What If Space Is What Survives?

A public introduction to End Theory: Evans Node Dialect

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Editorial status
This is a public-facing theory introduction and research-programme document. It does not report completed empirical validation, a derivation of the Standard Model, or a finished theory of everything. Equations marked **benchmark** describe one concrete realization of the ontology; equations marked **target** state what a successful realization would eventually have to reproduce.

1 The universe as a pattern that learned to persist

1.1 One-page introduction for the JRE-MNT site

Imagine erasing every familiar object from the universe - stars, atoms, distance, duration and even the empty stage called space. END/MNT begins with what could remain: possible relations and a rule that decides which changes may follow which. The universe does not begin *inside* space and time. Space and time are proposed to emerge when relational change develops memory, rhythm and persistence.

First comes an **ordered history**. One configuration can follow another before a physical clock exists. A flipbook has numbered pages, but a page number is not a second. Time appears only when a stable pattern repeats reliably enough to become a clock.

Next comes **persistence**. Most microscopic arrangements vanish; some remain recognizable through repeated updates. These survivors define stabilized frames. Persistent clusters become candidate nodes, and the strengths of their direct relations form a weighted graph. If that graph develops stable dimension and isotropy, its path structure can become effective distance. Space is then the geometry of durable relationships, not an empty container.

Every local neighborhood is also proposed to have **finite transition capacity**. Its dimensionless demand must satisfy $0 \leq C_i \leq 1$. Because the bound is local, distant regions do not consult an instantaneous global accountant. Highly loaded regions may delay or redirect later change. Such progression imbalance might eventually map to inertia, clock-rate differences or geometric torsion, but gravity has not yet been derived.

Stable, transportable graph patterns are candidates for matter; collective modes are candidates for fields. Phase relations can be expressed with gauge-consistent link variables. Mass would have to be a calculated energy gap, charge an exact symmetry or topological label, and particle identity a stable solution - not a familiar name attached to a chosen frequency.

The Evans Quantum Energy Field (**EQEF**) now has a disciplined meaning. At its basic level it records expressed versus deferred local capacity. It becomes a physical field only if coarse-graining produces an action and fixed coefficients. Possible links to cosmology, dark sectors or torsion therefore remain conjectures.

The proposal can be summarized without pretending it is already complete:

$$X_{n+1} = U_p\left(X_n, X_{n-1}\right), U_p : A \times A \rightarrow A, A = \left\{X : C_i\left[X\right] \leq 1 \,\forall i\right\}.$$

The deterministic map U_p must keep every state inside the admissible set A. This is the **master specification**. The present scalar graph equation is only one benchmark realization. It supplies an exact update, dispersion relation and stability bound, but no canonical microscopic values yet exist.

END/MNT is therefore a research question, not a completed replacement for physics. It succeeds only if one frozen micro-model survives held-out tests; otherwise it fails.

2 The master specification, benchmark equation and values

2.1 The master specification

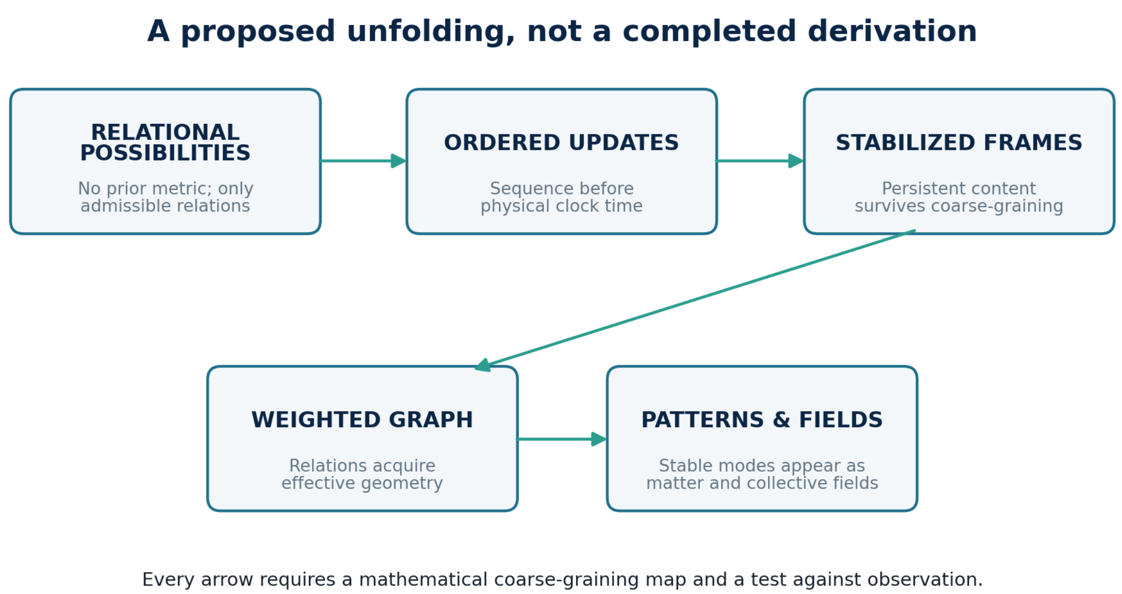
The most general honest equation is a rule for admissible evolution:

$$X_{n+1}=U_p\left(X_n,X_{n-1}\right),U_p:A\times A\to A$$

with

$$A=\left\{X:0\le C_i\left[X\right]\le 1\,\forall i\right\}.$$

Here X_n is the complete microscopic configuration at update n, p is one frozen parameter vector, C_i is the demand placed on location i and its finite neighborhood, and U_p is the deterministic update law. These equations are a **specification**, not yet a solved dynamics. A completed theory must define every object, boundary condition and graph-change rule, then prove or numerically bound locality, stability and conservation.



The proposed hierarchy from relations to effective fields. Every arrow is a required derivation, not an assumed equivalence.

2.2 A concrete scalar benchmark

On a temporarily fixed weighted graph $G=\left(V,E,w\right)$, let each node carry a real coordinate q_i^n. Give the coordinate an inertia $\mu>0$, neighboring links a stiffness $\kappa>0$, the local mode an onsite frequency $\Omega_0\ge 0$, and nonlinear behavior a potential $W\left(q\right)$. The discrete action is

$$S_0 = \sum_n \Delta\tau \left[\frac{\mu}{2} \sum_i \left(\frac{q_i^{n+1} - q_i^n}{\Delta\tau} \right)^2 - \frac{\kappa}{2} \sum_{(ij) \in E} w_{ij} \left(q_i^n - q_j^n \right)^2 - \frac{\mu\, \Omega_0^2}{2} \sum_i \left(q_i^n \right)^2 - \sum_i W\left(q_i^n \right) \right].$$

Varying this action gives the explicit leapfrog update

$$q_i^{n+1} = 2\, q_i^n - q_i^{n-1} - \Delta\tau^2 \left[\Omega_0^2 q_i^n + \frac{\kappa}{\mu} \left(L_G\, q^n \right)_i + \frac{1}{\mu} W'\left(q_i^n \right) \right]$$

where

$$\left(L_G\, q \right)_i = \sum_j w_{ij} \left(q_i - q_j \right)$$

is the weighted graph Laplacian. Given two consecutive states, the graph and the parameters, the update above determines the next state without a random draw. It is the present **benchmark evolution law**. It does not yet enforce the capacity bound whenever an uncapped step leaves A; constructing a conservation-compatible capacity completion is the first major open problem.

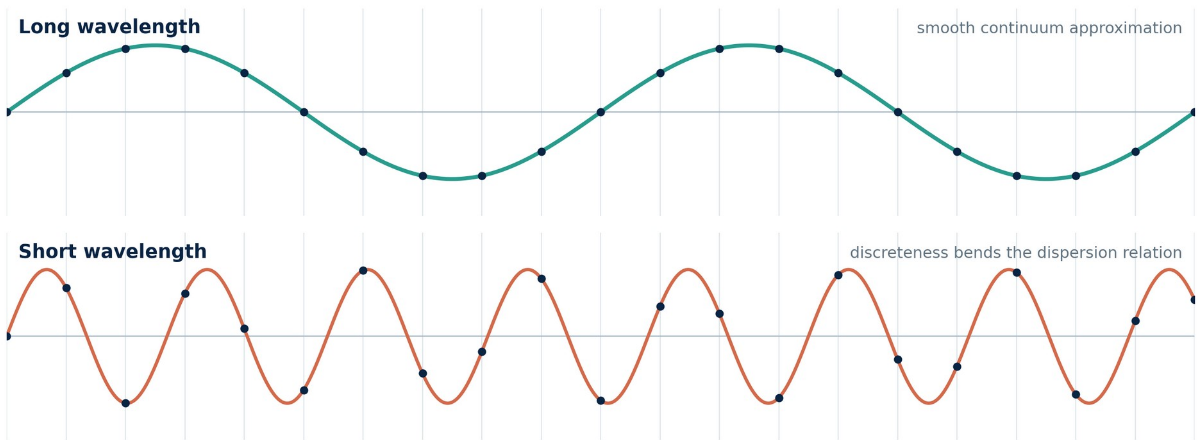
For a regular d-dimensional lattice of spacing a, with $W = 0$, the exact plane-wave relation is

$$\frac{4}{\Delta\tau^2} \sin^2\left(\frac{\omega\, \Delta\tau}{2} \right) = \Omega_0^2 + \frac{4\, c_0^2}{a^2} \sum_{r=1}^{d} \sin^2\left(\frac{k_r\, a}{2} \right), c_0^2 = \frac{a^2 \kappa}{\mu}.$$

At long wavelength, $\omega^2 \approx \Omega_0^2 + c_0^2 |k|^2$. The wave speed therefore depends on spacing, stiffness and inertia. It is not automatically one link per update. A sufficient free-field stability condition is

$$\frac{\Delta\tau^2\, \Omega_0^2}{4} + d \left(\frac{c_0\, \Delta\tau}{a} \right)^2 \le 1.$$

Violation of this inequality produces unstable high-frequency modes. This is already a falsifiable mathematical test of the benchmark.



Long waves can look smooth while short waves reveal the discrete substrate.

2.3 Values: known, constrained and still unknown

Canonical domains and definitions

Update order n: $0, 1, 2, \ldots$; a dimensionless ordering label, not physical time.

Local demand C_i^n: $0 \le C_i^n \le 1$; the defining admissibility bound.

Node inertia μ: $\mu > 0$; a free benchmark parameter, not yet measured or derived.

Link stiffness κ: $\kappa > 0$; a free benchmark parameter, not the retired legacy fine-structure substitution.

Onsite frequency Ω_0: $\Omega_0 \ge 0$; a free benchmark parameter that maps to a mass gap only after a quantum scale is derived.

Compact phase θ: $\theta \equiv \theta + 2\pi$; a periodic angular variable.

Phase mismatch χ_θ: $0 \le \chi_\theta \le 1$ after gauge-consistent link variables are supplied.

Kinetic modulation δ: $0 \le \delta < 1/2$; the positivity range in the repaired effective amplitude-phase sector.

Graph spacing a: unassigned; it becomes a length only after metric calibration and is not assumed to equal the Planck length.

Update interval $\Delta\tau$: unassigned; it becomes a time only after an operational clock map.

Capacity scale E_*: $E_* > 0$, unassigned; it converts local benchmark demand into an energy-scaled quantity.

Reference values from measurement and the SI

Speed of light c: exactly $299\,792\,458\,m\,s^{-1}$ as an SI defining constant [8]. Reproducing its number after choosing units is not a prediction.

Planck constant h: exactly $6.626\,070\,15\times10^{-34}\,J\,s$, with $\hbar=h/(2\pi)$ [8].

Elementary charge e: exactly $1.602\,176\,634\times10^{-19}\,C$ in the SI [8].

Boltzmann constant k_B: exactly $1.380\,649\times10^{-23}\,J\,K^{-1}$ in the SI [8].

Newtonian constant G: $6.674\,30(15)\times10^{-11}\,m^3\,kg^{-1}\,s^{-2}$, the 2022 CODATA recommended measured value; not derived by END/MNT [9].

Fine-structure constant α: $7.297\,352\,5643(11)\times10^{-3}$, the 2022 CODATA recommended measured value and a future dimensionless target [10].

There is no defensible canonical numerical set for a, $\Delta\tau$, μ, κ, Ω_0, E_*, the nonlinear potential or the graph rule. Assigning those numbers is future model construction. Any simulation values used before that point must be labeled **dimensionless demonstration values**, frozen in a parameter file and never called measurements or derivations.

2.3.1 Retired legacy numbers

The earlier Higgs note used $\tau=10^{-43}\,s$, $\gamma=1.618$, $\delta=0.057$, $\kappa=1/137.036$ and $N_c=3$ in a displayed mass expression. Those numbers are not part of the canonical theory. They mixed a timescale, a golden-ratio choice, measured constants and Standard Model inputs in a formula that did not close dimensionally as written. Likewise, earlier public parameter sets and aggregate “alignment” percentages are retired until regenerated from a frozen, dimensionally valid micro-model and held-out data.

3 A working lexicon of the mathematics

The lexicon is arranged in the order in which the theory says the concepts should appear. A later object cannot be used to define an earlier one.

3.1 Pre-geometric layer

Proto-state, $p \in P$. A primitive degree of freedom before physical position, clock time, energy, mass or charge has been derived. Internal labels may exist, but naming one “frequency” before time exists would be circular. The safer term is *phase propensity*.

Admissibility relation, R. The set of transitions or joint changes allowed among proto-states. “Local” at this level means directly coupled by the rule, not nearby in metres.

Microscopic history, $X_0 \prec X_1 \prec X_2 \prec \cdots$. An ordered sequence of complete configurations. The symbol $\prec$ means “precedes in update order.” It does not yet mean “earlier by a measured number of seconds.”

Update map, U_p. A single-valued rule that converts admissible prior configurations into the next configuration. Determinism is a property of this map, not a mood or interpretation.

Local demand, $C_i(X)$. A dimensionless measure of how much transition capacity node or proto-location i and its finite neighborhood require during an update. The canonical law is $C_i \leq 1$ for every i.

Admissible set, A. All configurations satisfying the capacity bound. A completed update must map $A \times A$ back into A.

3.2 Persistence and emergent geometry

Coarse-graining map, C_R. A rule that suppresses details below resolution R while retaining observables relevant at that scale. It must be explicit enough that two researchers obtain the same coarse state from the same microstate.

Persistence. A resolved structure persists for N updates if it remains within tolerance ϵ_R of an allowed transported or phase-shifted copy of itself:

$$\| C_R X_{n+m} - T_m C_R X_n \|_R \leq \epsilon_R, 0 \leq m \leq N.$$

Frame, F_n. The equivalence class of micro-configurations that share the same resolved persistent content at update n. A frame is not simply “everything on page n”; it is what survives the declared stabilization test.

Candidate node. A persistent cluster at a chosen resolution. The node lattice is therefore an emergent stable phase, not necessarily the deepest ontology.

Weighted graph, $G_n = \left(V_n, E_n, w^{(n)}\right)$**.** Nodes V_n, direct relations E_n and positive weights $w_{ij}^{(n)}$ measuring interaction strength, transfer capacity or another declared functional.

Graph distance, d_G**.** The least total positive link length along a path. A smooth spatial metric is justified only if the graph displays stable dimension, isotropy and scale behavior over a range of resolutions.

Physical clock, K**.** A persistent subsystem with a monotonic or cyclic observable. Its elapsed time is accumulated from its own locally derived ticks. The update number n becomes proportional to time only in a homogeneous approximation.

3.3 Patterns, fields and phase

Pattern type, P**.** An equivalence class of configurations that is localized or controlled in support, stable under the update and transportable under graph symmetries.

Particle candidate. A pattern with a solution or invariant manifold, a perturbative stability spectrum, a dispersion relation, conserved quantum numbers and an interaction map to detector observables. A resemblance or chosen label is not enough.

Field. A coarse collective coordinate for many related patterns. The word does not imply that a particular continuum action has been derived.

Graph Laplacian, L_G**.** The operator $\left(L_G q\right)_i = \sum_j w_{ij}\left(q_i - q_j\right)$, which measures how different node i is from its linked neighborhood. It is the graph analogue of a spatial curvature or diffusion operator for a scalar mode.

Dispersion relation. A relation between frequency ω and wave vector k. It tells us how patterns propagate. Microscopic discreteness usually produces sine terms and short-wavelength deviations from the smooth continuum relation.

Mass gap, Ω_0**.** The nonzero frequency at zero spatial momentum in the benchmark. Only after a universal action-phase scale $\hbar_*$ and relativistic continuum map exist may one write $m_{eff} = \hbar_* \Omega_0 / c_0^2$.

Compact phase, θ**.** An angular degree of freedom with period 2π. Phase differences must be compared in a gauge-consistent way.

Link variable, $U_{ij} = e^{iqA_{ij}}$**.** A phase carried by an oriented link. The covariant difference $D_{ij}\psi = U_{ij}\psi_j - \psi_i$ is invariant in magnitude under paired transformations of node and link phases.

Plaquette holonomy, $U_{\square}$**.** The ordered product of link variables around a closed elementary loop. Its deviation from unity is the lattice analogue of gauge curvature. This is a real mathematical bridge to gauge theory; a bare phase line integral alone is not.

Phase mismatch, $\chi_{\theta,i}$**.** A bounded local measure such as

$$\chi_{\theta,i}=\frac{1}{2z_i}\sum_{j\sim i}\left[1-\cos\left(\theta_j-\theta_i-qA_{ij}\right)\right],0\le\chi_{\theta,i}\le 1.$$

3.4 Capacity, EQEF and geometry

Residual capacity, $r_i^n=1-C_i^n$. The unused portion of a local transition budget. It is dimensionless bookkeeping until a physical coarse-graining and normalization are derived.

EQEF. The Evans Quantum Energy Field. At Level 1, EQEF is the expressed/deferred capacity ledger represented by quantities such as r_i^n and their causal fluxes. At Level 2, a continuum field $\chi(x)$ may be introduced only if coarse-graining supports it. A candidate action does not prove dark energy or dark matter.

Progression imbalance. Persistent spatial variation in the ability of neighboring regions to complete comparable local updates. It is an ontological idea seeking a geometric map.

Torsion, $T^{\rho}_{\mu\nu}$. The antisymmetric part of an independently defined affine connection, measuring infinitesimal non-closure of transported displacements. END/MNT proposes that coarse-grained progression imbalance *might* source torsion. The tetrad, spin connection, source and coefficients remain to be derived.

Curvature. Path-dependent rotation or deformation governed by the connection. Curvature and torsion are not synonyms. Neither is interchangeable with energy, chaos or EQEF.

Effective action, S_{eff}. The long-distance continuum theory obtained after coarse-graining. Writing Einstein-Hilbert, gauge, fermion and scalar terms as a target demonstrates required compatibility; it is not a derivation unless the micro-model fixes the fields, symmetries and coefficients.

3.5 Evidence words

Definition. A declared meaning or mathematical convention.

Assumption. An input accepted provisionally to explore consequences.

Calibration. Use of data to fix a parameter or unit conversion. Calibrated quantities cannot then be counted as predictions.

Consequence. A result derived from definitions, assumptions and calibrated inputs.

Prediction. A numerical distribution, interval or qualitative outcome fixed before the comparison data are inspected.

Held-out test. A comparison using data that did not influence model choice, parameter values, observable selection or analysis cuts.

Falsifier. A stated result that would count against the theory. “Any outcome can be explained” is the absence of a falsifier.

Validation. Evidence that a specified model performs as claimed on declared tests. A list of possible experiments is a validation programme, not completed validation.

4 What if space is what survives?

4.1 A long-form magazine-style feature for curious general readers

Physics became simple once before. The great equations of the twentieth century compressed motion, gravity and quantum behavior into astonishingly economical forms. End Theory: Evans Node Dialect asks whether that simplicity may be the visible surface of a deeper, more intricate process - a universe assembled from relations that repeatedly survive their own change.

4.2 Begin by taking away the stage

Nearly every picture of the cosmos starts with a stage. Galaxies drift through space. Clocks tick in time. Fields spread across positions that already exist. Even when the stage curves, as it does in general relativity, the mathematical story begins with a spacetime geometry on which matter and radiation live.

Now try a harder thought experiment. Remove the actors, then remove the stage. No coordinates. No metres. No seconds. No background grid waiting to be occupied.

What could still be real?

One possible answer is **relation**: this potential state can influence that one; this joint change is allowed; another is forbidden. Relation is not yet distance. Order is not yet duration. But a network of allowed transitions can possess structure before it possesses geometry.

That is the beginning of END/MNT. Its central proposal is that observed physics may be the durable, large-scale description of a deterministic relational process with finite local transition capacity. The familiar world would not be made of little beads sitting in a pre-existing void. Instead, bead, void and motion would all be effective ideas that become useful after patterns persist.

This family resemblance places the project near several serious traditions in physics, without making it identical to any of them. Regge calculus replaces smooth geometry with discrete simplicial pieces [2]. Lattice gauge theory puts gauge fields on links and makes their symmetry exact even at finite spacing [1]. Causal-set research asks whether spacetime order and discreteness can precede continuum geometry [3]. Emergent-gravity and quantum-information programmes explore whether geometry can arise from more basic organization. END/MNT adds its own emphasis: stabilized frames, persistent relational patterns and a locally bounded capacity for change.

The proposal is ambitious. Its repaired form is also deliberately modest about what has been achieved. The ontology is a map of what should be derived. The scalar graph equation is a benchmark showing that part of the map can be made explicit. The bridges to quantum probability, the Standard Model and gravity remain incomplete.

That distinction is not a weakness to hide. It is the line separating an imaginative framework from a scientific theory that can survive contact with nature.

4.3 The flipbook is not the clock

Picture an endless flipbook. Each page contains a complete configuration, and each page follows the previous one according to a rule. A character inside the book may build a clock from a recurring pattern: a pendulum, an atomic transition or a repeating pulse. The clock counts its own cycles as the pages turn.

The page number and the clock reading are not the same thing.

This matters because END/MNT wants physical time to emerge. The fundamental label n merely orders updates. Operational time appears when a stable subsystem K supplies a repeatable observable. In a homogeneous regime, clock time might be proportional to update count. In a loaded or geometrically distorted regime, the local tick duration may change.

The thought experiment immediately imposes a burden. If progression imbalance is meant to reproduce gravitational time dilation, a clock pattern in one region must accumulate fewer operational cycles than a comparable clock elsewhere, even when both histories can be compared within the micro-description. Declaring each frame to be one universal instant will not do. The tick rate has to come out of the dynamics.

The same discipline repairs the word “energy.” Earlier versions spoke of energy as frame-to-frame change. Change may be a microscopic correlate of energy, but it is not yet energy in the physicist’s quantitative sense. In an effective time-translation-invariant regime, energy should be a conserved Hamiltonian or Noether charge with measurable units. The theory must derive that bridge rather than define it by metaphor.

4.4 How persistence can become space

The next step is selection by survival.

Suppose the microscopic process explores an immense variety of local arrangements. Most appear and disappear. Some recur. Others remain recognizable while moving, rotating or changing phase. We can formalize recognizability by coarse-graining the microstate at resolution R and asking whether the result stays within a tolerance of an allowed transformed copy over many updates.

The survivors are candidates for nodes.

Now connect persistent clusters that directly exchange influence. Give each link a positive weight representing interaction strength or transfer capacity. The resulting graph has paths. If stronger relations correspond to shorter effective links, the cheapest path between two clusters defines a graph distance.

The geometry has begun to appear.

But a graph is not automatically our three-dimensional space. A successful model must show that neighborhoods possess a stable effective dimension, that long-distance behavior becomes sufficiently isotropic, and that the same metric organizes the propagation of every relevant low-energy mode. It must explain why the continuum is Lorentzian and why there is one invariant speed to extraordinary precision.

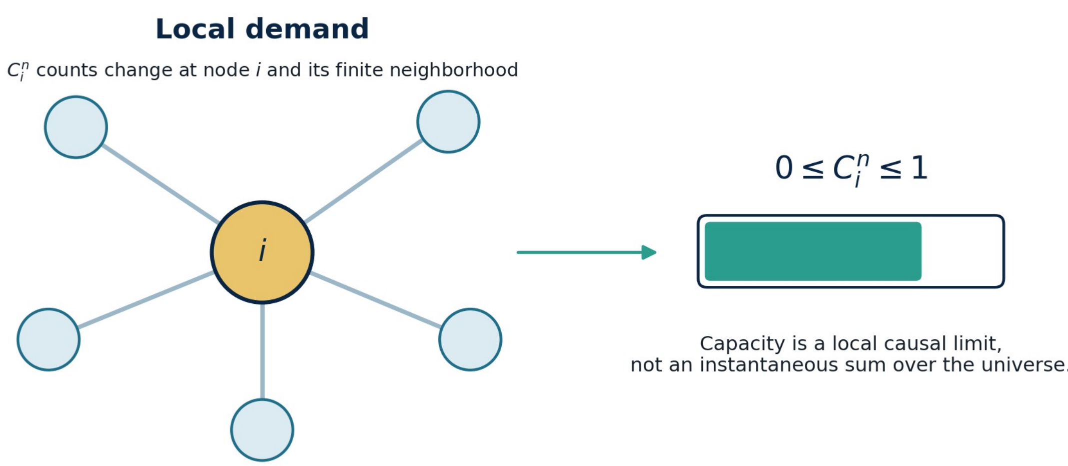
This is where the phrase “emergent space” earns or loses its meaning. Drawing nodes and connecting them is easy. Demonstrating a resolution range over which the graph behaves like a smooth 3+1-dimensional spacetime is a calculation.

4.5 A universe with a local speed limit on change

END/MNT’s most distinctive structural idea is not simply discreteness. It is a finite **local transition capacity**.

Imagine a city road network in which every intersection can process at most one normalized unit of traffic during a tick. Congestion at one intersection changes nearby routes. Its effects propagate. But a driver does not need the total traffic count for every road on Earth before moving through the next light.

The original ontology used a global capacity sum. On a large or infinite lattice, that can diverge and can make distant regions instantaneously interdependent. The repaired law is local: every node i carries a demand C_i, computed from changes at that node and its finite neighborhood, and admissible evolution requires $0 \le C_i \le 1$.



A local capacity bound avoids instantaneous coordination across an arbitrarily large universe.

A bound like this could do several jobs. It could limit propagation, constrain local acceleration, create nonlinear thresholds and force highly loaded regions to redistribute change. It could also do none of the hoped-for physical jobs if its detailed update rule produces instability or contradicts precision experiments. The value lies in making the idea concrete enough to find out.

The benchmark action converts one version of the intuition into mathematics. Neighboring coordinates resist disagreement like coupled springs; an onsite term sets a gap; a nonlinear potential permits richer patterns. The resulting update is explicit and deterministic. Its plane waves have an exact lattice dispersion relation, and its high-frequency stability condition can be checked before any comparison with particle data.

This is the right order of operations. A model that cannot preserve its own admissible set, conserve its intended quantities or converge under refinement should not be asked to explain the Higgs boson.

4.6 Why a particle might be a verb

In ordinary speech, a particle sounds like a tiny noun: a thing occupying a location. In a relational theory, a particle may be closer to a verb - a localized activity that keeps recreating its identity while moving through the network.

Think of a stadium wave. No spectator travels around the arena, yet a coherent pattern does. Now make the pattern nonlinear, self-stabilizing and capable of carrying invariant labels. Such a structure could, in principle, possess a rest-energy gap, scatter from other structures and survive transport.

The analogy is useful only if the mathematics goes further. A particle candidate needs a solution or invariant manifold. Perturbations around it must have a stable spectrum. Its motion must obey a dispersion relation. Its conserved labels must come from exact symmetries or topology. Interactions must produce calculable amplitudes and decay channels. Finally, the coarse-grained observables must connect to what a detector actually records.

Mass then becomes a rest-energy gap or an eigenvalue of a stability operator. Charge becomes a representation label of a gauge symmetry or a topological invariant. Spin requires the correct transformation behavior. None of these can be obtained by naming a frequency after a known particle and substituting $\omega = mc^2/\hbar$; that merely rewrites the measured mass.

This sharper standard retires many old numerical claims while preserving the motivating picture. Pattern identity may still be a productive way to think. It simply has to pay its mathematical debts.

4.7 Phase, loops and the route to gauge fields

Phase is one of the theory’s strongest surviving ideas because it has a natural exact language on a graph.

Assign a complex value $\psi_i = \rho_i e^{i\theta_i}$ to node i. A direct phase difference $\theta_j - \theta_i$ depends on how the local phase convention is chosen. To compare phases consistently, place a link variable $U_{ij} = e^{iqA_{ij}}$ between neighboring nodes. The covariant difference $U_{ij}\psi_j - \psi_i$ keeps the same magnitude when node phases and link phases transform together.

Take the ordered product of link variables around a closed elementary loop. The result, called a plaquette holonomy, is gauge invariant. At long distance it can become the curvature of a gauge field. This is the architecture behind Wilson's lattice formulation of gauge theory [1].

For END/MNT, the lesson is precise. Phase alignment can be retained, but electromagnetism does not emerge from a suggestive line integral alone. The theory must specify node representations, link transformations, loop observables, dynamics and the continuum limit. Chiral fermions create an additional obstacle: naïve lattice formulations tend to produce unwanted doubled species, captured by the Nielsen-Ninomiya no-go theorem [6]. Any claim to derive the Standard Model must confront anomaly cancellation and chirality directly.

That is physics becoming complex again in the productive sense. The simplicity of the low-energy equations would have to be explained by a deeper system whose symmetries survive coarse-graining with extraordinary exactness.

4.8 EQEF, deferred change and the geometry of imbalance

The Evans Quantum Energy Field has carried several meanings across the project's history. The canonical reconstruction narrows them.

At the first level, EQEF is a ledger. If local demand is C_i, residual capacity is $r_i = 1 - C_i$. A causal balance equation may track how residual capacity is transported, stored or released among neighboring regions. This quantity is dimensionless until a physical normalization is supplied. It is not automatically a new form of energy.

At the second level, coarse-graining may produce a field $\chi(x)$ representing fluctuations of residual capacity around a background. One can write a conservative effective action with a kinetic term, a potential and couplings to curvature. Depending on the potential, such a field might vary slowly enough to influence cosmology. But many scalar fields can do that. END/MNT becomes distinctive only if the discrete update fixes the field's coefficients or produces a relation that survives held-out observations.

The same restraint applies to torsion. In Riemann-Cartan geometry, torsion measures the infinitesimal failure of a transported parallelogram to close [7]. Imagine taking one tiny step east, one north, then reversing both moves. If local translation rules are imbalanced, the endpoint may miss the start. The mismatch per enclosed area is a geometrically meaningful candidate for "progression imbalance."

The word *candidate* matters. The theory still has to derive a tetrad, a spin connection, a torsion source and the effective coefficients. Curvature, torsion, energy and EQEF cannot be used as interchangeable poetic names.

4.9 The quantum challenge cannot be skipped

A deterministic micro-history does not by itself reproduce quantum mechanics.

Quantum theory predicts probabilities, interference and entanglement with astonishing accuracy. Bell experiments rule out a broad class of local, measurement-independent hidden-variable theories [4,5]. A deterministic completion must say what the complete ontic state λ is, how preparations generate an ensemble, how measurement settings enter, how outcomes are read and which assumption behind the Bell bound is altered.

There are several logical options: operational nonlocality, measurement dependence, retrocausal structure, contextual outcomes or another carefully defined departure from the standard assumptions. “The two particles shared an earlier frame” is not enough. A common past produces ordinary correlations, but not the full Bell-violating pattern under the usual local and measurement-independent conditions.

The Born rule is a separate demand. If stable amplification or a capacity threshold creates localization, the model must calculate outcome frequencies and recover the squared-amplitude rule in the appropriate regime. It must also preserve no-signaling at the operational level and state what happens to conservation laws during localization.

END/MNT retains a deterministic intent and a useful language of frame histories, phase dispersal and stable amplification. Its quantum completion remains open. That is one of the programme’s decisive gates, not a detail to add after the cosmology.

4.10 How the universe could unfold in this picture

With those cautions in place, the proposed cosmic story can be told as a sequence of transitions.

First comes a pre-geometric relational regime: possible states and admissible joint changes, but no established physical distance. Ordered updates create histories. Recurrent structures begin to store information about their own past. Persistence separates durable patterns from transient noise.

As persistent clusters interact, a weighted graph stabilizes. Its large-scale neighborhoods acquire regular dimension and approximately isotropic distance. Collective disturbances develop long-wavelength dispersion. Operational clocks emerge from repeating patterns. A shared conversion between graph propagation and clock readings produces an effective causal speed.

Nonlinear stable modes become particle candidates. Link phases and loop holonomies organize gauge-like interactions. Symmetry breaking in an effective scalar sector may generate mass matrices, but the matrices must ultimately be computed from the node operator rather than tuned to the observed spectrum.

Regions approaching local capacity respond nonlinearly. If coarse-grained progression imbalance universally affects clock rates and trajectories, an effective geometry may emerge. If residual capacity develops a slowly evolving collective mode, an EQEF-like field may contribute to cosmic dynamics.

This is a proposed unfolding, not an established chronology of our observed early universe. A real cosmology requires background and perturbation equations, initial conditions, light-element abundances, microwave-background spectra, structure formation and late-time expansion - all derived from the same frozen model. Substituting standard ΛCDM parameters into standard equations would test ΛCDM, not END/MNT.

4.11 What has been removed - and why that makes the project stronger

The theory's history contains many numerical targets: particle masses, resonances, coupling values, dark-sector signals, gravitational-wave echoes and aggregate alignment percentages. Some were suggestive. Several used measured constants as inputs and then counted their reappearance as predictions. Others mixed dimensions, changed parameter meanings or proposed experimental windows without an interaction model.

Those claims are retired from the canonical scientific record.

The removal is substantial. It includes unfrozen resonances at several incompatible energies; a Higgs expression with inserted measured constants and incorrect dimensions; a dimensionally wrong gravitational formula; a cosmological-constant value with Planck-unit and SI units confused; masses generated by substituting measured frequencies; and "validation" scores without a common likelihood, covariance, parameter count or held-out dataset.

What remains is less spectacular on a poster and more valuable in a calculation: an ordered ontology, a local capacity law, a concrete graph-field action, an exact update, an exact dispersion relation, a stability bound, a gauge-invariant phase extension, a disciplined meaning for EQEF and torsion, and a staged falsification programme.

Science does not become smaller when a weak claim is removed. The search space becomes clearer.

4.12 The experiment before the experiments

The first serious test of END/MNT should happen on a computer, before the project attempts another global fit.

Implement the scalar benchmark on square, cubic and approximately isotropic irregular graphs. Verify the exact dispersion relation numerically. Map the stability boundary. Add compact phases and link variables, then unit-test gauge invariance to machine precision. Construct one local capacity-preserving completion and measure its conservation residuals under resolution refinement.

Only then search for stable localized nonlinear patterns. Freeze all parameters before comparing any pattern with a particle mass. Report dimensionless gaps, scattering behavior and failure regions. If patterns disappear under small perturbations or if the continuum anisotropy does not shrink as predicted, say so.

Later gates are harder. A gauge and chiral sector must avoid doubling and anomalies. A quantum module must reproduce preparation-dependent probabilities and Bell correlations. A gravitational coarse-graining must yield universal free fall, the Newtonian limit, relativistic propagation and allowed corrections. External tests require preregistration, versioned code, declared calibration data, held-out data and comparison against simpler baselines.

This programme can fail early and cheaply. That is an advantage. A theory that risks nothing teaches nothing.

4.13 Complexity returns - with a purpose

The twentieth century gave physics equations of breathtaking compression. General relativity turned gravity into geometry. Quantum field theory organized particles as excitations of fields and interactions as symmetries. The Standard Model became extraordinarily successful even as its list of fields, parameters and unexplained patterns grew.

END/MNT asks whether the next layer may be conceptually simple but dynamically complex: local relations updating under one rule, producing multiple effective descriptions at different scales. The complexity is not an excuse to fit anything. It is the complexity of emergence - the way a simple local rule can create phases, defects, collective modes, effective geometry and information-processing structures.

The question is not whether a sufficiently elaborate network can imitate known physics. It can. The question is whether one constrained, economical micro-model predicts several independent structures that were not inserted: a common invariant speed, stable dimension, gauge group, chiral content, mass ratios, quantum statistics and gravitational response.

If it can, physics will have become complex again beneath the equations we know - while becoming more unified in its foundations.

If it cannot, the failed attempt will still have clarified what a relational theory must do.

That is the invitation of End Theory: Evans Node Dialect. Do not believe it because the picture feels complete. Follow the equations until the picture either becomes unavoidable or breaks.

4.14 About Ryan

Ryan is an independent thinker based in Medicine Hat, Alberta, with roots in Campbell River on the east coast of northern Vancouver Island - a community set between Discovery Passage and a mountain backdrop [11]. His path into foundational physics grew from an interest in systems: computers, network security, hypnosis and the language of suggestion, and extreme sports.

Across those fields, Ryan asks what hidden rules shape visible behavior. Computers scale local instructions; security finds gaps between intended rules and real vulnerabilities; hypnosis examines framing and ethical influence; extreme sports make feedback and consequence immediate.

Ryan wants difficult ideas tested and challenged. He believes knowledge should serve people, approaches others with goodwill, and values the courage to be wrong.

5 Editorial and scientific notes

5.1 Canonical claim in one paragraph

Observed physics may arise from persistent relational patterns in a deterministic sequence of locally capacity-limited configurations. A node graph is an emergent stable phase of that process. The proposition becomes a physical theory only if one frozen micro-model derives its continuum observables, quantum statistics and gravitational response with fewer independent inputs than the phenomena it predicts.

5.2 What is currently established inside the framework

A consistent hierarchy from proto-relations to ordered updates, stabilized frames, graphs, patterns and effective fields.

A local capacity requirement that avoids the nonlocal global-sum defect.

One explicit deterministic scalar graph benchmark.

Its exact lattice dispersion relation, long-wavelength limit and sufficient stability bound.

A gauge-invariant link-variable extension for compact phase.

A repaired vocabulary for EQEF, progression imbalance and torsion.

A source-disposition rule and falsification programme.

5.3 What remains conjectural

The unique microscopic update and the capacity-preserving completion.

The emergence of 3+1-dimensional Lorentzian spacetime.

Stable patterns corresponding to the observed particle spectrum.

A chiral, anomaly-free Standard Model gauge sector.

The Born rule and a Bell-compatible causal account.

Universal gravity, torsion coefficients and an EQEF cosmological role.

Any new resonance, dark-sector signal, gravitational-wave correction or numerical constant relation.

5.4 Publication note

This is a long-form site feature, not a peer-reviewed manuscript. Scientific American asks for evidence-based, nonpromotional features of roughly 2,000-4,000 words and does not accept AI-generated freelancer pitches or drafts [12,13]. Use this as a research and voice-development base, not as submission copy.

6 References and source notes

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6.1 Source-corpus disposition

This public package is based on the ontology-aligned reconstruction and the supplied END/MNT corpus. The ontology and corrected mathematical reconstruction control the meaning of the terms. Later mathematical consistency and evidentiary standards supersede incompatible older prose. The early END papers, deterministic-lattice manuscripts and "end" notes are treated as idea reservoirs only. Unsupported validation percentages, circular constant derivations, incompatible resonance targets, dimensionally incorrect formulas and unarchived experimental claims are not carried forward.

6.2 AI-use disclosure

Generative AI assisted source comparison, mathematical checking, organization, graphics and drafting under Ryan's direction. AI is not an author. Ryan remains responsible for every scientific statement, equation, source and public biographical fact; numerical results require regeneration from archived code.