the star is then a somewhat diffuse swirling surface layer of ejected but locally retained protonic material which, for our Sun we call the **corona**.



Depending upon the energy of the ejections, this process results in a retained surface envelope containing huge sporadic arcs of protons and larger nuclei as well as great flares of smaller protonic material as exemplified in this image of our local star.

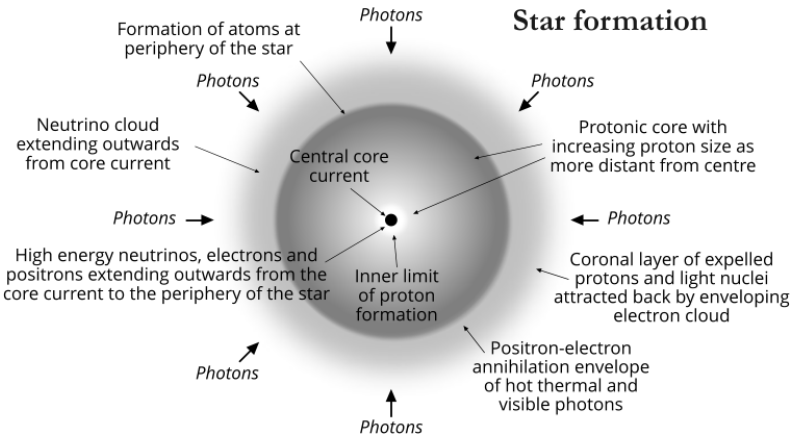
Meanwhile, the substantial population of outward-travelling energetic positrons created by pair production at the star's centre, whose energy was too high for them to aggregate with forming protons within the core, also emerge from the star's surface of energetic protons and atomic material into the relatively low energy external environment. As they are slowed by interactions with quantum pairs, they are strongly attracted to and mutually annihilate with the high population of low energy electrons in the cloud surrounding the star. The enormous population of resulting high energy thermal and visible photons created by this process produces a

substantial intensely hot layer within the corona and enveloping the entire star and **this is why all stars are both hot and bright**.

Many of the electrons and positrons emerging from the star's surface are sufficiently high energy to penetrate and emerge beyond this surrounding low energy electron-positron annihilation envelope. They then travel on over considerable distances and, as they are progressively slowed by quantum space sufficiently to mutually annihilate, they produce high energy photons in the visible and even x-ray range. Around our sun, we call this region the **transition zone**.

The annihilation envelope, in all stars, is somewhat non-uniform as a result of natural local variations in the densities of positrons making their way to and emerging from the surface and this results in localised regions of reduced positron-electron annihilation and hence fewer thermal and visible photons. Our Sun has a relatively low core current and a correspondingly thin annihilation envelope and where and when the photon envelope is thinnest, this results in the appearance of 'holes' where we can see through to the cooler star surface below. We call these areas **sunspots**.

All stars have a similar structure, as shown in the schematic below.



At the centre is the core current pinch point surrounded by a region of high energy n-neutrinos, electrons and positrons in a field extending all the way to the outer edge of the star. As the energy and density of these particles reduces with distance from the core current, they begin to form into protons, producing an extensive high density proton region which begins close to the core current for a small, low-current star, and further out for a large, high-current star and then extends right out towards the star's outer surface. The protons within this region start as small clusters and grow progressively larger with increasing distance from the core current, eventually becoming atoms within the star's outermost reaches. The entire star is then surrounded by an intensely hot envelope of high energy thermal and visible photons within a region of ejected and partially retained protons and nuclei which, in our Sun, is what we call the corona.

Galaxy formation

In areas of considerably higher electron density in the early universe, the enormous currents, with their hugely energetic pinch points, resulted in considerably larger protonic cores than those that produce stars. These enormous positive cores attracted in electrons from the surrounding environment and resulted in huge magnetically condensed laterally

incoming currents. The huge magnetic field generated by the immense central core current forced these laterally incoming currents into spirals and its electrostatic repulsion from both sides forced the spirals into a disc shape. Stars then formed around pinch points within the spiral currents to form the familiar spiral galaxies we see today.

Image credit: NASA/JPL-Caltech

Galactic cores have a similar structure to a star apart from a much wider and more extensive region of electrons and positrons between the core current and the start of the surrounding proton mass and, as explained under the Centres of Galaxies heading in the next section, a complete absence of atomic matter within their outer regions.

Also, all the electrons and positrons emerging from and surrounding galactic cores have too high an energy to mutually annihilate and so galactic cores do not have an envelope of high energy photons. Galactic cores therefore have low brightness compared to stars and are effectively invisible. However, the high energy electrons and positrons emerging from their surfaces create an environment that strongly favours the creation of new stars around the incoming spiral currents closest to the core.

When the first stars were created, the environment was highly favourable for them to grow to a large size and, as a consequence, they exploded as supernovae (see Matter in our Galaxy section, below) producing a proliferation of nebulae.

This would have been the fate of the majority of all large early-universe stars and it meant that the evolving universe at that stage would have contained substantial volumes of nebulae containing vast populations of electrons and positrons.

Such an environment was then a rich source of all the ingredients needed to create more matter. As local currents immediately formed from the very abundant nebula electrons, the largest were amplified as photon collisions resulted in pair production which generated significantly more electrons. The resulting enormous currents were then further concentrated and combined by their own surrounding magnetic fields and, at the points of highest electron densities, triggered the creation of huge protonic cores.

Formation of spiral galactic discs: As outlined above, the strongly positive external local charge profile of these cores then drew in electrons from the surrounding environment in all directions, but particularly strongly in a direction transverse to the core current, where the cores' positive external charge profile was greatest. The consequently rapidly moving incoming electrons' own magnetic fields mutually attracted them into a multitude of huge current streams which magnetically attracted into a smaller number of enormous multi-stream currents, all of which converged at the core.

Because the electrons in these 'transverse' currents were electrostatically repelled from both sides by the central core current, they formed into a disc shape around the core and, as they were drawn into the disc, they were also laterally diverted by the core current's enormous surrounding magnetic field. Because they continued to be increasingly strongly attracted inwards towards the central positive core and laterally diverted

by the core current's magnetic field, these incoming electrons travelled in a spiral path towards the core.

The net result was therefore a growing positive protonic core forming around a huge central core current and a number of smaller but still enormous transverse currents spiralling in towards it and constrained into a disc shape. Photon pair-production around the high-energy electrons in these spiral currents then resulted, as for the galactic core current, in them becoming somewhat self-sustaining.

More stars were then created around developing pinch points within these huge spiral currents, producing a spiral galaxy with strings of stars forming along the arms. Because all galaxies form in the same way, we can say that **all galaxies start as spirals**.

As the same process repeated right across the universe, more and more spiral galaxies appeared around the substantial developing electron streams. In the regions between, large isolated stars were also created as a result of the electron densities from the earlier nebulae and, at that point, the universe started to resemble the one we are familiar with today. The big obvious difference between then and now would have been the small size of all the galaxies and their highly defined spiral arms as well as the considerably more frequent flashes as individual stars went supernova.

Galactic expansion: Because all stars are positive protonic cores formed around the pinch points of a galaxy's incoming spiral currents, their electrostatic repulsion along their spiral currents and away from the central positively charged protonic galaxy core means that all galaxies are expanding. The core-star repulsion is greatest for close, newly formed stars, which have substantial protonic cores, and gradually reduces as, with reducing core currents further out, the stars develop a greater proportion of neutral atomic matter and so become less positive. However, even when the currents in the outer galactic reaches have all but disappeared, the outward momentum and (reducing) charge of all the stars means that even the outermost populations within galaxies continue to expand outwards.

Current conventional wisdom tells us that galaxies are the result of the weakest force in the universe pulling expanding regions of rarefied matter back towards itself to form immensely high gravity bodies made of hypothetical 'collapsed' matter. However, in this model, the opposite is happening. There is no large gravitational body made of dense, unexplained material at the centre of galaxies pulling matter inwards but, instead, their star-filled spiral arms are expanding outwards, away from a vast central energetic process of ongoing matter creation. This expansion is the result of electrostatic repulsion within a huge magnetic field. Gravity, some 10^{22} times weaker, is entirely irrelevant.

As a galaxy's core current eventually reduces or ceases completely, the electrostatic and magnetic fields which shaped the disc and spiral formations disappear. However, because the surrounding stars continue to be electrostatically repelled by the positively charged core and by each other, now in all directions, the spirals lose their shape producing what is called an **elliptical galaxy** (see Matter in our Galaxy section, below).

Galactic rotation curves: Because galactic spiral currents are simply electron streams attracted to the central core, or attracted to the mutually rotating twin cores in the case of a barred galaxy, **they do not rotate around the centre**.

When positively charged protonic cores form along multiple pinch points developing along the same spiral current, the resulting stars are repelled by both the positive galactic core and by each other. As new stars are then created close to the positive galactic core, they are strongly repelled by it and accelerated outwards, only to be decelerated as they catch up with and are repelled by the existing stars further out. Because the cores of all stars naturally develop an increasing proportion of neutral atomic matter and so become less positive as they move outwards, this means that stars move faster along the spiral near to the core and progressively more slowly further out.

Viewed side-on, this produces a component of velocity towards or away from us as observers that is much the same for the slower moving stars further out as for the faster moving stars closer in.

Despite the illusion of rotation, in fact none of the stars is rotating around the core, they are merely moving out and along its non-rotating spiral arms.

As a result and completely contrary to what would be expected with the gravitational scenario of spinning black holes and rotating spirals, **the 'rotation' curves for all galaxies are flat**.

Apparent galactic rotation: Because galactic cores produce only high energy neutrino clouds and not the weakly energised clouds responsible for gravity, galactic cores have zero gravity. However, the stars in galactic spirals have a substantial gravity as a result of the considerable proportion of atomic matter in their outer reaches and, as a result, gravitationally attract large amounts of neutral matter such as dust and other particulate nebula debris in from the surrounding environment. This dust is always present in the vicinity of galaxies as a result of prolific early nebulae.

As this dust moves inwards past the outward-moving positively charged stars and inward-moving electrons in the spiral arms, the particles develop both negative and positive static charge and, as they mutually attract into clumps, form into vast clouds around the spiral arms.

Messier 74 and its spiral dust clouds
Image credit: NASA/ ESA/ STScI/Aura (The hubble heritage team)

Gravitational attraction then accelerates the clouds along the spirals towards the densest populations of stars nearest to the core. The dust clouds are therefore moving inwards, away from their own trailing arms, as the large massive stars in the same spirals are moving outwards.

For galaxies that are viewed side-on, this dust movement produces a redshift and blueshift on opposite sides of the galaxy that **creates the false impression that the galaxy is rotating away from its trailing arms**.

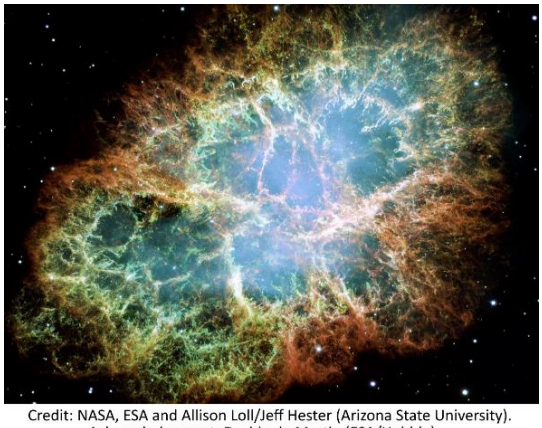
Because, as we saw in the Photon section, source objects such as stars do not produce direction-related red or blue shift, the observed shifts in galaxies is related solely to the motion of the spiral dust clouds which are invariably moving inwards, away from their trailing arms.

All the spiral arm stars in all galaxies in the universe are moving in the opposite direction, outwards, along the non-rotating spiral arms and

neither the dust moving one way nor the stars moving the other way are actually rotating around the centre.

Matter in the Universe

Supernovae and Nebulae: If a star's central core current is high enough, the surrounding proton mass may grow to a size where photons are unable to penetrate to the centre. Pair production and the process of matter creation will then slow or cease. As a result, the enormous numbers of high energy core-current neutrinos, now no longer moderated by their interactions with newly created electrons and positrons, continue to travel on into the existing surrounding high density of embryonic protons, increasing their internal vibrational energy.



Credit: NASA, ESA and Allison Loll/Jeff Hester (Arizona State University). Acknowledgement: Davide de Martin (ESA/Hubble)

As the photon supply continues to reduce, a point is reached where the internal energy of the small, just-about-stable core protons' constituent electrons and positrons exceeds the point where they are held by the electrostatic force and the protons fly apart. This energetic disruption generates large numbers of high energy positrons and electrons which have their own surrounding high energy neutrino clouds. As they collide with and similarly disrupt neighbouring just-about-stable protons, if their density is high enough, a chain reaction is triggered. The resulting very rapid disintegration and hence expansion of core protons into their component particles produces a huge explosion as the whole star is violently disrupted.

All nebulae are the result of these massive stellar explosions.

The debris from such explosions includes vast numbers of electrons, positrons and protons. Photons energised by collisions with the neutrinos generated around them produce radiation detectable at all energies including radio and visible light. As the positrons and electrons are attracted together, they annihilate to produce high energy photons so that, for most supernovae, the initial explosion produces a massive burst of gamma rays which gradually gives way to lower energy radiation as the frequency and energy of electron-positron annihilations reduces.

In a newly created nebula, the high population of energetic electrons, positrons and photons amongst the debris creates conditions which favour further star creation. The observed existence of stars within nebulae is then a consequence of these extreme electrical environments and is, of course, totally unrelated to the weak force of gravity.

Galactic Jets: Galactic jets are the result of the same initiating process that disrupts large stars into supernovae.

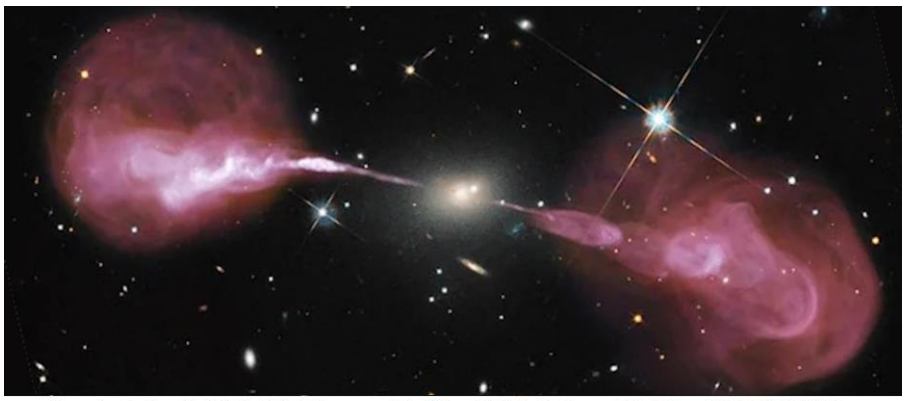
Both galaxies and stars have a region closely surrounding their core currents where the electrons and positrons produced by pair production are all too energetic to form into protonic clusters. As a result, the surrounding protonic mass is separated from the core current by a channel comprising high energy electrons, positrons and neutrinos. As the volume

of the protonic mass grows to a point where photons can no longer penetrate to the centre, pair production within this channel slows or ceases and the high energy neutrinos, no longer moderated by collisions with electrons and positrons, travel on into the proton mass and disrupt the protons.

For a star, which has a considerably lower core current than a galaxy, the channel is relatively narrow and the resulting highly energised electrons and positrons may have nowhere to go except further into the high density of protons, resulting, as above, in a supernova. However, for a galaxy, this channel is significantly wider and so a substantial proportion of the protons disrupted at its periphery fragment back into the channel rather than into the core.

This has two effects. Firstly, it means that the reduced population of newly fragmented electrons and positrons within and travelling into the protonic mass is now insufficient to cause a supernova chain reaction. Secondly, the huge numbers of highly energised electrons and positrons fragmenting into the channel create a rapid expansion within and along it and this expansion ejects them outwards with enormous velocity.

This venting ejection is therefore always along the direction of the central current and hence along the axis of the galactic disc. For all galaxies capable of producing such an ultra-high-energy event, the result is a beam of extremely high kinetic energy electrons and positrons which travels outwards in both directions for great distances.



Hercules A Credit: NASA, ESA, S. Baum and C. O'Dea (RIT), R. Perley and W. Cotton (NRAO/AUI/NSF), and the Hubble Heritage Team (STScI/AURA)

Within the beam, ambient photons collide with the neutrinos generated around the ejected high-speed particles and become energised across a wide range of energies from very low to very high, making the beam detectable at all energies including radio frequency and visible light. The beam eventually dissipates into a formless cloud as the electrons and positrons are slowed as a result of energy loss to quantum pairs and are then either scattered as they mutually repel or annihilated to low-energy photons as they mutually attract.

The outward-travelling and scattered electrons and positrons also electrostatically charge dust particles in the galactic environment as they move past them. Such particles are naturally created by earlier supernova events and therefore exist everywhere in the vicinity of all galaxies. The negatively and positively charged dust particles then mutually attract and clump together into larger particles, producing visible amorphous clouds around the expanding jets.

Galactic jets eject enormous volumes of material and the process continues until the core shrinks sufficiently for renewed pair production

to develop around the central core current. The core then begins to grow once more until it reaches a size where **venting recurs in an ongoing cycle**, as exemplified in the image above. As the rapidly moving energised electrons and positrons are forced outwards along the core current channel, they disrupt other small protons along the way and the higher the core current, the greater this disruption and the greater the volumes of ejected electrons and positrons. The period of time for the core to again grow to the point of venting is therefore longer for large, high current galactic cores than for smaller cores with lower currents.

Galactic jets, by venting energy outwards rather than inwards, effectively act as a kind of galactic pressure relief mechanism, preventing internal disruption of the protonic mass into its constituent electrons and positrons. Without this relieving process, a supernova would result.

Star life cycle: A star is the result of photons transforming, through the process of pair production, into electrons and positrons which aggregate into protonic clusters and grow into large, high density proton cores around the initiating huge electrical current. As the core in a newly-formed star grows, the protons within its outer reaches grow to a maximum size and increasingly start to attract orbital electrons, producing atoms of hydrogen. At the same time, the large numbers of core pair-production electrons and positrons reaching and emerging from the star's outer surface annihilate into high energy thermal, visible and often higher energy photons, producing the hot, bright envelope that surrounds all young stars.

During this early stage of a star's life cycle, internal electrostatic repulsion means that many of the smaller and more energetic protons at or near its outer periphery are ejected from the surface. This loss of material combines with ongoing venting of electrons and positrons from the core to produce the cyclic variation in core proton creation which is described in the next section on Variable Stars.

For all stars, the further they move away from the galactic centre, the lower and less dense their spiral arm core currents and hence the lower the degree of electron and positron creation at the star's core. The consequential reduction in energetic electrons and positrons flying outwards from the core means that the star's hot, bright outer annihilation envelope progressively thins and eventually switches off completely. The star then becomes a low-brightness **Red Dwarf**.

When this happens, the star remains dimly visible as a result of ambient photons being energised by collisions with energetic protons within the outer periphery of the star. This happens, of course, throughout the life of the star but the effect is invisible unless or until the star's outer annihilation envelope has disappeared. For stars which have lost this envelope but still retain a substantial central core current, their protons will be relatively energetic and such stars are the brightest of the Red Dwarfs. As the star moves outwards along its spiral and hence its core current reduces, not only do more of its reducing-energy protons attract electrons to form nuclei and atomic material but the remaining lower-energy protons progressively transfer less energy to ambient photons. The star consequently gradually becomes dimmer.

This also means that, by the time a star's annihilation envelope disappears, the star's outer reaches have already become relatively rich in multi-proton atomic material and so all Red Dwarfs generally have a high metallicity.

The spiral currents around a galaxy effectively exist for the lifetime of the galaxy itself and reduce in electron density and energy only slowly with radial distance from the galaxy centre. This means that, as Red Dwarfs move slowly outwards along the spirals, they remain dimly bright for extremely long periods of time.

Because stars only become Red Dwarfs in low core-current regions, they do not exist close to the galactic core but become more prolific further out. All galactic spiral arms are a collection of multiple magnetically attracted electron streams rather than a single current and, in our own particular spiral arm these are all relatively low current. This, and because we are situated about halfway out towards the edge of our galaxy, means that we are surrounded by large numbers of Red Dwarfs with varying degrees of brightness. Indeed, our own Sun, which already has a somewhat thin core electron-positron annihilation envelope, as evidenced by the periodic appearance of sunspots, will eventually join these many neighbours and also become a Red Dwarf.

Our sun is currently in the process of ejecting protons together with a low proportion of positively charged helium nuclei, both of which we detect as cosmic rays, and its outer core contains mostly hydrogen plus a substantial proportion of helium but only traces of the heavier elements. All this and the high numbers of ejected electrons and the extremely hot outer electron-positron annihilation layer within the corona suggests a healthy degree of ongoing pair production activity at the core. This means that, because its relatively small size precludes any chance of supernova, our sun has a very long way to go before outward motion along its galactic spiral reduces its core current to a point where slowed pair production causes the hot outer envelope to thin and eventually shut down and subsequent cooling starts to become an issue for us here on Earth.

The Sun is not a massive gravitational ball of hydrogen powered by nuclear fusion into helium, it is a protonic mass with an intensely hot external envelope powered by electron-positron annihilation. As a result and contrary to the outcome predicted by a gravitational theory of the universe, our sun will not suffer internal collapse followed by an expansion which engulfs the solar system. Instead, as above, its hot outer photon envelope will continue to warm the solar system until the star has moved so far away from the galactic core that this envelope finally shuts down.

Variable Stars: A variable star is a star whose brightness regularly changes. This happens as a result of cyclic changes in the mass of a star as its ongoing core pair production and proton creation processes increase its size to a point where, eventually, photon penetration to the core is limited and pair production reduces or ceases. This initiates venting, as above, but at considerably lower energies so that the electrons and positrons are expelled at a relatively low rate, low energy and in a more dispersed stream. External photons colliding with these streams are only minimally energised and hence, unlike the case with galactic venting, the streams are invisible. As the star loses mass and size by ejecting electrons and positrons from its core as well as continuing to expel protons and lighter atomic matter from its periphery, it reduces to the threshold size at which core pair production restarts. The process then repeats in a cycle.

For some stars, such as pulsars, which have a high proportion of photon-transparent atomic matter content and very high core currents, this cycle may be a matter of seconds whilst for other stars with a higher proportion of protonic matter and lower core currents, the cycle may be weeks (Cepheids), months, years (our Sun) or even decades (T Coronae Borealis).

The Centres of Galaxies: The huge numbers of electrons drawn into the positive galactic core along its multitude of transversely arriving spiral currents, after bouncing around amongst the high density of small forming protons and becoming highly energised, eventually fly off through the core's surface and so are returned to the surrounding environment. However, whilst within the core, their high energy n-neutrino fields combined with those generated by the core current, permeate the entire core. This limits the aggregation process of the forming protonic clusters and so maintains them at a small size throughout. As a result, the core cannot form into a star, which is a body that has low energy n-neutrino fields within its outer reaches which consequently produce large, fully-formed, stable protons and atoms. Instead, a galactic core remains as a huge body of small positive protons, stabilised by either ongoing low-energy venting or sporadic high-energy galactic jets.

Every galaxy has one of these immense high density protonic cores.

As positively charged stars in new galaxies are repelled outwards by the huge positively charged cores, pinch points develop within the huge galactic spiral currents and generate further star creation with the highest population density nearest to the centre, where the currents are strongest and populations of high energy electrons and positrons emerging from the core are greatest. As a result, the central regions of all galaxies are always densely packed with newly created stars arranged along the spiral arms near to and around the central galactic core.

However, there is a region immediately surrounding all galactic protonic cores where the enormous population of incoming spiral electrons and subsequently outgoing electrons produces a sufficiently high density of very high energy n-neutrinos to preclude any possibility of matter and hence star formation. All the pair production electrons and positrons in this outer region have such high energies that cluster aggregation is impossible. This results in a region densely populated with high energy electrons and positrons and their associated n-neutrinos and p-neutrinos, but little else.

M74 Galaxy. Acknowledgement: NASA/ESA/CSA/STSCI/JUDY SCHMIDT CC BY 2.0

When viewed from a distance, all galaxies therefore have a bright centre resulting from the huge population of newly created stars at the inner ends of its spiral arms, but, close up, the protonic core has a surrounding 'empty' region where, as exemplified in the remarkable infrared image above, there are no stars and, because gravity from the galactic core is zero (see Gravitational black holes, later), there is no dust.

All the electrons and positrons emerging from and surrounding high energy galactic cores have too high an energy to mutually annihilate and

so galactic cores do not have the envelope of high energy photons which, in a star, is produced by electron-positron annihilation. Galactic cores therefore have low brightness compared to stars and are effectively invisible. However, all photons travelling closely past it are energised by its surrounding neutrino cloud so that all the light passing through the empty central region is blue-shifted. Background galaxies can also be seen as a result of 'lensing' around the core, which is due to photon refraction (see Gravitational Lensing), and with their photons also energised by the high energy neutrino density in the region, these galaxies appear to be brighter and hence more of them become visible.

The powerful core current feeding the huge positive protonic core at the heart of every galaxy is naturally replenished and maintained as its high energy electrons initiate photon pair production. This produces both electrons and positrons with the latter flying away and gradually losing their energy to quantum pairs. The enormous electron current then naturally and automatically creates the conditions which lead to venting. There is consequently a close-to-zero chance of a galaxy going supernova whereas the likelihood of supernova for the large, growing and lower core-current stars within its spiral arms is much higher.

Gamma Ray Bursts (GRBs): When huge naturally occurring and mutually corkscrewing electron streams form a pinch point, this may result in the formation of a galaxy in the case of the largest currents or a star where the currents are smaller. However, if the resulting electron density is not quite energetic enough to produce the seed quanta required for matter formation but is nonetheless energetic enough for substantial pair production, then there will be an enormous gamma ray burst as the newly created energetic electrons and positrons collide and annihilate, but no associated matter creation.

Annihilation occurs in this situation because, in this environment where the currents are not energetic enough to produce seed quanta, the pair-production electrons and positrons have sufficiently low energy. This is unlike the case where electrons and positrons are produced around the larger and more energetic currents responsible for galaxy core or star formation, in which case the pair-production electrons and positrons are all too high energy to be able to annihilate.

The result is a massive burst of high energy photons, mostly gamma rays and x-rays, with an extended afterglow as the large population of electrons and positrons, with gradually diminishing energy, continue to mutually attract and annihilate.

As the energy of the annihilations reduces, the average photon energy also decreases down through visible light and into the radio spectrum. The natural lifetime of the initiating pinch effect pair production event is limited because, as the electrons in the mutually attracted currents give up their kinetic energy by generating the energetic n-neutrinos that result in pair production, they consequently slow and this decreases their magnetic attraction so that the current streams separate. GRB events are therefore of fairly short duration but can have protracted afterglow lifetimes.

Barred Galaxies: When magnetic pinch occurs within higher energy corkscrewing electron streams, then instead of simply a Gamma Ray Burst, as described above, the high electron density of the close proximity streams initiates matter creation. This can result in either a single central protonic core or two mutually orbiting and electrostatically repelling cores which are so close as to be considered a single core. Where the currents

are high enough, a galaxy may then form and it is likely that most, if not all, galaxies are formed in this way. The magnetic pinch, as in all stars and galaxies, is maintained as p-neutrinos from the protonic core energise the electrons in the pinched streams.

However, as the galaxy ages and the core currents reduce, their mutual magnetic attraction also reduces to a point where the magnetic pinch suddenly disappears. The enormous core currents then rapidly repel, forming two principal currents at their natural non-pinch separation which is now around rather than through the centre of the core protonic mass.

Although no longer passing centrally through the protonic core, the electrons in the separated currents are now immersed in its high density, high energy p-neutrino field and so are substantially energised. This triggers the formation of new pinch points, extensive photon pair production and matter creation once again, but now at each side of the original core. The net outcome is two additional protonic masses forming around the separating corkscrewing core currents and hence rotating around the original core.

NASA, ESA and the Hubble Heritage Team (STScI/AURA); Acknowledgment: P. Knezek (WIYN)

Because these new protonic masses are the result of individual and less powerful but nonetheless still pinched core currents, they are smaller than the remaining central mass and, as the currents and their associated mutual magnetic attractions continue to deplete, they separate further and move further away from it and from each other. This produces a lengthening of the combined and rotating system which is typical of such galaxies.

Although the central core continues to create protonic material as a result of pair production around its incoming but reducing density of spiral currents, this eventually shuts down as the core begins to internally self-repel and consequently both expands and sheds protonic material.

As the mutually corkscrewing core currents continue to weaken, the orbital protonic masses stop growing and eventually revert to stars. The ultimate result is then, typically, two major strings of stars meandering away from each other as a result of electrostatic repulsion.

Barred galaxies are simply aging orbital binary current galaxies and observations suggest that, in our region of the universe, they are far more prevalent than single-core galaxies.

Galactic core lifetime: All galactic cores are the result of photon pair-production around huge electrical currents followed by aggregation of the resulting electrons and positrons into protonic clusters which then grow

into immense protonic cores. In the considerably smaller version, which is a star, the protons within its outer reaches not only become larger than is possible in a galactic core but also start to attract electrons into orbit to produce atoms and larger nuclei. This does not happen with a galactic core because the transverse incoming currents, which are the galactic spiral arms, maintain the flux of n-neutrinos throughout the core at an energy level that is far too high.

As a galaxy's core current inevitably and eventually starts to diminish, the attraction of the protonic core to it naturally reduces and, as it does so, the undiminished mutual repulsion of its constituent protons results in the ejection of those furthest from the core's centre. The lower the current becomes, the greater the loss of protons so that the galaxy core increasingly shrinks. For some galaxies, this shrinkage is hugely exacerbated in the early stages by galactic jets which eject vast amounts of material. Combined with the loss of spiral currents, the result is a protonic core that eventually becomes a star.

By this time, the stars that had previously inhabited its spiral arms have all moved outwards, as in the previous section on elliptical galaxies, and so the aging galaxy becomes no more than a somewhat amorphous and expanding collection of stars.

Elliptical Galaxies: As a galaxy's core current eventually reduces or ceases completely, the electrostatic and magnetic fields which shaped the disc and spiral formations disappear.

However, the surrounding stars continue to be electrostatically repelled by the positively charged core and by each other, but now in all directions.

Image credit: ESA/Hubble & NASA and N. Gorin (STScI)

This initially produces an axial bulge at the centre of the galactic disc, where the density of repelling stars is greatest and then, eventually, a more spherical, amorphous shape as the whole galaxy continues to self-repel and expand. As in the image above, the disappearance of the core magnetic field also means that its resulting spirals lose their shape as stars and dust start to occupy the spaces previously between them.

The Intergalactic Medium: As photons are naturally created throughout the whole of the universe and are then energised by collisions with low-energy ambient neutrinos, pair production results in the widespread creation of electrons and positrons. Although their density within universal quantum space is extremely low, their numbers across the vast reaches of intergalactic space are enormous and these prolific electrons and positrons contribute to the enormous electric currents responsible for the creation and ongoing existence of stars and galactic cores (see Creation of Matter and Antimatter, earlier).

In addition to these particles, the frequent supernova events in the early universe plus the ongoing, less frequent supernovae in our present

universe mean that universal quantum space also contains a low density but nonetheless huge quantity of dust, molecular matter, free protons and, again, electrons and positrons. In locations where the latter particle densities are highest, we get the formation of stars and galaxies whose charged cores then attract current flows from neighbouring regions of high density electron or positron populations, producing a 3-dimensional network of galaxies interconnected by huge diffuse currents right across the infinity of space.

As electrons or positrons are consequently and inevitably depleted from certain regions, galaxies 'switch off' and, after an elliptical galaxy phase, their protons progressively lose energy until their component electrons and positrons self-annihilate and they evaporate back into photons. These photons then become energised by both low-energy ambient neutrinos and the higher energy neutrinos surrounding the dust and molecular matter in the environment and so the process of pair-production, matter creation, star and galaxy formation and occasional supernovae repeats forever and everywhere throughout infinite space. The interconnected intergalactic network is therefore a dynamic structure forming, disappearing, reforming and evolving shape and size in a state of perpetual change.

As described earlier, the high population but low density of dust particles around and between galaxies is both gravitationally and electrostatically attracted into and along galactic spirals as well as into galactic jets where, in both cases, it forms into larger clumps and then into vast visible clouds.

Also within this intergalactic space, free undisrupted protons from supernova events attract electrons to form atoms and nuclei of all sizes. Together with existing nebula molecular matter, this then produces regions containing a huge variety of elements and molecules which continue to expand outwards from the initiating supernova event to populate vast regions of the intergalactic space.

Far from being 'empty space', the intergalactic medium therefore comprises a network of huge interconnecting currents both attracting and threading paths through varyingly extremely low densities of large and small atoms, molecular matter and dust.

The cosmic photon background: The ongoing processes of photon creation from matter evaporation and neutrino-neutrino collisions mean that the overwhelming majority of photons in the universe are very low energy. Not only are such photons highly penetrative of all matter, which is why huge numbers are able to collide with the dipoles within metallic materials to produce magnetism, but they are also effectively undetectable. On top of this 'invisible' background population are the detectable, more energised photons produced as a result of interactions with matter and these photons collectively form what is known as the Cosmic Microwave Background.

The Cosmic Microwave Background: The so-called Cosmic Microwave Background is simply the result of huge numbers of photons gaining energy from electrons, positrons and neutrinos that originate from stars and star birth, galaxies, nebulae and all the matter created and variously distributed across the entire universe.

Such collisions produce photons with a range of energies. The least energetic are from collisions with universally ambient minimally energised neutrinos and from the low-energy neutrino clouds surrounding neutral matter. More energetic photons result from collisions with high energy

electrons, positrons and neutrino clouds within and around existing stars and more energetic still from areas of star birth. Because the neutrino clouds surrounding highly energetic sources can travel across vast distances of space before eventually giving up their energy to and consequently energising photons, these energised photons are observed in the spaces between the sources as well as around the sources themselves.

New stars and galaxies have formed, and are forming, throughout the infinite universe which means that the energised photons from distant 'invisible' galaxies are also contributing to the flux of photons in the spaces between observed sources. Because photons lose energy to quantum pairs as they travel over vast distances, the observed photon energy from these distant high energy events is much lower than for more local galaxies and, for the most distant of galaxies, will be so low as to be undetectable, which also resolves Olber's Paradox.

The result, therefore, is that wherever we look, in all directions, there is a flux of photons with a distribution of energies ranging across the energy spectrum.

Although detectors pointing at active galaxies will detect a higher energy distribution, in between these areas, which represents the majority of space, there is a low level hum of energised photons with energies centred in the lower part of the spectrum. The fact that the CMB is centred in the microwave range is absolutely no surprise. Not only should we expect the CMB to be much the same everywhere in the universe, but also we should have no reason to suppose that it will dim over time.

Quasar ghosts: Quasars are simply galaxies with extremely high magnetically pinched central core currents and accordingly huge protonic cores. As a quasar's core current eventually starts to disappear, the galaxy loses its spiral shape and becomes elliptical and the smallest protons that had been surrounding the core current are ejected, as described in 'Galactic Core Lifetime' above.

However, in this case, the very high positive core charge repels them with high speed and the protons fly away both somewhat attracted to the strongest remnant of the corkscrewing binary core current and, as high-speed moving charges, drawn together by their own magnetic fields. This produces a proton ejection stream which spirals away around the electron current stream, as in the image in the Elliptical Galaxies section, above., or, if some magnetic pinch still remains, a stream that follows one of the binary currents in both directions and so crosses over the galactic disc, as in the image below.

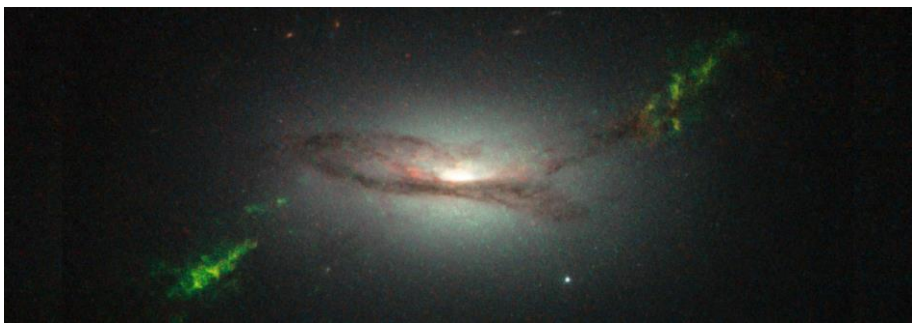


Image credit: NASA / ESA / W. Keel, University of Alabama

As these small protons move outwards and away from the core, their environment rapidly changes to one with a lower density and increasingly lower energy n-neutrino field. The protons consequently and rapidly grow to maximum size and then attract electrons into orbit to form atoms. The

high local density of protons and electrons in the environment then also results in large numbers of them combining, with electrons acting as the 'glue', to form larger nuclei and hence larger atoms.

Unlike the same process within a star, the ultimate size of these atoms is somewhat limited as a result of the relatively short time the rapidly moving protons spend in this 'combination' environment. As soon as the first small nuclei of the lighter elements have formed, they have sped on and into an environment where further combination is impossible. The characteristic green glow of quasar ghosts suggests that this combination process rarely produces atoms larger than oxygen.

The result of all this is the formation of huge meandering ejection streams comprising the lighter element atoms only and rapidly spreading outwards from the galaxy's core. Photons from the still bright central region then collide with these atoms and generate their characteristic emission spectra, with oxygen green responsible for their typically observed colour.

Circular Galaxy clusters: When huge corkscrewing electron streams are naturally produced in regions of high electron density, each individual stream, itself comprising multiple magnetically attracted sub-streams, may itself be sufficiently large to result in the formation of either a single galaxy or many along its length. In the latter case, this results in strings of corkscrewing galaxies within each electron stream and, viewed end-on, these will appear to be either circular arcs or complete circles, depending upon the numbers of galaxies formed along the current sections.

Binary Stars: Stars are formed around high energy electron streams and these, as explained in the earlier Gamma Ray Bursts section, commonly occur as corkscrewing multiple rather than single streams. The resulting stars are then formed at the pinch points of these currents as binary or multiple mutually rotating arrangements. Although the positively charged stars electrostatically repel, they are held in balanced orbits due to the magnetic attraction of the electron core currents around which they form.

Where the core currents are high and the pinch effect strongest, binary stars may be either effectively single-cored or very closely orbiting, almost touching doublets. For lower currents, or where the magnetic pinch effect disappears, they may be widely separated. As the core currents eventually gradually reduce, the mutually rotating stars move ever further apart.

Gravitational black holes: The idea of a black hole is that a neutral body, made of electrons and protons, can 'collapse' into some kind of higher density state which then combines small size with a gravity so strong that even light cannot escape.

However, the densest form of matter is an atom devoid of its orbital electrons, which is therefore a nucleus or a proton. We know from collider experiments that neither can be violently compressed into something denser without fragmenting and hence expanding into a less dense state.

Nor can they non-violently self-compress into a smaller structure without annihilating into photons (see Matter Evaporation, later). Although the highest possible density state for a body, if it could exist in isolation, would be as a conglomerate of positively charged protons or atomic nuclei, the powerful electrostatic repulsion of the particles would prevent their approach to within range of any hypothetical binding 'strong force'.

Even if such a body could somehow compact and hold together under the influence of such a hypothetical force, the neutrinos bouncing around

amongst its same-charge particles would necessarily all be very energetic and, because gravity exists only as a result of the very weakly energised neutrino clouds which surround neutral matter, such a body, whether small or large, would exhibit zero gravity.

A galaxy's hugely massive protonic core, stabilised around a huge central electron stream, produces only high energy neutrino clouds and, as a result, **all galactic cores have zero gravity**. Although stars also have protonic cores, the neutral atomic matter in their outer reaches generates weakly energised neutrino clouds and so their very large size and accordingly high peripheral matter content produces a very considerable gravity. The degree of gravity responsible for the inward attraction of a galaxy's spiral dust clouds is the result of the high population density of stars close to the galactic core and is unrelated to the core itself.

On a size-for-size basis, stars and galaxies therefore have much lower gravity than bodies comprising purely low energy neutral molecular matter and for all bodies, the smaller they are, the lower their gravity.

Summarising the above, not only is it impossible for an isolated neutral body to 'collapse' into a collection of protons or nuclei, but also such a body, if it could exist, rather than having enhanced gravity, would have no gravity at all. When the nature of gravity is understood, we can see that, contrary to the idea of a collapsed matter black hole, the highest possible gravity state for a body is actually as uncollapsed neutral matter.

When we also consider that gravity has no effect on light and so cannot 'trap' photons, we can categorically state that **gravitational black holes are impossible**.

The black hole is a purely hypothetical construct designed to support the notion that the weakest of all forces, gravity, might somehow be strong enough to form galaxies or maintain their dynamics. However, as explained within this model, there is no need for such constructs because galaxies are not formed by gravity.

The centres of galaxies are not gravitational black holes pulling stars inwards. They are highly energetic, positively-charged protonic cores repelling stars outwards.

Cygnus X-1: This star system is a strong source of X-rays and is considered to have provided the first major evidence for the existence of black holes. However, instead, it is simply the result of the natural diminishing, over time, of a star's core current.

The star in Cygnus X-1 was formed around the magnetic pinch between two huge corkscrewing electron streams. Each of these streams would have been the result of a number of smaller, magnetically attracted, individual streams and, as the currents naturally slightly diminished over time, the magnetic pinch suddenly disappeared and the two principal core currents moved apart from their pinch proximity. Unlike the case for a barred galaxy, where the hugely massive and substantially higher inertia galactic core stays in place, the result here, as the currents moved apart, was that the relatively low mass and low inertia star moved with and was retained by one of them. The magnetic pinch was then retained and sustained within the star's protonic core as its p-neutrinos energised the electrons in the currents.

This resulted in two huge magnetically attracted electron streams rotating around each other, in this case with a period of around 6 days, one with a star formed around it and one without. The rapid velocity of the star in its

resulting orbital path through quantum space generated and continues to generate a huge energetic neutrino cloud that substantially energises incident photons making it a source of X-rays.

The star's orbit is simply the result of the strong magnetic attraction between two powerful corkscrewing and hence mutually rotating electron streams and is not the result of its gravitational attraction to a hugely massive invisible object.

Neutron Stars: As earlier, a neutron is simply the proton-plus-electron part of a proton-electron-proton nucleus which can be created as a temporary, short-lived and unstable particle by stripping away one of the nucleus's protons. Neutrons do not naturally exist within galactic environments and, even if they did, because they are both net neutral and ephemeral, they would not aggregate into large bodies. Neither can mutually electrostatically repulsive net positive nuclei compact together and thereby, somehow, transform into electron-proton structures. **Neutron stars are therefore impossible**.

All so-called neutron stars are actually either pulsars, as described earlier, or large stars trapped into huge rotating electron streams and acting as a source of photons as described in the Cygnus X-1 section above. Although both types of star have varyingly huge associated magnetic fields as a result of their core electron streams, where jets are observed, these are the result of venting and not magnetic activity.

The Intergalactic Medium: As photons are naturally created throughout the whole of the universe and then energised by collisions with low-energy ambient neutrinos, pair production results in the widespread creation of electrons and positrons. Although their density within universal quantum space is extremely low, their numbers across the vast reaches of intergalactic space are enormous and these prolific electrons and positrons contribute to the enormous electric currents responsible for the creation and ongoing existence of stars and galactic cores.

In addition to these particles, the frequent supernova events in the early universe plus the ongoing, less frequent supernovae in our present universe mean that universal quantum space also contains a low density but nonetheless huge quantity of dust, molecular matter, free protons and, again, electrons and positrons. In locations where the latter particle densities are highest, we get the formation of stars and galaxies whose charged cores then attract current flows from neighbouring regions of high density electron or positron populations, producing a 3-dimensional network of galaxies interconnected by huge diffuse currents right across the infinity of space.

As electrons or positrons are consequently and inevitably depleted from certain regions, galaxies 'switch off' and, after an 'elliptical galaxy' phase, eventually (see later) evaporate back into photons. These photons then become energised by both low-energy ambient neutrinos and the higher energy neutrinos surrounding the dust and molecular matter in the environment and so the process of pair-production, matter creation, star and galaxy formation and occasional supernovae repeats forever and everywhere throughout infinite space. The interconnected intergalactic network is therefore a dynamic structure forming, disappearing, reforming and evolving shape and size in a state of perpetual change.

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Dark Matter: The concept of dark matter has been proposed as an attempt to explain how the weak force of gravity might be able to account for the formation of galaxies and their observed dynamics. The only possible way for gravity to achieve this would be if the universe somehow contained a hugely greater amount of massive material than is observed. Dark matter has been suggested as a fix for this problem.

However, this hypothetical new type of material appears to merely add further problems and complication to the situation. It does not have the usual properties of matter and it does not fit within the Standard Model or any other model of physics. Worse still, although its presence is required in sufficiently vast quantities for it to make up the majority of all matter in the universe, it manages to remain both invisible and undetectable.

Gravity, whether arising from real or imaginary material in space, is actually just a weak manifestation of the electrostatic force and it is the electrostatic force itself, some 10^{22} times stronger than gravity, that drives the dynamics and behaviour of galaxies. All stars have positive protonic cores and so mutually electrostatically repel along their galactic spirals rather than gravitationally attract. The resulting observed flat rotation curves of all galaxies do not indicate the presence of a mysterious new type of matter. Instead, they confirm the natural process of star formation along and around naturally forming electron streams. See 'Galactic rotation curves' earlier in the Galaxy Formation section.

So-called gravitational lensing is also considered to be evidence for the existence of dark matter. However, this is simply the result of refraction by the dense neutrino clouds around energetic bodies (see Gravitational Lensing, later) and is unrelated to gravity. Both behaviours are therefore readily explained by established, basic physics and without the need for hypothetical new forms of matter.

Dark Energy: Dark energy is a hypothetical form of energy that has been proposed to explain the notion that the universe is expanding in a way that doesn't fit the theory. The (accelerating) expansion is deduced from the observed red shift of distant stars and from the cosmic microwave background which together are interpreted as evidence of a universe spontaneously expanding from a pre-existing infinitely hot and dense singularity.

However, as earlier, the cosmic microwave background is simply low energy photons resulting from naturally existing charged and uncharged matter distributed across the whole universe. The simple explanation for the observed red shift of distant stars and galaxies and one that does not require a stretching of the spatial part of the universe's spacetime metric,

is that it is the result of photons losing energy to quantum space as they travel over vast distances.

There is no reason to suppose that the universe is expanding and still less to suppose that this expansion is accelerating. Hence there is no need to invent a theoretical new type of energy to try to explain it.

There is currently a huge amount of time, resource and valuable funding being expended in the search for dark matter and dark energy. So far, unsurprisingly, this has confirmed only that it's invisible and undetectable.

Hubble's Law: Hubble's Law is often cited as supportive evidence of a big bang. However, the parameters plotted in the famous graph of velocity against distance are, in reality, a plot of colour against brightness. Velocity is inferred from redshift which is assumed to be a Doppler type effect for light but is actually simply due to the distance light has travelled. Distance is, correctly, inferred from brightness although in some cases variations in brightness are also due to age or size.

The plot is exactly what we should expect from a non-expanding universe containing a mix of galaxies which naturally appear redder when further away because their light has travelled further towards us and so lost more energy to quantum space as a result of resonance.

Matter evaporation: The energy level of the atoms which constitute all matter is a balance between the energy lost to quantum pairs and the energy gained from both photons and the neutrinos in the clouds surrounding their neighbouring atoms. If the external source of energised photons is weak then the ongoing net loss of internal kinetic energy of the collection of atoms comprising the matter produces a cooling effect.

Cooling will continue until a balance is reached between the energy lost to quantum pairs and the energy gained from external energised photons or from nearby or surrounding matter.

As matter cools, the constituent electrons and positrons in a proton generally do not annihilate because its internal vibrational energy keeps its seed quanta apart. This energy is maintained by the density and energy of neutrinos originating both internally within the proton and externally from neighbouring matter or from local currents, plus the energy received from incoming ambient photons.

However, if atoms are isolated from neighbouring energetic matter and from any external electrical currents, the contribution from the external neutrino field will drop to near zero and so, as the internal energy reduces, all the separations within each of their protons will shrink. If also remote from any appreciable source of photons, then the constituent electrons' and positrons' ongoing loss of energy to quantum pairs means that each proton's internal vibrational energy depletes further. This resulting net loss of energy further reduces the gaps between the protons' internal electrons and positrons and between the central seed quantum triplets.

This eventually and inevitably brings the seed quanta to within reach of the fundamental force, at which point they transform into neutrinos and their mutually attracted surrounding electrons and positrons annihilate into photons. As the central seed quanta triplets consequently 'disappear', the mutual attraction of the surrounding electrons and positrons draws them into rapidly reducing orbits and to within range of the fundamental force, whereupon they also successively annihilate into low-energy photons. The final remaining 'extra' positron in the proton then either flies

away or annihilates when it is attracted to and collides with an electron that had previously been orbiting the same or a neighbouring atom.

Isolated atoms or protons therefore eventually completely transform into photons and neutrinos. Large nuclei, molecules and larger bodies of cold matter will take progressively longer to transform because many of the photons produced will collide with and re-energise the atoms and molecules within the remaining matter and so slow the process. However, all will eventually 'evaporate' as their protons transform.

This process cannot possibly occur on Earth because matter here is never sufficiently isolated from the neutrino clouds surrounding our local star or the electron streams feeding it. However, it is likely that matter at the extreme edges of all mature galaxies exists in such isolated conditions.

This means that whilst matter continues to be created at the centres of large galaxies, it is simultaneously disappearing at their extremities. As the core currents of galaxies and stars eventually deplete and the process of matter creation switches off, stars within the spirals continue to expand away from the galactic centre and eventually also evaporate into photons.

Stability and future of the Universe

When photons are naturally created from low-energy neutrinos, they immediately start to lose energy as a result of their resonant motion through universal quantum space. In the absence of matter, all photons therefore all eventually decay back, ultimately, to low energy neutrinos or zero-point quantum pairs. The resulting net population of photons in existence at any given time within the universe is then self-limiting because low numbers result in a proliferation of the low-energy neutrinos from which they are created and hence the population increases. Higher numbers then reduce the population of these neutrinos and hence their creation ceases. The universal population of photons is therefore fixed between these broad limits.

Because the process of matter creation requires the transformation and hence removal of photons, the amount of matter in existence must be limited by their fixed and limited availability. Too little matter and the resulting high photon population generates more matter. Too much and the resulting shortage of photons slows or halts further matter creation. The matter already created then gradually transforms back to photons until there are again sufficient photons around to generate more matter.

This means that the average amount of matter, in the form of stars and galaxies, which can exist within the universe is fixed and in balance between these broad photon population limits.

At or near the upper limit, not only do galaxies' protonic cores stop growing and galactic jets form, but also galaxies' core currents are no longer sustained by photon pair production and hence inevitably diminish and finally 'switch off'. This shifts galaxies from being net consumers of photons, as a result of their internal matter creation processes, to being net producers of photons as a result of matter evaporation. This process replenishes the supply of available photons and so, together with those naturally and continually being created from quantum space neutrinos, allows for further matter production, preserving and maintaining the balance of matter throughout the universe.

We see evidence of this process all over our visible universe. Aging and expiring galaxies are indicated by barred galaxies, elliptical galaxies and quasar ghosts, younger existing galaxies by their more sharply defined

spirals, galaxy formation by lensing and halos (see Gravitational Lensing, below) and the ongoing potential for new star and galaxy formation is indicated by Gamma Ray Bursts.

Instead of the bleak 'heat death' or the various singularity scenarios predicted by the current establishment theories, the model presented here suggests a balanced universe that will continue to recycle and recreate stars and galaxies forever.

Relative motion and a single frame of reference

The notion that the relative speed of a photon to both source and observer is constant, plus the idea that the universe is driven by gravity, led to the formulation, over 100 years ago, of a spacetime variant of physics to explain otherwise seemingly inexplicable aspects of cosmic behaviour. Although inconsistent with the model of physics designed around observed atomic and subatomic scale behaviours, this new spacetime model, designed to explain these cosmic scale behaviours, successfully did just that and, although incongruent with the other model, became accepted into the consensus.

However, contrary to the cornerstone foundations of the then new theory of Relativity, this paper asserts that the universe is not driven by gravity and that the speed of light relative to either a moving observer or to a moving source within stationary quantum space is not constant. The universe is instead explained by a much simpler and universally consistent physics based on real particles and forces. Although the impossibility of a gravity-driven universe has been covered earlier, as has the relative speed of light, an additional note about the latter is given below in the context of motion-related red/blueshift and gravitational lensing.

Constant speed of light: Because the speed of light is the result of photon resonance with stationary quantum space, all photons created at a source, regardless of its speed and direction, fly away through quantum space at the fixed speed of light. If the source is moving in the same direction as the photons, then their relative speed is lower than if the source is moving away.

Redshift and blueshift: It follows that, if we are stationary within universal quantum space, then radiation from rapidly moving stars or other objects will always travel towards us and be received at the same fixed speed of light. If we are not stationary, then any absolute speed we have will add to or subtract from the relative speed of the received photons but this only affects the brightness of the source and not its colour. This is because the energy of the received photons (ignoring resonance losses) is the energy they had as they were created and our relative motion as observers affects only the rate at which we receive them. If we are moving away then the source will appear dimmer and if we are moving towards it, brighter.

As explained in the Photon section, there is no direction-related red or blue shift associated with the motion of a source object such as a star moving at any given speed towards or away from us, but there is a shift when radiation from an external source bounces off a reflecting or scattering body moving through quantum space. This is because, as previously, photons bouncing off an object moving through quantum space gain energy from collisions with a forward-moving body and lose energy to a receding body.

This means that the photons bouncing off any object moving through stationary universal quantum space towards a stationary observer will be blue shifted and photons from an object moving away will be red shifted. A good example of this effect is in the blue and red shifted light observed from the dust clouds moving in opposite directions along the oppositely disposed arms of a galactic spiral. If the observer is also moving then the blue or red shift will be unaffected but the received light will appear to be brighter or dimmer depending on the observer's direction of motion.

Because the redshift/blueshift effect is produced only by photons bouncing off a moving body and is not produced by a moving source of photons, it means that, say, a galaxy's spiral dust cloud moving towards or away from us will exhibit blue or red shift but a source of light such as a star or collection of stars situated within those dust clouds will not.

Observations indicate that the light from all distant galaxies is redshifted. The current mainstream model attributes this to the essential presence of an unexplained, hypothetical form of 'dark' energy driving an accelerating expansion of the universe. Despite decades of searching, this dark energy has, of course, not been found and, as a result, other complex and largely mathematical alternative realities are now also being considered in an attempt to somehow justify the established model. However, the far simpler explanation, when the nature of light is understood, is that the observed redshift is due to resonating photons losing energy as they travel over vast distances.

Gravitational lensing

So-called gravitational lensing has nothing to do with gravity since light is unaffected by the weakly energised neutrinos responsible for gravity.

The effect is the result of refraction as the light from the 'hidden' galaxies is bent by the neutrino density gradient created by the very dense and highly energised neutrino clouds expanding away from the obscuring active galaxies.

As these neutrinos move axially outwards, the presence of their orbital quanta when moving around the central quantum in a direction towards the approaching photons, reduces the speed at which the tangentially arriving photons resonate and so the local speed of light within the cloud is reduced. Because each photon moves forwards through quantum space as a transverse disc, the forward resonant speed of its orbital triplet when within the thinner neutrino field on the side furthest from the galaxy is greater than when on the nearer side and so the beam is diverted inwards.

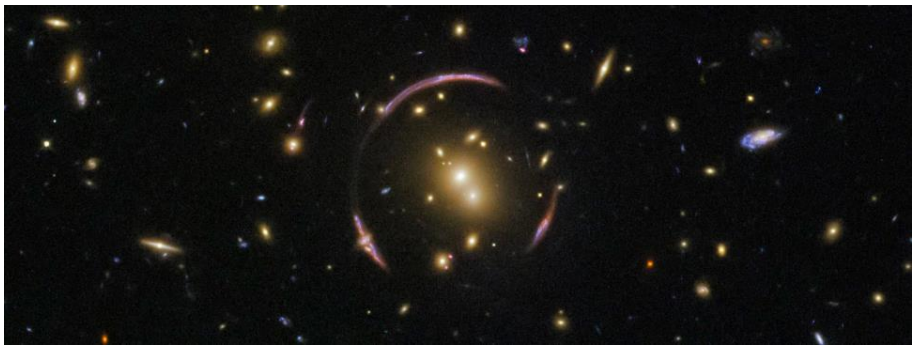
Although all background light is diverted, only the light arriving within a narrow angular range arrives at our vantage point which is why the diverted light appears as a halo.

A Horseshoe Einstein Ring from Hubble Image Credit: ESA/Hubble & NASA

As well as being refracted, the observed photons, as they pass on by the galaxy, are energised by collisions with those energised neutrinos that are

moving in a closely similar direction towards us. As a result, the refracted light from otherwise largely invisible background galaxies is blue-shifted as well as being somewhat focused, extending the visible range within and around the circumference of the halos and making them appear brighter.

The more electrically active the galaxy, the greater the range and the more energised the surrounding neutrino clouds will be and hence the greater the degree of refraction, the greater the energy of the photons and the wider the radius and apparent brightness of the rings. 'Electrically active' here means recently formed or currently still forming galaxies.



ESA/Hubble & NASA; Acknowledgement: Judy Schmidt, CC BY 4.0

The more distant the galaxy is from us, the smaller will be the angular range within which the diverted light reaches us, resulting in halos that are both thinner and less bright. However, in all cases, for high energy galaxies, the halos produced by their expanding very dense neutrino clouds will be hugely distant from the galaxy source itself.

All types of halos are a result of these very dense neutrino clouds generated by highly electrically active galaxies and none of them is related to gravity.

Optics and Quantum Mechanics

Because photons are particles, not waves, the early established wave explanations for optical effects such as total internal reflection, diffraction at double slits and polarisation through mutually oriented polarising filters were highly problematic. A solution was found within another version of physics, Quantum Mechanics, which replaces common-sense precepts such as local realism with a probabilistic version of reality. Because this new paradigm provided a means to mathematically account for the troublesome behaviours, it became firmly established within Quantum Field Theory and the Standard Model.

The Two Particle Model of physics, very differently, assumes the universe to exist as a physical rather than as a mathematical reality and, accordingly, explains all these problematic areas simply and logically in terms of real, measurable particles and forces and proven basic physics.

This then provides simple explanations for optical effects, including reflection, refraction, diffraction and polarisation, all the 'problematic' optical behaviours, Bell's Test, superposition and entanglement. These are all related to the behaviour of photons within the neutrino gradients at neutral boundaries and are a natural outcome of the Two Particle Model but not an essential part of it. As a result, and because the full explanations necessarily extend into many pages, they have not been included here within what is already a lengthy paper. For those interested, the complete model can be accessed via Ref 1 or, for specific elements of it, by contacting the author of this paper.

Conclusion

The Two Particle Model presented here describes and explains the universe in terms of just two familiar and precisely measured fundamental particles and one fundamental force. There is no need, in this model, for large numbers of hypothetical fields, forces and particles or incongruent mathematical versions of reality.

The model is simple, coherent, consistent and comprehensive and is based throughout on real particles and forces. Most importantly, it works. It works at all scales from the sub-atomic to galaxies and it is compatible throughout with common-sense, basic universal science-based physics and the huge body of existing observational and experimental data.

The current mainstream theories are based upon ideas established in the early part of the last century and, since then, most new ideas in physics have been largely aimed at trying to justify these old ideas. Huge amounts of time, money and intellectual resource are being spent in the process.

This paper instead presents a rational and consistent alternative explanation for the universe based upon proven reality rather than hypotheticals, upon simplicity rather than complexity and upon verifiable physics rather than bespoke theoretical mathematics.

Because this simple two particle model works consistently at all scales from the atomic to the cosmic whereas the current established models do not, my hope is that this paper might generate some discussion and debate. The outcome might then be the start of a process of rethinking that ultimately results in a complete theory of everything.

Ref 1: The Two Particle Universe, Paul G Leader, October 2025, ISBN 978-1-0683160-0-5. The complete Two Particle Model of the atom and the universe.
Ref 2: Experiment on the Relationship between Gravity and Temperature: International Journal of Physics. 2018, 6(4), 99-104. DOI: 10.12691/ijp-6-4-1