The physical foundations of thermodynamics laws and quantum tunnels

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Using the pre-fermion framework previously established, the underlying foundations of the first and second laws of thermodynamics are explained as physical constraints imposed by the only observable pre-fermion-based composite structures that physically exist. Those structures also provide quantum tunnels which enable the non-locality and superposition of quantum mechanics.

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I. INTRODUCTION

This paper follows on from previous papers [1,2] building the logical development of a hypothetical pre-fermion based interpretation of the universe. The hypothesis uses only two foundation force types, one type of particle/anti-particle – the meon – and one observable composite meon structure – the loop – which is an observable quanta of gravity.

The hypothetical nature of the work allows the narrative of the paper to be positive, in that what the framework envisaged is correct and ignores potential issues that have yet to be uncovered or considered.

II. SIGNIFICANCE and OBJECTIVES

The significance is in explaining, in terms of the physical pre-fermion-based framework of loops, what physically underlies the first and second laws of thermodynamics and how non-locality, superposition and entanglement through quantum tunnels can be produced from the same underlying components as the particles that are observable. The tunnels are denoted ‘quantum’ because they are the underlying source of the effects of quantum mechanics but are not related to quantum tunneling.

The objectives are a better understanding of the strength of the hypothesis and its depth of explanatory power, from the smallest scale to the largest.

III. OUTLINE

The paper considers, from a recap on the underlying basics, how the loop structure, of meons rotating in a circle, ensures that slower (lower rotational frequency) loops cannot speed up faster (higher rotational frequency) loops and how that leads to the first two laws of thermodynamics.

The issue of quantum tunnels is considered from the framework of the stacking of loops and how the zero mass black hole background could be expelled from between two loops to form an entanglement void enabling travel without viscosity within the tunnel subsequently formed, producing non-locality and superposition.

IV. THERMODYNAMICS FOUNDATIONS

Previous papers [1,2] have described a hypothetical interpretation of the underlying physical system that provides almost all the substantial structural observables seen in physics.

At the most basic level, the hypothesis is based on the premise that there are only two types of energy, due to the mass and charge of the only particle/anti-particle that really exists – the meon. These are the fundamental energies of a meon and are of the same size and strength and exist in both positive and negative forms within the adjusted-Planck radius of a sphere that is either a positive or negative meon. Where there are derivative energies, such as the charge energy due to one-sixth electron charge there is a balancing opposite mass energy of the meons’ spin (denoted as ‘twist’ to differentiate from loop rotational motion which is what produces fermion and quark spin).

What is observed as ‘mass’ is the result of the meons forming loops, where a number of positive and negative meon pairs chase each other. Here the loop ‘mass’ is the effect of the loop on the background of the universe – which is itself myriad pairs of positive and negative meons that are wholly or partially merged – and of the background on the loop. Each loop is its own quanta of gravity, with its own time derived from its frequency. The balancing charge energy for loop ‘mass’ is the spin energy of the loop, due to the meons’ charge angular momenta around the loop.

The source of the meons is myriad pairs of partially or fully merged pairs of positive and negative meons. In this form they are zero mass black holes (ZMBHs) because outside their adjusted-Planck radius when fully merged there is nothing observable or acting and their density and is the maximum possible at the adjusted-Planck density, so that

they cannot be crushed, ensuring there are no singularities possible. When partially merged, they move due to other ZMBHs and loops and it is ZMBHs that transmit all forces by forming chains of ZMBHs. These will usually start on meons within loops, where they transmit the effect of the loop to other background ZMBHs, or can form their own ZMBH loops where a chain of them catches its own tail.

In every case, the total energy of each ZMBH, meon, pair of meons or loops composed of meons is always zero when considering all the energies present. This means that the total energy of all loops (leptons and quarks), stacks of loops (nucleons, photons and bosons), atoms, planets, stars, galaxies, black holes and the universe itself is always, and has always been, zero.

Thus the first law of thermodynamics is true in the most fundamental way. Energy is conserved because it is always zero. What needs to be considered is how much of which types of energy are present in any system, and it is that which defines how encounters are affected.

For two random particles, the mass-type energies of one will only influence the mass-type energies of the other. And the charge-type energies of one will only influence the charge-type energies of the other. In their interactions, when all energies are considered, they will both start with zero total energy and end with zero total energy. However, the amount of each energy type they each have will alter.

The strong force is not a separate force, but is due to loop to loop fundamental mass and charge interactions at close distances. The colour force is not a force at all and is a reflection of the need to balance stacks where the three-fold asymmetric loops in a stack have positional asymmetries in their one-sixth electron-sized twist- generated meon charges that need to be balanced along the stack axis to maintain stability. The weak force also is not a force, but is the random impact of a suitably energetic neutrino in knocking an energetic electron from a neutron stack to form a proton stack. The electromagnetic force is not transmitted by photons, but by the ZMBHs in the background. Photons redistribute frequency.

Mass energy, in terms of rotational or motional activity, is required by meons in loops to move through the background of ZMBHs and there will be an energy lost, to that form of viscosity, which reduces the rotational frequency, or translational motion, of the loops. This energy is replaced for loops, whose sizes were locked-in by inflation, by photons providing the lost frequency. Photons themselves lose energy when travelling through the background which is reflected in a reduction in their rotational frequency – a red shift – which is proportional only to the spiral distanced travelled by the meons that comprise the photon loops through ZMBH space.

In each case above, the rotational or motional energy of the loops or photons is lost to the background ZMBHS, which vibrate, move or rotate faster. In turn, this effect moves through the background to effectively warm the background.

The viscosity of the background acts to impose a maximum velocity for photons, which is called light speed.

The original source of meons being the ZMBHs that compose the background implies that at some point in space there was sufficient concentration of the right type of energy to break a ZMBH into its two unmerged meons - a ‘pair’. In an unmerger event, many such pairs would have chased each other, and other such pairs, to form chains which eventually attached to their own tails to form loops. Loops of three pairs are our matter and loops of other pair number are dark matter.

At some point loops formed, at high frequency from the initial unmerging of ZMBHs, collided and then conservation of momentum of the meons within loops would have expanded the loops’ radii substantially. This is what inflation means. There will still be total energy of zero, but the initial rotational rate of the loops would be slowed significantly and the effect would be to transfer the motion to the loops themselves as an outward expansion from the point of initial unmerging.

Provided the ‘energy’ (frequency) released by inflation is sufficient, the expansion will enable the ‘small mass’ loops (low frequency) to overcome their own gravitational pull and continue expanding. If the inflation is insufficient the ‘large mass’ loops (high frequency) will contract back under their own gravity. The former represents our big bang, and the latter failed big bangs which have occurred frequently previously within our only universe.

In this interpretation our big bang volume is only a small fraction of the total universe and failed big bangs will appear as black holes or condensing galaxies, each with anomalously large red shifts compared with spatially adjacent moving components of our own big bang expansion. The remains of previous failed big bangs beyond the extent our current successful one will have anomalously large red shifts.

The energy cycle is thus from ZMBHs to meons. Then from meons to loops. And from loops back to the background ZMBHs. At every stage the total charge and energy of the universe is always zero.

The second law of thermodynamics requires that spontaneous processes are irreversible. This is best shown in the viscosity of the background of ZMBHs, where every motion requires a rotational, or motional, energy loss. The action cannot be reversed and energy regained. Reversal of an action just results in more energy loss. So all motion loses energy, providing an arrow of time, which is a breaking of the symmetry of actions. There are no energy-free reversible actions within ZMBH space.

When considering the effects of loop to loop interactions, for two nearby parallel loops, rotating in the same sense, the chase action of the meons in the faster loop, to their opposite meons in the other loop, will always act to speed up the meons in the slower loop, whether relatively pushing from behind or pulling from in front. The slower loop thus receives rotational mass energy until the velocities are matched, at which point no further change can be made. In current terms this would be considered as a warm system heating up a cold one, but the cold one cannot heat up the warm one. The total frequency of the two loops in the frame of the axis of rotation will not change, but the outcome will be that the faster one will be slower and the slower one faster.

For two nearby parallel loops rotating in opposite sense, the chase action of the meons will be to slow down both loop frequencies. The net frequency of the two loops in the frame of the axis of rotation will not change, but each will be smaller. The slowing will continue until the loops are at their inflation-set locked-in rate, after which photons will continually act to keep them at each loop's own rate.

This slowing effect will not occur if the loops are so close as to become entangled and a void created between them so that no forces between them can be carried by ZMBHs. Entanglement is thus the creation of a void in the background ZMBHs between loops where the loops effectively occupy that void together as the void lengthens into a tunnel.

If the two loops are loop and anti-loop that start at different frequencies, provided they do not entangle together, the initial net frequency will be expressed as translational motion of the pair, whilst they then rotate at the same locked-in frequency.

In terms of entropy, the viscosity energy lost by loops in motion through the background ZMBHs will be passed initially to those ZMBHs within the track of those loops, but will spread out from that path over time into the general background. The only instance where this may not be the case is when an energy concentration unmerges a first ZMBH to spark off an inflation event, but the randomness of the background ZMBH motions will ensure that such an event does not have a zero probability.

Considerations of the energy of motion of objects through the background and of the same object as stationary in a moving frame of reference are not the same since the former loses energy whilst the latter does not.

Large black holes might also seem to act against the expected features of entropy in that loops falling into such a hole will be broken into chains, losing individual properties to the black hole. A large black hole is really a chain star, where its volume is made of chains that have no temperature, since that is a property of the rotational rate, and thus the energy, of loops. The only thing that can be said about homogeneity in black holes is that all the chains within the hole have zero total energy – as do all systems anyway – so the universe is already homogeneous at the most basic level.

Without significant numbers of meon loops, which are quanta of gravity, inside a black hole, quantum mechanics cannot be said to widely exist within the it. Quantum mechanics requires loops in order to build tunnels that enable those loops to move without viscosity and enable its actions to work.

Chains can escape from black holes by forming extremely high frequency loops and anti-loops that become photons whose rotational planes are parallel to the local black hole surface. The photons travel perpendicularly to the black hole local surface but lose energy as they escape, leaving only lower frequency photons observable. Escaping photons could be of any number of meon pairs, so will be a mixture of normal and dark matter. A black hole is thus a symmetry sieve in that it takes in loops of any type and symmetry and emits only symmetric photons. If a black hole is rotating it will be easier for chains to form loops and photons, with a bias towards forming these parallel to the black hole's axis of rotation. This may explain the large energy emission beams from some black holes.

V. QUANTUM TUNNEL FORMATION

Given the explanatory success of previous papers [1,2], apart from the anomalous magnetic moment of lepton loops, it is logic that drives to the conclusion that the background of the universe (zero mass black holes or ZMBHs) plays a much greater role in forming tunnels between loops, which is the basis of non-locality, superposition and quantum entanglement.

Considering the stacking of two loops, at very close distances the net force effect is near zero. This is because the charge and mass forces at work between meons in each

loop are the same sizes, although differing in action. This suggests that there are other effects in action.

It appears that for any two loops, of the same radius and regardless of relative parallel rotation direction, at very close distance the ZMBH background is squeezed out from between them. The effect is that, without any background ZMBHs to transmit forces, there are no forces directly between the meons in the two loops. This is a void volume which is the first stage of a quantum tunnel.

There are still the external ZMBH chains attached to each meon, mainly in the plane of the loop, that reflect the rotational rates of the loop and thus its mass effect and also its charges, the latter producing both the overall loop charge and its spin angular momentum. There are not necessarily separate chains for mass and charge transmission. The different orientations, rotations and motions of the ZMBHs in a chain can transmit the forces of both types. There are also internal ZMBH chains within the plane of a loop transmitting forces between the meons in the loop.

So the picture of a stack of two loops is of a surrounding background of ZMBHs, some of which are attached as chains rotating with the meons, internal chains helping to keep the loop together and at the centre between the loops a void where no forces act from loop to loop.

Logic then suggests that as the loops separate, the void increases. To do so requires that something retains that initial void volume. There is only the background itself available to provide this. It appears that, in a similar way to which the chains which attach onto meons to transmit gravity, charge and spin, the ZMBHs can form chains that attach to their own tails to form ZMBH loops.

The ZMBH loops probably rotate at the same radius as the meon loops, although there is no reason why they could not be larger. They could not be smaller because then they would be within the original void between the meon loops.

As the meon loops separate further, new ZMBH loops would continue to form, producing a tunnel between the meon loops. The meon loops' masses and charge/spin properties are expressed by the chains which attach to the meons themselves, but are only observable because of those chains. Logically, again, it is likely that those chains transmitting mass forces could be transferred to the ZMBH loops at the ends of the tunnel.

The frequency or rotational rate, which represents the observable mass of a loop, does not depend on how many meon pairs are in a loop. A two-pair meon loop has the same observable 'mass' as any higher number pair loop. A ZMBH loop may contain many more meons, partially merged, than the meon loop adjacent to which it formed.

The ends of the tunnel will continue to follow whatever the paths of the meon loops originally were – affected by their progress through the background - whilst the meon loops themselves will be at the ends or within the tunnel and will have no forces in action outside their own internal meon planes because there are no surrounding ZMBHs when within the tunnel to transmit them. At the end of each tunnel will be the ZMBH background and the only logical way for the void to continue to exist is that the meon loops themselves, through their internal ZMBH chains, act as the end stoppers.

The charge and spin showing at the end of the tunnel will be that of the meon loop that is present at that moment, with the external background transmitting the charge related forces through re-orientations of the existing ZMBH chains.

To ensure that the void does not collapse, the meon loops must always be at one end or the other, swapping places instantaneously through the tunnel since there are no background ZMBHs producing viscosity and no forces acting from or between the meon loops within the tunnel, even though they retain their respective charges. Because there will always be a meon loop at each end, the path of the tunnel ends will follow what the meon loops' paths would have been and will be affected by the background viscosity as it slows the meon loops' rotational rate.

This implies that the stress holding the ZMBH loops in place as a form of tunnel must be acting outwards from the void, balanced by the chasing forces holding the ZMBH loops together and the meon loops at the ends.

Then the basics for quantum mechanics are simply that the two meon loops randomly move from tunnel end to end, swapping positions, without any ZMBH viscosity in the tunnel and so no maximum velocity along the tunnel.

The tunnel can be of any length and what is observed when it is collapsed is whichever meon loop is trapped at that tunnel end. Whatever the separation in ZMBH space between the ends of the tunnel, the motion through the tunnel produces non-local results. The average over time of the properties observable at a tunnel end will be proportional to the time each meon loop spends there and will look like a superposition of the two loops' properties.

What this interpretation implies is that there are voids within any multiple-loop stack. All stacks contain the seeds of quantum tunnels. Nucleon stacks will contain multiple voids, one at each loop/loop boundary. Zerons, being a loop and anti-loop contra-rotating stack will have a void and

when sufficiently perturbed will separate, currently called pair creation, and may break their tunnel temporarily.

Photons are a special case in that the loop and anti-loop actually merge to almost reform a single loop of six rotating ZMBHs. However, on separating into component loops they will still create a void and then a tunnel.

Since the total energy of all loops is zero, when counting mass and charge as opposite types, there may be multiple photons merged together that appear to be only one photon. What is observed is the frequency of rotation of the composite, but the merger, of each meon with its opposite partner in the other loop, into almost-ZMBHs means that any number of photons may be in the photon 'stack' and yet the stack has only one frequency. This may explain why some particle decays produce variable photon numbers.

After two entangled photons have been separated in ZMBH space by a filter, it is not possible to know which photon, when entangled this is really one tunnel end, successfully passed through the filter. The path of the successful tunnel end is only successful at the filter and subsequently the two photons will randomly occupy that tunnel end and its path through ZMBH space.

The requirement for forming voids would seem to require that the adjacent loops be the same radius (energy). This implies that a long stack, like a nucleon, must be made of loops of the same radius because otherwise some of the loops would have different sized voids/tunnels on either side of them. This means that some loops with inappropriate locked-in sizes would require continual photon frequency replenishment to remain at the correct size for that stack.

Entanglement is thus likely to be much more prevalent than currently envisaged and is probably the most frequent state of all meon loops in stacks. Only single loops are more likely not to be entangled, although, when in orbitals, they probably have photons adjacent which can be emitted or absorbed when moving between orbitals to enable their change of observable energy. This implies that such absorbed photons are more likely to be in the form of photon pancakes, rather than stacks, where the photon loops are centred on the electron and rotate in the same plane. In this way different frequency photons can be attached and detached from the pancake.

In this interpretation, it is possible to envisage stack loops with photons either in pancake form surrounding them, or adjacent, providing the necessary frequency to maintain the loops all at the same size and with voids existing between them.

A tunnel collapse could be as simple as an event that knocks one meon loop off one end of the tunnel, taking the chains from the ZMBH loop at the tunnel end. This would leave that meon loop where the event occurred near its tunnel end and the other meon loop at the other end of the tunnel, no matter how far away in normal space that it was, instantaneously. The issue is how a tunnel, as a series of ZMBH loops, can also react instantaneously.

The tunnel exterior is constrained by the background, whereas the tunnel interior is not. So it may be that the knocking off of one end loop enables the pressure of the background ZMBHs to send external ZMBHs throughout the inside of the tunnel, once again without velocity limit whilst the tunnel persists. So the inside of the tunnel would be instantaneously converted into a background of ZMBHs, exactly like the exterior of the tunnel. Thus what happens to the tunnel ZMBH loops after the end loop is knocked off is not an issue, and it may be they just disperse over time to return to their more normal non-loop motions or decay through the effect of normal background ZMBH viscosity energy loss.

In the case of zerons, loop and anti-loop contra rotating, even though they are entangled and thus do not slow each other down because of the void between them, they will continue to be affected by the background viscosity. They will be continually boosted back to their locked-in frequency/energy by faster rotating photons temporarily nearly-stacking. Since the photons will necessarily be of higher frequency, they cannot stack and produce an entanglement void.

This latter effect also affects very high frequency loops that are nearby, but not entangled, which are contra rotating. The meons within the loops will be slowing each other down until they reach their locked-in frequency, at which point photons will provide any needed extra frequency. If the two loops are loop and anti-loop that start at different frequencies, provided they do not entangle together, the initial net frequency will be expressed as translational motion of the pair, whilst they then rotate at the same locked-in frequency.

VI. CONCLUSION

This analysis provides a potential physical explanation for why the first and second laws of thermodynamics exist, and how tunnels may possibly be constructed around an entanglement void between two loops to enable non-locality and superposition, which are the basics of quantum mechanics.

VII. REFERENCES

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