Why cosmic inflation is of loops not space, equal for charge families although different individually

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The current standard model of cosmology considers that space inflates and subsequently expands. The pre-fermion model proposes that instead it is the loops, which are the only directly observable objects in the universe, that expand in radius during inflation and which are then locked-in at the size that they attained after that inflation ended. Subsequent expansion is the physical motion of those inflated loops. The paper explains the model in some detail and concludes by comparing the calculations made in the Koide mass formula for the charged lepton loops with the same result using the inverse area of those same loops, implying that the loop structure is consistent with the mass observed. Also shown is that the total inflation across each charge family of loops, once adjusted for the 'missing charge' factor, is the same, at $1.44x10^{23} \pm 10\%$, despite the inflation of each loop along each of the three spatial axes being different.

Key words: Inflation; Loops; Pre-fermion model; Charge; Koide; Cosmology; Dark matter; Dark energy; Universe; Spacetime; Big bang; Charge families;

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I. INTRODUCTION

The current cosmological model [1] considers space to be something that can be inflated, as required by the big bang model [2] and then subsequently expands. It considers that there has been only one big bang (ignoring any bounce-related concepts) and that as a result the universe should be isotropic and homogeneous [3]. There are ideas and observations which tend either to support or reject these basic foundations, although recent observations of large voids [4] and very large multi-galaxy structures [5], amongst others, point towards the latter. These paradoxes, the reinterpretation of observations using the pre-fermion model [6] and the estimation of total inflation on all loops based on its loop structural hypothesis are the subject of this paper.

II. SIGNIFICANCE AND OBJECTIVES

The pre-fermion model will be used to explain that there have been, are, and will continue to be many big bangs throughout our only universe. No big bang, in this model, gives rise to a new universe, only an unmerging event within our only universe.

The model will also show that space cannot inflate. The foundation particles/anti-particles are of only one size and cannot change size, other than by adding or subtracting the energy of rotational or translational motion. It is the loop system that such particle/anti-particle pairs form – the only directly observable objects in the universe – that inflate in radius from formation at near the Planck energy and Planck radius.

The significance of the paper is in explaining why the universe is not homogeneous and how different rates of inflation during our big bang affected the loops formed differently based on their 'missing charge' fraction – although each family of loops has the same total inflation.

The objective is to show that the loop system produces the same family relationships as exhibited by the Koide formula [7], supporting the loop structure of matter, and to show how to calculate the potential masses of dark matter loops.

III. OUTLINE

The pre-fermion model [8] explains many of the cosmological and other paradoxes in a particle-based way. The model uses only one type of particle/anti-particle forming only one observable loop structure using only two energies, with emergent energies the result of that loop structure.

The basis of the model will be outlined by considering different areas and then its consequences for the amount of loop inflation will be considered. Each area is deliberately self-contained to a large extent.

The paper uses Double-adjusted Planck units (DAPU) [9] throughout where the DAPU Planck mass is related to the DAPU Planck charge by $M = Qc$, and the electron charge is $q = \sqrt{\alpha/2\pi}Q$ which is different to the SI value of the electron charge by the factor $\sqrt{1x10^{-7}}$. Where mention is made of Planck mass, it means the DAPU Planck mass of size $\sqrt{hc}$.

IV. THE PRE-FERMION MODEL

Model overview
The pre-fermion model proposes that fermions are not fundamental particles and that there exists a single type of particle and antiparticle, called a meon and anti-meon individually, and pairs when considered together, that are more fundamental and which, in numbers of pairs, form loops. Loops of three pairs are our fermions and loops of other pair number are dark matter.

In the pre-fermion model, since the meons and anti-meons are the densest particles that exist, nothing can break either apart. Therefore there can be no singularities and physics does not break down anywhere.

The model proposes that the same pairs, when partially merged, form the background to all relativistic motion – rather like spacetime but with each partially merged pair having its own individual time and space. All forces due to the energies of the meons and anti-meons, whether in loops or pairs, are transmitted by the background.

Gravity is the effect of the rotation of loops, whose meons and anti-meons each have chains of partially merged pairs attached, which sweep through the background attracting the background towards the loops, and vice versa. Each loop is its own Higgs-like particle, creating its own gravity effect within the background.

The unmerging of each partially merged pair results in both positive and negative one-sixth the electron size charge being generated, so that the loops and loop composites have equal chances of being overall positive or negative charge, resulting in there being no baryon asymmetry.

The interpretation of the acceleration of the expansion of the universe is hypothesised to be due to the difference in the component fractions of red shift observations, due to the viscosity of the background within our own big bang envelope versus those from outside it. Outside red shifts are due mainly to the effect of loss of energy by photons to the background, by its viscosity, over distance travelled, whereas inside our big bang envelope red shifts also include the relative motional flow of our big bang constituents.

The result is that our big bang envelope is smaller than currently interpreted and all our standard candles are mis-calibrated, with greater misalignment at greater distances.

The Universe
The pre-fermion model hypothesises that there is nothing separately physical in the universe except a myriad of the two fundamental particles, pairs of meon and anti-meon, in six different forms. Fully merged (1) as zero mass black holes (ZMBHs), they are the material from which the universe is initially composed. As partially merged pairs (2) that form the main background through which all objects move, other than when in the quantum environment - which latter excludes the background. The background produces a viscosity against which all objects move and lose energy.

On unmerger of a pair (3), each spins about an internal axis (‘twists’ to differentiate from loop spin) and generates either positive or negative one-sixth the size of the electron charge, always totalling zero for an unmerging pair.

Partially merged pairs and unmerged pairs form chains (5) by catching onto other similar pairs, and chains catch onto their own tails to form loops (6). Loops of three pairs are our fermions and loops of other pair number are dark matter. Once pairs are no longer ZMBHs, they are always in motion.

The meon and anti-meon have Planck size fundamental mass and charge, positive and negative respectively, within a spherical Planck radius. Negative fundamental mass is completely symmetric with positive fundamental mass in that both attract the same type, but chase, or are chased by, the opposite type in a Bondi-like [10] action.

There is only one universe because there is only one size of the fundamental meon and anti-meon, and one composite loop form. ZMBHs unmerging enable loops, boson stacks, nucleon stacks and atoms. Nothing thus produces something, although the total mass and charge energies are always zero for all systems.

There are only two sizes in the universe, other than the loop sizes (‘masses’) which were locked-in by loop inflation, which are the Planck size of the meons and anti-meons and the fine structure constant, a function of the energy needed to unmerge partially merged pairs.

The laws of physics are the same everywhere and could not be any different because of the dimensionalities of properties, the consistent size of the meons and anti-meons everywhere in the universe and the maximal density of the meons and anti-meons ensuring that no composite formed from them can form singularities.

Particles
The pre-fermion model hypothesises that the only directly observable ‘particles’ are loops. The actions of the partially merged pairs of the background are observable in the energy lost in motion within the background. The properties of the loops are the sum of the properties of the component meons and anti-meons in the loops and of their interaction with the background.

Symmetric loops, the leptons (except asymmetric neutrinos), can be observed without the need for balancing by other loops, but can stack with other balanced loop stacks. Asymmetric loops, the quarks (and asymmetric neutrinos), require other asymmetric loops to produce a balanced stack. Stacks of loops are mesons, bosons and baryons.

The Higgs scalar boson [11] is just a stack of loops like other zero spin bosons. Each loop is its own version of a Higgs particle in that its rotation produces the effect of gravity proportional to its rotational rate - its mass – and size of overall loop 'missing charge' factor.

The summation over a three-pair loop of the one-sixth electron-size charges on each meon or anti-meon produces the total loop charge of, positive or negative, zero, 1/3, 2/3 or 1 electron charge size.

There are chains of partially merged pairs attached to each meon and anti-meon in a loop which sweep through the background and produce, by the dragging effect, the attraction that is called gravity. The mass energy of the loop rotation is ½ hw and is the same size, but opposite type, to the loop spin energy.

Changes to loop sizes can move loops between families. An electron taking sufficient frequency from a photon or neutrino can change into a muon. It is the change in loop radius that changes the loop mass and magnetic moment.

Loops built from twisting meons and anti-meons pairs always have the same size of charge in zero or ±1/3 electron charge size steps.

Red shift

Viscosity energy lost by meons and anti-meons in loops takes two forms which result in red shifts in photons.

1 Photon double-loops, that is a loop and an anti-loop merged together and rotating in the same sense, lose angular frequency (rotational rate) as they translate at light speed through the local background – called viscosity red-shift. Viscosity red shift requires the rethinking of how much, or whether, dark energy exists and the size and age of our big bang.

The shear viscosity of the background is inversely proportional to the volume of the meons and anti-meons, not the loop size. This means that a photon loop, with its six meons and six anti-meons merged into six new partially merged pairs, composed of previously unmerged pairs, suffers the same viscosity regardless of the loop radius. The result is that the energy loss of photons is frequency-independent, except at near Planck energy.

It is frequency-independent tired light that is responsible for the viscosity red shift of photons that is proportional to distance travelled by the meons and anti-meons, not by the photons. This viscosity red shift has not yet been accounted for in observations of cosmic red shifts, and leads to the expectation that objects are much closer than currently calculated.

2 In the other form of viscosity energy loss, non-photon loops would lose energy, that is rotational rate, except that they interact with photons in order to take frequency from the photons by stacking (absorption) and release (emission) so that they continue to maintain their frequency, which was locked-in by inflation in our big-bang.

The non-photon loops also lose energy as they translate through the background partially merged pairs, which, whilst refreshed by photons during travel and when again stationary within the background, will have a locked-in phase difference compared to when they were previously stationary.

The background takes the energy from these loops into forms of additional rotation, vibration or motion of the background partially merged pairs, basically heat, so 'mass' would be lost in the absence of photons that would otherwise refuel those loops.

The speed of light c is the maximum local velocity at which a meon or anti-meon, or a pair, can travel against the background, balancing viscosity forces against the mass chaser/chasing force between meons and anti-meons that have formed new partially merged pairs in the two photon component loops. Motion subject to this limitation is relativistic. Light speed c in metres per second depends on the local density of the background, which itself depends on the local masses present. Where there is a dense enough mass, light speed could be zero.

If a loop is not passing through the background, it is not limited to c and will not lose energy due to viscosity so exists in a quantum mechanical environment, producing non-locality with speeds above c.

The viscosity of the background underlies relativity, the arrow of time, electric charge generation and the second law of thermodynamics.

Spacetime

In the pre-fermion model, there is no overall spacetime. Each loop, and each meon/anti-meon partially merged pair is its own spacetime. A volume of many loops and pairs will have an average spacetime inversely proportional to the mass energy within. The overlapping of the partially merged pairs, and their chains, within the background produces both a continuous medium and a source of indivisibles for transferring all forces in the same way.

Spacetime does not exist for the universe as a whole. There may be average times across volumes of space, but time exists only within loops for bodies composed of loops. Time for particles composed of loops did not exist before loops formed. Time exists mainly in loops and when a loop breaks as it falls into a black hole it loses all time and reverts to a chain.

General relativity requires time because it depends on the frequencies of loop rotations. Quantum mechanics does not require time because its non-local effects are outside the background partially merged pair environment and are reversible in time.

Before loops formed, there was no time in our sense since there were no loops, or composites formed of loops, existing to observe. Partially merged pairs' rotational, vibrational or motional activities form the main background, alongside myriad zerons, but only affect the specific partially merged pairs themselves.

There are three levels of time – outside the partially merged pair background, which has no time, partially merged pair motion/rotation/vibration and loop time.

Other failed big bangs may have had their own times, but will have lost them when their loops broke as a black hole formed and broke the loops into chains.

There is no time inside a black hole since it is a chain star, so no loops in general, except at the surface where high frequencies symmetric photons, can form stably and escape. So black holes eat time, but are not home to singularities, because there are none. Quantum mechanics cannot exist within black holes, only at their surfaces.

Big bangs

A big bang in the pre-fermion model does not create a new universe, but occurs within the only universe.

Our big bang is one of many throughout the history of the universe. Failed big bangs are studded throughout the universe as isolated black holes and collapsing galaxies. The success or failure of a big bang depends on the amount of inflation of loops that occurs along the three dimensional spatial axes. The mix of two axes defines the size of each type of loop inflated in that plane, so there are three families of loops.

There are only two sizes in the universe, other than the loop sizes ('particle masses') which were locked-in by loop inflation, which are the DAPU Planck size of the meons and anti-meons and the fine structure constant, a function of the energy needed to unmerge the background partially merged pairs and produce one-sixth electron size charges for the meons and anti-meons. There are only three spatial dimensions so there are only three families of fermions and no evidence exists of any more.

If the amount of loop inflation of a big bang is sufficiently large, the resulting loops will be large in radius, so small in mass. The energy released by this amount of inflation will drive a large expansion away from the centre of loop inflation, acting on small mass loops. In this scenario, gravity will be unable initially to overcome the subsequent expansion.

If the amount of loop inflation is not sufficiently large, the resulting loops will be small in radius, so large in mass. The energy released by this amount of inflation will not be enough to drive a large expansion away from the centre of inflation and it will be acting on large mass loops.

In this scenario, gravity will overcome the subsequent expansion and the loops will collapse over different timescales to become black holes or slowly collapsing galaxies. Many black holes and galaxies are these failed inflation events. Isolated black holes with no surrounding matter would prove that they were such failed inflation events.

Inflation is of the loop sizes, not the size of the meons or anti-meons, so our big bang is moving through the pre-existing background in which failed big bangs should be observable as having 'wrong' red shifts for their positions relative to objects co-moving within our big bang expansion. Where there are two seemingly physically conjoined galaxies that have different red shifts, one will be part of our expansion and the other part of the pre-existing universe or a failed big bang which occurred during our own expansion but is not part of our flow.

The difference in red-shifts for these objects at the same distance from us will enable the calculation of the relative motional rates and the age of our big bang. Since we are unlikely to be at the centre of expansion, there will be significant uncertainties in the calculation, but our relative position within our big bang may be estimated eventually.

The unit size of meons and anti-meons means that space cannot be expanding in the accepted sense of all distances increasing. The observance of expansion in this sense is due partially to the viscosity of the background producing a red shift in photons which has not yet been taken into account.

There will be a change in average red shift gradient versus distance starting from the extreme point of our big bang's current expansion. The average red shifts being a mix closer in due to both viscosity and the motion of our expansion itself and further out solely with viscosity. The existence of the viscosity red-shift will necessitate reconsideration of our current standard candle calibration.

Big bangs beyond the current envelope of our own will be observable as extreme red shift objects. There will probably be failed big bangs within our big bang envelope whose discordant red shifts compared with adjacent galaxies which are part of our big bang flow will enable their identification.

If the fraction of red shift observations due to viscosity is high, it is possible that the net red shift of our own big bang components will show it to be collapsing, or expanding more slowly than previously calculated.

The distance at which the Hubble rate changes in size is probably where our big bang envelope ends, so that red shifts beyond that point will be pure viscosity red shift, ignoring the very small local transverse relative velocities.

This set of red shifts will enable the calculation of the actual average viscosity red shift effect on photons over distance and will help in estimating the real Hubble rate for our big bang.

Failed big bangs beyond our own big bang envelope will look like galaxies that have grown too quickly for their lifespan from the start of our big bang. Such large early galaxies will have no relationship in time with the start of our big bang.

The twist/charge $qc^3/6$ energy sizes will be the same in any big bang because they depend on the size of the meons/anti-meons and the fixed energy needed to unmerge them. The maximum speed of light c will also be the same in any big bang because the partially merged pairs are always the same size.

Other failed big bangs may have had their own times, but will have lost them, if they collapsed significantly, when their loops broke as a black hole formed and broke the loops.

Mass
In the pre-fermion model, mass is the effect caused by the rotation of the meons and anti-meons in a loop, each of which has chains of partially merged pairs attached that drag through the background. The rotational frequency of the loop produces what we call the size of the mass and that rotational energy is equal in size and opposite in type to the spin energy of the loop. Each loop, with its chains dragging through the background is like its own Higgs particle where the Higgs field is like the background of partially merged pairs and zerons.

The mass that we observe a loop to have is also proportional to the 'missing charge' factor of that loop. The square of the loop radius will not be, apart from the charged leptons which have no 'missing charge', directly inversely proportional to the loop mass. The quark observable masses are changed by the factor $(1 - \frac{missing\ loop\ charge}{maximum\ loop\ charge})^{0.5}$ so that needs to be included in the calculation of the loop radius.

The result for the electron is that, with no missing charge, the factor is 1, whereas a symmetric neutrinos, which is missing all its charge has the factor zero. The situation for the asymmetric neutrinos is unclear, but may allow a partial mass to be shown.

For the three-pair quarks, the factors are 0.8165 for the $1/3$ charge family and 0.5774 for the $2/3$ charge family.

Dark matter loops will have further factors depending on the pair-numbers, but the high and low charges will have the same factors as the electron and symmetric neutrino.

This gives a pointer to what the observable masses and charges of dark matter may be, despite the difficulties in actually being able to observe them. The gravitational masses and spins will be identical in size to our three-pair fermions since those energies depend only on the rotational rates of the loops and their inflation rates are likely to be the same as our fermions families overall, even if not individually the same.

Zero point energy
Another form of stacked matter/anti-matter loops is a zeron - like a photon but with zero spin. This is a spin +½ electron stacked with a spin -½ positron, or vice versa, with total spin zero - opposite rotating loop and anti-loop. The zeron has the lowest stack energy of any loop stack and zerons exist centred at all points in space at all concentric radius sizes. Zero point energy is multiple concentric shells of zerons centred at every point in space and may be considered part of a form of Higgs field along with the partially merged pair background.

The existence of zerons means that 'pair creation' is not a quantum mechanical effect.

Pair creation
Pair creation is the temporary separation into loop and anti-loop of a zeron that has been impacted by another loop, or loops, of appropriate energy (frequency). The loop pair always exists, but is hidden, as zero point energy, until impacted. Pair creation is effectively the temporary un-stacking of a zeron.

Zerons are also one reason for the Casimir effect [12]. Any zerons of greater diameter than the distance between two parallel plates cannot exist between the plates and have to be moved aside, creating a pressure at the plates.

Black holes
The pre-fermion model proposes that there are two types of black hole.

1 Meons and anti-meons are the densest black holes of Planck size mass and charge, and of Planck radius size, which cannot be broken into smaller units and so there are no singularities and physics does not break down anywhere - even inside the second form of black hole, the massive type.

2 Massive black holes are the second type of black hole, where ZMBHs, partially merged pairs, chains of partially merged pairs and unmerged pairs, and, at the surface of the black hole, loops exist. They are not black and photons form at their surface to escape.

All massive black holes are identical in their composition, although not their total mass, charge and spin. As a loop enters a black hole, a loop whose plane is not parallel to the local hole surface will experience differential gravitational and charge fields that stretch and eventually break the loop into a chain.

The ex-loop's attached/surrounding background chains of partially merged pairs and the chain itself enter the black hole and its 'mass' increases because the local background density is larger and the mass energy of the rotational rate of the loop, due to the fundamental masses of the meons and anti-meons, is absorbed by the hole. The same is the case for the fundamental charge energies that produce the 'spin' energy of the loop, so that this energy is absorbed by the hole in a changed spin overall. The one-sixth charges on each meon and anti-meon in the chain remain with those meons and anti-meons inside the hole, as do their fundamental masses, one-sixth electron size charges and twist energies.

The result is that, by the time the ex-loop gets to the massive black hole horizon, all its rotational energy has been absorbed by the hole, but the chain retains its individual meon and anti-meon properties. The latter are available, after breaking into/reforming into other chains within the hole, to become symmetric double-loop photos at the surface of the hole to escape perpendicular to the black hole surface, if the rotational rate is high enough - although such a photon will lose most of its energy in escaping.

A massive black hole is mainly a mass of chains forming, breaking and reforming. A black hole is really a chain star. All black holes are the same, whether pre-existing failed big bangs, or formed in our successful big bang, because they break symmetric and asymmetric loops into chains, then shorter fragments, and spit out very symmetric photons whose frequency of exit depends on the mass of the black hole. Regardless of the loop sizes or pair number formed in the failed big bang, the result of being broken into chain fragments means all black holes are identical in their components.

Massive black holes transform loops preferentially into dark matter photons since 2-pair loops are more likely to form than 3-pair loops. The need to leave perpendicularly means that the physical size of the black hole cannot be observed. For an observer, the photons being viewed are those that escaped along their line of sight and no photons from other parts of the black hole surface can be observed simultaneously.

Black holes act as symmetry sieves, taking in all symmetry loops and converting them to symmetric photons, both matter and dark matter versions.

Where a failed big bang has occurred, the loops formed during inflation have too large masses and not enough energy of expansion to resist gravity. In some instances, the loops formed will break into chains as the contraction occurs to form a black hole. In other instances, where the amount of inflation is larger, galaxies will form.

It may be possible for single symmetric loops to escape from the poles of axial rotation of a rotating black hole because the extra rotation at these two points may aid the formation of loops and their subsequent motion away.

Inflation

The pre-fermion model proposes that inflation is in loop size, not space, because the meons and anti-meons which constitute the background material of the universe cannot change size – their fundamental mass, charge and radius are all 1 in DAPU. At the initiation of a big bang, myriad partially merged pairs are unmerged and form chains, then loops, at near Planck energy.

At some point during unmerger, the loops physically impact together, slowing rotational velocities, so that, in order to retain the mass angular momentum of the meons and anti-meons within the loop at a size of Planck's constant h, the loop size inflates.

With three spatial dimensions, the inflating loops would rapidly diverge in orientation into the three planes formed by those axes. The result is that there are three generations of loops, each formed by the different inflation rates within each of the planes and each loop's overall family charge.

The loops can change generation by transferring frequency between them – either directly between same charge loops – or by stacking/unstacking of photons or neutrinos/anti-neutrinos. In such a transfer, the mass and spin energies alter together and the magnetic moments will change.

For the electron, the amount of inflation is the difference between its current radius and its radius near the Planck energy, which for an electron is a volume change of approximately $(4.95\ x\ 10^{8})^{3} = 1.21\ x\ 10^{26}$, although the section below on differential loop inflation shows the amount to be an average of $1.44x10^{23}$ across all loop families.

The energy released by the change in loop sizes was available to move the loops away from the centre of their big bang as expansion.

Gravity

In the pre-fermion model, what is called gravity is the effect of the rotation of a loop on the background, and vice versa. Mass is the observable effect caused by the rotation of the meons and anti-meons in a loop, each of which has chains of partially merged pairs attached that drag through the background. The rotational frequency of the loop produces what we call the size of the mass and that rotational energy is equal in size and opposite in type to the spin energy of the loop. Each loop, with its chains dragging through the background is like its own Higgs particle where the Higgs field is like the background of partially merged pairs and zerons.

The effect of the fundamental mass of the meons and anti-meons is like gravity to some extent in that it attracts the same mass types, but between opposite mass types has the chase/chased action. The chase/chased effect acts directly between meons, between meons in loops and between meons in adjacent loops.

The chase/chased effect is a different form of potential energy, a ‘relative’ potential energy, because its direction of action depends on the relative position, or change of separation, of objects. The active and passive mass energies are the same size, but their direction of motion depends on the relative positions, of meons and anti-meons starting from rest, or on the change in separation between loops.

There is a difference between the continuity of action of gravity between loops and partially merged pairs. In loops, unless within a tunnel where there are no partially merged pairs available to transmit the rotation of the loops, the partially merged pair chains attached to the meons and anti-meons are continually sweeping through the background.

For partially merged pairs, their internal motions of vibration, rotation and translation will produce intermittent mass and charge fields as the pair change their merged fraction. The result is intermittent gravitational and electromagnetic fields produced by the pair.

Rather than the action of partially merged pair chains attached to loops sweeping through the background, this gravity effect is directly to other partially merged pairs, acting to form short or long chains as the fields decrease or increase, but is not only attractive. This type of gravity effect is due to the relativistic potential energies of the pair acting on other pairs and can have no net effect, net attraction or net chase/chased action.

The tunnel ends, formed as the start of entanglement of loops, effectively transfer the sweeping partially merged pair chains of those loops onto themselves as those chains are stripped off the loops when the loops enter into the newly forming tunnel. This means that the gravitational, and charge, effects of the loops remains continuously at the tunnel ends even whilst the loops themselves have no gravitational or charge effect within the tunnel. The motion of the tunnel ends, and their gravitational and charge properties, are affected as if they were the loops.

The gravity and charge properties of a loop in motion at c are transmitted by partially merged pair chains which extend at c. So rather than having gravitational and charge field lines that bend backwards as loops move forwards, they are continually symmetric front to back, where there are no local asymmetric mass or charge distributions.

Although this seems unrelativistic, it is because the loop must have started somewhere at zero transverse velocity, with chains attached and reaching out towards infinity. As the velocity increases, so the chain lengths remain and are extended at the loop velocity. Since the partially merged pairs can move at c, and the chains can extend at c, the chain distribution will remain symmetric at c.

Inertia

Inertia is the property that requires a force on a body to change its motion. Newton defined it to be [13] what the body possesses and that requires a force to change, although the former is no longer accepted.

The pre-fermion model hypothesis is that Newton was right the first time, on both points, and that a body moving within a frame of reference possesses a force internally which requires another force to change it.

Retained momentum is what produces inertia. Since energy is a vector in the same direction as an applied force, a body subject to such a force has energy along the same direction and retains that energy, ignoring viscosity loss to the background partially merged pairs, as momentum until it encounters another body or force in opposition. Inertia is the vector total mass energy that a particle has in an external frame of reference.

Dark Matter

Loops are split into the two categories of normal matter and dark matter by the number of meon-pairs within a loop.

Loops with three meon-pairs are our normal matter and all other pair numbers are dark matter. It is assumed initially that no loops can be formed from a single pair.

The ratios of various number-loops can be estimated based on their pair-numbers and their probabilities of forming.

This will give the following summation of the number of loops $N_{loop-weighted}$ across all n sets of pair-numbers, initially including 1-pair loops in the calculation, to be

$$\begin{aligned} nN_{loop-weighted} &= \frac{n}{1^2}+\frac{n}{2^2}+\frac{n}{3^2}+\cdots+\frac{n}{n^2} \\ &= n(1+\tfrac{1}{2^2}+\tfrac{1}{3^2}+\cdots+\tfrac{1}{n^2}) \\ &= n\frac{\pi^2}{6} \end{aligned}$$

where each set is based on the whole number of available pairs being used for each, which produces a total that is n times too large, although when calculating a ratio this effect will cancel.

For the ratio of normal matter to total matter $R_{m/all-m}$ this, excluding 1-pairloops, gives

$$R_{m/all-m} = (\tfrac{1}{3^2})/[\tfrac{\pi^2}{6}-1] = 0.1723 \quad \text{or } 17.23\%$$

This ratio is the starting point of a big bang unmerging event and would be expected to change over time as massive black holes swallow both symmetric and asymmetric loops and emit only symmetric loops, with a greater probability of the latter being two-pair dark photons.

Atomic dark matter

Previous papers [14] have explained that only odd-number pair-loops can form atoms because their balanced stacks have to contain one loop of each asymmetry that will be matched overall by an orbiting symmetric loop of equal and opposite charge to the stack total charge. Only odd pair number loops can have chemistry.

This means that as shown in a different previous paper [15] a 5-pair loop has 12 fermion-equivalent loops of which 4 are symmetric lepton-equivalent and 8 asymmetric quark-equivalents (ignoring asymmetric neutrino isomers). The quark-equivalent charge sizes are 1/3, 2/3, 3/3, and 4/3 with lepton equivalent charges of 0 and 5/3, all as fractions of positive or negative the electron charge size.

How the positive and negative one-sixth electron-sized charges of the meon and anti-meon pairs are placed around the loop define the symmetry or asymmetry of the loop and there will be the equivalent of 5 different asymmetries – or 'colours' in the QCD sense – for asymmetric 5-pair loops.

To be overall colourless requires one of each colour loop to be present in a stack. That is what balancing the stack means.

Since each loop has spin angular momentum of $\pm$½ *h*, the total spin for an odd-pair-number stack, whose loops have alternating spin orientations, will always be $\pm$½ *h*. Thus to balance the stack requires a similar size-opposite-charge loop that is symmetric and has a spin of $\pm$½ *h*. In this 5-pair loop example, that is the lepton-equivalent that has charge $\pm 5/3$and $\pm$½ *h* spin.

This means that all odd-pair-number loops of odd number *k* will be able to form atoms where the central stacks (nucleon-equivalents) are colourless overall and will contain *k* loops of total charge $\pm k/3$ orbited by an electron-equivalent symmetric loop of charge $\mp k/3$. Stacks may have different total charges to their symmetric charged loops, but will not be able balance them orbitally.

What is observed in the equivalent of photon emission/absorption will depend on the mass of the electron-equivalent loop. The photon emitted or absorbed will be a double loop of positive and negative *k*-pair symmetric fermion-equivalents rotating in the same sense.

If initial general big bang inflation of loops is related to pair-number then the sizes of such *k*-pair loops would be different to our 3-pair versions. If initial general big bang inflation was related to loop charge then the sizes of such *k*-pair loops would also be different to our versions. However, if the initial inflation was not related to either of those properties, the *k*-pair loops could have the same sizes as our versions because the mass and spin of a loop is independent of the number of pairs in that loop, but the observable masses would have their specific 'missing charge' factor to account for.

So the red shift emitted by different *k*-pair loop photons could be similar to that emitted by our 3-pair loops, or different.

The requirement for balance is the fundamental drive in the universe. The largest imbalance will be sorted first, then smaller ones. All systems tend towards zero total of each energy type.

The volume of dark matter exceeds that of normal matter because loops with less than three pairs are easier to make, black holes convert asymmetric loops into mainly symmetric dark matter photons and the background partially merged pairs soak up viscosity energy which is higher around denser distributions of normal matter loops.

A symmetric 4-pair loop equivalent to the 3-pair electron size will have charge 4/3*q*, spin $\pm$½ and electron mass at 100% of the loop frequency *w*. A similar symmetric neutrino-equivalent will have 0% of loop *w*. The mass of normal and dark matter symmetric loops will be the same size as ½ *hw*. Their spin energies will all be ½ *hw* as well, but the magnetic moments will depend on the number of pairs in a loop.

Dark energy

In the pre-fermion model there is no dark energy. The change in the rate of expansion of the universe is instead interpreted as occurring at the boundary where our big bang envelope ends and the rest of the universe begins.

Each big bang is proposed to be an event within the only universe, so that there have been many before our big bang, during it and will continue afterwards. The extent to which our big bang matter, in the general sense, has expanded defines our big bang envelope. Failed big bangs will be studded within our big bang envelope and outside as quickly or slowly collapsing galaxies or black holes. Each failed big bang initiation event has no relationship to our own big bang initiation event, although failed big bangs within our own envelope will have influenced matter within our expansionary flow.

The result is that the universe is neither isotropic not homogeneous, being filled with random big bangs.

The red shifts observed of all objects, ignoring local gravitational and motions, will be of three types:

1 Inside our big bang envelope the red shifts will be a mix of the viscosity red shift, proportional to distance travelled, and to the relative motion of that object.

2 Outside our big bang envelope the red shifts will be due only to the viscosity red shift of those objects, proportional to distance travelled.

3 Failed big bangs within our own envelope will have red shifts, due only to viscosity red shift, which are

discordant to seemingly conjoined objects that are co-moving with our big bang expansionary flow.

The different rate of red shift change beyond our big bang envelope looks like an change in the expansionary rate of our big bang, but is an artefact of the change in red shift component factors inside and outside that boundary.

The result interpreted is that the net red shift within our envelope may be actually a blue shift with our big bang now collapsing, or that it is expanding at a slower rate than heretofore calculated.

Inflation and steady state cosmology
The pre-fermion picture of random big bangs that fail or succeed is a mixture of an inflationary and a form of steady state models mixed with a dash or non-multiverses caused by failed big bangs throughout the whole universe.

The big bang and steady state theories can coexist, with failed inflation events appearing randomly as isolated black holes or galaxies.

Very large black holes or galaxies which appear to have formed too early after our big bang are probably pre-existing failed big bangs just inside or outside the envelope of our own big bang that have attracted our subsequent big bang matter around them.

It may be that some volumes of the background are subject to a general flow, with a likelihood increasing with increased local mass dragging that local background.

Outside our big bang envelope will be very high red shift failed big bang galaxies whose development is far greater than would be expected had they occurred as a result of our own big bang. The timing of these failed big bang galaxies have no relationship to the timing of our own big bang.

The model is a type of mix of big bang (but not itself creating a universe), steady state (the continual eruption of big bang events within our single universe) and multiverse (but observable directly as failed big bangs within the only universe).

The result of many big bangs, our own and the failed ones, means that there is no overall homogeneity in the distribution of matter. It could be that one failed big bang sets off a nearby second and maybe a third and so on, so that we observe a large scale structure formed in one event that is actually a series of connected events over time.

Flatness
In the pre-fermion model, the overall universe started with no total energy and remains with no total energy, although energy moves between different types. Therefore the universe is always flat on the basis of all energy types across the whole universe and also across the total of any big bang envelope.

However, since energy is a vector, the inflation of loops and subsequent expansion away from the unmerger of our big bang hides that the outward motional mass energy, in a symmetric expansion, sums to zero. It also hides that the total outward expansion mass energy of zero was released by the inflation of the loops and will also be the same size of zero. Only at individual loop or constrained volumes within any big bang will the total mass energy look like non-zero and have the appearance of a non-flat volume of space.

Quantum gravity
The pre-fermion model differentiates between environment with and without the presence of the background of partially merged pairs, and zerons. Where there is the background, there is viscosity which limits the velocity of meons and anti-meons, and their composite loops, to a maximum terminal velocity of local light speed.

Quantum gravity cannot exist because a loop is either within the background or it is not. It may be argued that a loop itself is a quantum of mass and charge energy, which always sums to zero, but to have gravitational mass requires that the rotation of the loop is within the background.

The model also solves the issue of the identity of dark matter particles since they are built from exactly the same meon and anti-meon foundations, in exactly the same structure, as our normal matter. The different is only that our fermions are built from loops containing three meon/anti-meon pairs, whereas dark matter loops have different pair numbers.

The model uses unbreakable meon/anti-meons as the building blocks for loops, so that, even when loops are broken apart in massive black holes, there are no singularities and physics does not break down.

The proposed presence of zerons, symmetric loop and anti-loop rotating parallel in opposite sense, at every point and size throughout the background, enables pair creation to be interpreted as the temporary breaking apart of such zerons, and their identification as zero point energy at any chosen point within the background.

Background
In the pre-fermion model, the initial starting point for the whole universe is myriad ZMBHs. These are unstable and form partially merged pairs which constitute the main material of the universe as both continuous in overlap and indivisible in being made from meons and anti-meons.

What we describe as mass is due to the rotation of the loops which the unmerged pairs form, and the sweeping of chains of partially merged pairs through the background of other partially merged pairs to transfer all forces.

Additionally there are zerons – double loops, of loop and anti-loop, stacked and rotating in opposite sense – which are the physical basis for pair creation. No particles need to be created, they are always there, at all points and at all sizes, within the universe and can be unstacked briefly on impact to produce the zero point energy level.

Each loop, with its chains dragging through the background is like its own Higgs particle where the Higgs field is like the background of partially merged pairs and zerons.

All the partially merged pairs continually create altering mass and charge fields at their rate of vibration, rotation or due to their motion.

The background can also include local masses that act to increase the local background density. This increase in density slows the value of local light speed, although it remains at c because that is the fastest that the partially merged pairs, that constitute the photon, can travel at in that density of background plus local masses due to the viscosity of that local background.

It is not clear whether the effect of the local background extends far beyond the sweeping of the partially merged pairs attached to loops. On unmerger of a ZMBH the partially merged pair chain will form at local light speed away from the point of unmerger out towards infinity. Such a chain will also 'dissolve' as a partially merged pair chain re-merges to become a ZMBH. So there will be a continual formation and dissolving of partially merged pair chains across the universe.

The lack of clarity is whether the background can be dragged by large local masses like stars to become a flow, or by galaxies to become a larger flow through which stars must travel. This possibility might suggest a fraction of galactic star velocities are due to being within that flow, so reducing the need for some dark matter.

This latter would affect the choice of frame of reference for relativistic interactions because the object in a non-moving background will experience a different energy change to that of an object moving within the background. The different is a phase change that appears as a time difference for those objects.

V. DIFFERENTIAL LOOP INFLATION

Consideration of the currently accepted masses of the quarks and leptons has generated interest in the Koide formula [16] which relates the sum of the masses of the charge families of particles to the square of the sum of their square roots. The result for the charge leptons gives the seemingly interesting value of 0.6666605, which has prompted speculation that it may mean something more fundamental.

More interesting results are achieved by comparing the inverse radii or inverse areas of the families of loops using the same formulae. Table 1 gives the comparison and suggests that there is nothing intrinsically special about the lepton result. However, the fact that the inverse square radius calculation produces the same value as the mass calculation strongly suggests that the loop structure is correct.

The most interesting results come from using the pre-fermion relationship between the loop radii of families, separating out the individual amounts by which each has been inflated along each of the three spatial axes.

The result, also shown in Table 1, is that if each loop family has its loop area (or mass) adjusted by the square root of the amount of fractional charge that each loop is missing from its maximum possible value (or by the square root of that amount on its mass) then each family has an average total inflation amount of $1.44\ x\ 10^{23}$.

The 'missing charge' factor is $(1 - \frac{missing\ loop\ charge}{maximum\ loop\ charge})^{0.5}$ and is multiplied by the Standard Model masses to produce the correct radii and area of each loop, which is the same as the inflation amount by which each loop was inflated in the big bang.

This is consistent with the pre-fermion model that proposes that what is observed as the 'naked' mass of a loop is proportional in some way to the charge on that loop. So an electron will show 100% of its size as its mass, whereas the symmetric neutrino will show zero mass. It is the action of the two types of chains, showing the one-sixth charges, attached to the meons and anti-meons in the loops that are either similar or different as they sweep through the background that produces the gravitational mass effect on the background. A change at every meon then anti-meon, as in a symmetric neutrino, will have no average effect on the background.

The underlying relationships are that each family of loops, differentiated only by size of charge, inflates along either axes a, b or c and ends in one of the three planes ab, ac or bc. Therefore the three loop sizes (or inverse masses) represent their ending up in those planes *A*, *B* or *C* respectively.

Table 1 shows the loop masses, the adjustments due to their charges, radii, area and total inflation amounts for each family overall.

The relationships are that $AB/C = a^2$, $AC/B = b^2$ and $BC/A = c^2$ with *A*, *B* and *C* the smallest, medium and largest loop in each family respectively.

Note that in Table 1 the defintion 'Smallest' in each family refers to the loop mass in each case.

The table suggests that, using current best Standard Model estimates for the masses of the quarks and leptons, if they are adjusted as explained for 'missing charge', approximately the same total amount of inflation has affected every loop, even if inflation along each axis for each loop and family is different.

The individual loop inflation amounts along the a, b or c axes are different, but not remarkably so. The maximum difference is $x2.4$ and the minimum $x0.47$ using the charged lepton family as the base.

Table 1							
Families	Smallest	Medium	Largest	Smallest	Medium	Largest	
	SI mass	SI mass	SI mass	DAPU mass	DAPU mass	DAPU mass	
Charge 1	9.11E-31	1.88E-28	3.17E-27	2.044E-18	4.226E-16	7.107E-15	
Charge 1/3	7.84E-30	1.55E-28	7.56E-27	1.76E-17	3.48E-16	1.696E-14	
Charge 2/3	3.39E-30	2.35E-27	3.09E-25	7.599E-18	5.28E-15	6.94E-13	
Charge 0	0	0	0	0	0	0	
Families	Charge	Smallest	Medium	Largest			
	Adjustment	Adj. mass *A*	Adj. mass *B*	Adj. mass *C*			
Charge 1	1	2.0439E-18	4.22605E-16	7.107E-15			
Charge 1/3	0.82	1.4369E-17	2.84121E-16	1.385E-14			
Charge 2/3	0.58	4.3876E-18	3.0482E-15	1.385E-14			
Charge 0	0	0	0	0			
Families	Koide	Koide	Koide	Koide	Koide	Koide	Koide
	mass	inverse mass	inverse radius	area	inverse area	on *a, b, c*	*a^2, b^2, c^2*
Charge 1	0.6666605	0.6666605	0.4780326	0.8514487	0.6666605	0.4780326	0.6666605
Charge 1/3	0.7393468	0.7393468	0.4842788	0.6654487	0.7393468	0.4842788	0.7393468
Charge 2/3	0.8472632	0.8472632	0.5958420	0.9236780	0.8472632	0.5958420	0.8472632
Families	Smallest	Medium	Largest	Smallest	Medium	Largest	
	SI radius	SI radius	SI radius	DAPU radius	DAPU radius	DAPU radius	
Charge 1	2.453E-21	1.7057E-22	4.15949E-23	4.946E+08	3.440E+07	8.388E+06	
Charge 1/3	9.25E-22	2.0803E-22	2.97994E-23	1.865E+08	4.195E+07	6.009E+06	
Charge 2/3	1.674E-21	6.3513E-23	5.53985E-24	3.376E+08	1.281E+07	1.117E+06	
Charge 0	-	-	-	-	-	-	
Families	Inflation	Inflation	Inflation	Total	Total	Total	Overall
	values	values	values	inflation	inflation	differences	Average
	a	*b*	*c*	radius	area	to Charge 1	Inflation
Charge 1	45036.763	10982.280	763.749	3.778E+11	1.427E+23	1	
Charge 1/3	44196.775	6330.927	1423.751	3.984E+11	1.587E+23	1.1121493	1.439E+23
Charge 2/3	107752.867	9398.663	356.579	3.611E+11	1.304E+23	0.9138628	
Charge 0	-	-	-	-	-	-	
Families	Inflation	Inflation	Inflation				
	relative	relative	relative				
	a	b	c				
Charge 1	1	1	1				
Charge 1/3	0.9813	0.5765	1.8642				
Charge 2/3	2.3926	0.8558	0.4669				
Charge 0	-	-	-				

If the average family inflation is consistent, then it should be the case that the neutrino family will have approximately the same total, and the symmetric neutrino should probably align well with the electron family. Asymmetric neutrinos, with two-fold symmetry, in this analysis, could have effective masses because the 'missing charge' multiplier effect might be more like that of the quarks allowing mass to be shown.

VI. CONCLUSIONS

The pre-fermion model describes the universe in a reasonably comprehensive way.

By comparing the calculations made in the Koide mass formula for the charged lepton loops with the same result using the inverse area of those same loops, the strong implication is that the loop structure is consistent with the way mass is observed.

It is significant that the total inflation across each charge family of loops, once adjusted for the 'missing charge' factor, is the same, at $1.44x\ 10^{23} \pm 10\%$, despite the inflation of each loop along each of the three spatial axes being different. This supports the amount of loop inflation along each spatial axis being proportional to the 'missing charge' factor.

The multiple big bangs of the model show why the universe is not homogeneous or isotropic and that space cannot inflate if built using a single type of densest unbreakable particles in the universe.

The overall conclusion is that the pre-fermion model is a good contender for a theory of everything.

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