

Discrete Quantum Mysteries: Biphasic Transitions and Matter-Energy Equivalence

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1 MODERN RELATIONALISM A non-Aristotle/Newton/Einstein approach that deviates from Leibniz's continuums/infinitesimals

OBJECTIVE

- 1) Present a quantum state concept grounded in a cyclic biphasic state of matter-equivalence, consistent with discrete dimensional phenomena occurring within a continuum.
- 2) Explore novel relationalism modeling approaches applicable to both discrete and continuous states of normal matter, new tools for considering quantum states.

Matter and energy are considered equivalent and interchangeable. $E = mc^2$ implies that mass and energy are two forms of the same underlying equivalent quantity.

Many theories and equations however require a continuous state of matter and yet we see discrete quantities of matter, like gravity, in a quantum state.

"As far as the laws of mathematics refer to reality, they are not certain, and as far as they are certain, they do not refer to reality." - Albert Einstein

RECENT ADVANCES TO THEORY OF RELATIONALISM^{1,2}

Advancements in relationalism theory are developing fresh tools and viewpoints for studying matter, space, time, and motion. It employs discrete geometric elements like points, lines, and planes, diverging from traditional methods. Zero is viewed as a coordinate for time or space yet still representing an absence of quantity or value. Zero can be the beginning and end of a cycle, or even the point between finite line segments.

Continuous motion, continuous matter, and continuous real abstract time are not required for relationalism. Consistent with Planck limits and Mohist propositions.

2 DISCRETE RELATIONALISM^{1,2} Embracing Euclid and Chinese Mohist propositions

EUCLIDEAN MODELS, N^n (point, line, and plane)

- **Universal frame** (dimensionless 2D Euclidean plane/lattice) with multiple-privileged points of reference
- An object' geometric zero-D point has no dimensional quantities (incl. mass), location only
- Dimensional quantities, including forces, are layered upon universal frame
- Multiple-scale invariances layer dimensional dataset in a single model

MATTER (point, line, and plane)

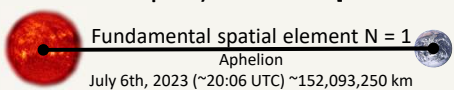
- **Centroid** (geometric center) used as location point for object.
- Matter, continuous and/or discontinuous, can be used for dimensional modeling
- Spheroids are discretized using two orthogonal planes, or cross sections (1D semi-minor/-major axes)

RELATIONAL EXTENSIONS (1D segments)

- **Relational-extensions** (finite geometric spatial 1D segment) between two centroidal points mapped to a zero point in a relational-time, $[t_r = 0]$. Non-abstract associated dimensional elements from independent length and temporal sets; $[L_r] \rightarrow [T_r]$, where $T_r = \emptyset_r$. Precision limited by technology, not definition.

Sun [zero-D centroidal point]

Earth [zero-D centroidal point]



RELATIONAL TIME (1D segments; see CAP 2024, London Canada. Abstract #4094)

- **Relational-time**; finite duration between signals (not motion based; independent of space), mapped to a natural number line. Precision limited by technology, not definition.
- Zero-time points of relational-time, shown abstractly as $[t_r = 0]$. However, \emptyset_r is a unique relational temporal coordinate point (no quantity) in a linear finite object-relational alpha-omega timeline that is relevant to a privileged point of reference, e.g., Earth_{aphelion} (see above)
- Universe has a network of overlapping and co-existing geometric relational timelines; dynamical and expanding set(s)

DISCRETE MOTION - INTEGRAL KINEMATIC-LIKE WITH EUCLIDEAN GEOMETRIC TRANSLATIONS

- **Integral kinematic-like, L-T (discrete geometric relational kinematics)**; nearer or further, expressed as points and instants¹
- Models associate, or map, elements from sets of relational-time and relational-extensions to express discrete static motion, consistent with discrete event simulations, Turing tape, and geometric translation.
- Discrete event simulations: accumulated change only expressed at zero-points in relational-time.

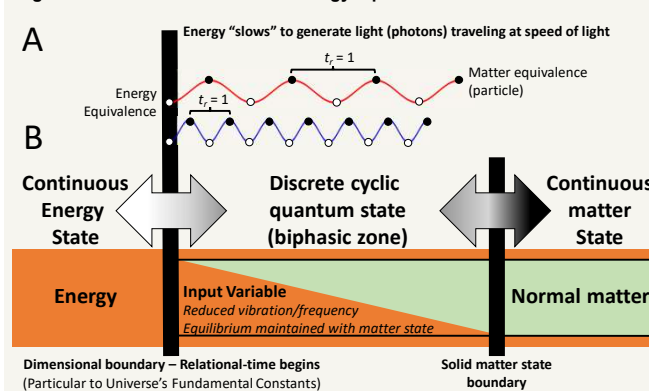
3 CONCEPT¹ Biphasic matter-energy equivalence

Discrete signals of normal matter, regardless of speed, to capture finite relational extensions of space and cyclic durations of relational-time.

MATTER-ENERGY BIPHASIC EQUIVALENCE

In a biphasic quantum state, offer a distinctive viewpoint for considering a novel mechanism for organizing energy, separating matter and antimatter within a primordial circle. Proposal suggests reversibility, supported by reversible entanglement.³

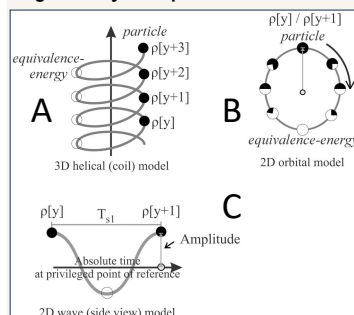
Figure 1: Three states for matter-energy equivalence



(A) Beyond the dimensional boundary, biphasic matter-energy can exist, matter does not exist to the left of boundary. A duration between discrete signals of dimensional quantities, or particles of light, is proposed to be the same regardless of the wavelength of light at our dimensional limit (wagon wheel-like effect). (B) Three interchangeable states: (i) continuous energy at/beyond speed of light (proposed centre of black hole), (ii) biphasic quantum state near speed of light (near event horizon), and (iii) slow continuous matter. Note: "energy" in this context is not kinetic energy, plasma may be a more suitable word.

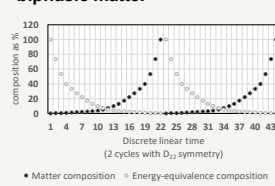
4 CONCEPT¹ Cyclic biphasic quantum state

Figure 2: Cyclic biphasic state¹



(A) 3D helical circular orbit/polarization view (B) 2D view towards observer; presented as eclipse/circle (C) 2D side view; presented as a wave. y = signal count. p = signal. T_s = Finite time sample/duration, a 1D temporal geometry. Privileged point of reference; object-equivalent centroid. Modified from Moore. JAMP 2023.

Figure 3: Exponential shift in biphasic matter¹



Graphing cyclic and exponential biphasic transition between matter and energy-equivalence in quantum state. Two recurrent cycles plotted in discrete and linear time with shift in composition between biphasic states. Modified from Moore. JAMP 2023.

5 EXPLORATORY CONCEPTS FOR INTERROGATION

Table 1: Exploring context referencing existing phenomena/theories

Phenomena	Current Considerations	Exploratory Concepts (seeking collaboration)
Black hole	Mathematical singularity; light unable to escape	No dimensional quantities; energy-equivalent state beyond horizon, no gravity. Zero-relational time, therefore no singularity.
Black hole evaporation (Hawking's radiation)	Energy emitted just outside the event horizon over time.	Energy-equivalent state not influenced by gravity.
Quantum tunneling	Particles pass through barriers unpredictably via tunneling effect	Energy equivalence states are not affected by dimensional barriers
Particle wave duality	Particles exhibit both wave and particle properties simultaneously	Particles are states of matter when observed, traveling in continuous helical coil
Uncertainty principle	Simultaneous precise measurement of position and momentum impossible	Position only exists when measured, in zero-time there is no velocity, no momentum
Quantum state	Complete description of quantum system	Restricted description, layered as discrete independent datasets at zero relational-time points.
Origin of matter	Matter formed from energy in early universe through particle interactions.	Energy slows vibration, dimensional matter is generated to maintain equilibrium in an unknown homogeneous state of things
Quantum collisions and black box	Details of the collision process are hidden, not directly accessible. Suppression; collisions are reduced when energy is high.	Collisions more common in low energy-equivalent states, when matter-composition is high enough to collide. Different particle types have different matter compositions. New consideration for "energy suppression."
Light	Emitted at speed of light	Energy vibrations slow energy to emit light at fixed speed & with dimensional quantities. A photon's energy can also be harnessed and converted into chemical energy ⁴
Quantum superposition	Particle exists in multiple states simultaneously.	Relational-time is zero, consistent with relational distance being independent of relational-time. Fig 1A; when wavelength = 0 then relational-time = 0.
Quantum entanglement	Particles instantaneously affect each other's states.	Particles state changes state in zero-relational time, dimensional limit of our universe.
Particle-wave duality	Discrete particle behaviors Wave-like phenomena	Particle; exists when dimensionally observed, wagon wheel effect. Wave; property of cyclic state on z-axis.
Relativistic doppler effect	Frequency and wavelength of light change due to motion.	Frequency and wavelength of light changes due to shifting relational distance.
Discrete gravity	A few approaches attempted to describe phenomena	Matter, not energy, has gravitational effects, when in a matter state, gravity is observed.
Dark matter/energy	Modified gravity/vacuum energy	Potential considerations continuous energy state and dark matter at a different equilibria vibration as normal matter
Higgs Mechanism	Theory on how particles acquire mass via field interaction.	Biphasic state offers a different mechanism for particles to acquire mass, proposed in part linked to a dimensional quantity of matter composition, but not energy composite (Fig. 3).

6 CONCLUSION

Advancements in discrete dimensional relationalism beings to describe how to model slow matter and quantum state phenomena can use the same approach.

We explore whether discrete quantum phenomena stem from a proposed bi-phasic zone, where matter and energy cyclically equate. This prompts questions about whether forces and gravity are inherent to matter state, motion, or dimensional observation/measurement, rather than properties of energy states.

EXPLORATION AS A COMPLEMENT/ALTERNATIVE TO EXISTING THEORIES (for example...)

Vs. String Theory: Similarities and differences. Both suggest a continuous state yet in different ways, e.g. continuous biphasic matter-energy equivalence instead of superstrings.

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