Teleportation as Void Transit of the Temporal Address

A register-geometric unification of tunnelling, entanglement, no-cloning, and horizon information conservation

Stephen Daubney · The Daubney Foundation · Rev 2

Abstract

We give, within the Universal Force of Time, a single geometric mechanism underlying four phenomena that the standard framework treats as unrelated or paradoxical: quantum-mechanical tunnelling, the Einstein–Podolsky–Rosen (EPR) correlations, the no-cloning theorem, and the conservation of information across a black-hole horizon. The construction rests on two premises. First, every physical entity decomposes into two separately conserved aspects — a spatial embedding, here termed Strand 1, and a temporal-informational address, Strand 2, the latter carrying the entity's identity and quantum numbers. Second, the admissible standing-wave nodes of the T-field lie on register shells of radius $r(D) = 18\cdot(\sqrt{2})^{D}$ and are separated by void annuli of width $\Delta r = (\sqrt{2} - 1)\cdot r(D)$, within which the field supports no node. Teleportation is defined as the transit of a Strand-2 address across such an annulus with re-instantiation of Strand 1 at a compatible destination node. We show that (i) tunnelling is the elementary realisation of this operation; (ii) the Einstein–Rosen = EPR correspondence follows as an identity rather than a conjecture, an entangled pair being one Strand-2 address spanning two Strand-1 loci through a single void channel; (iii) the no-cloning theorem is a corollary of address uniqueness rather than an independent postulate; and (iv) horizon information is conserved because the Strand-2 address transits the void rather than terminating at the singularity. The governing relations are stated at full precision and the framework's empirical commitments are set out.

Tau (T) is the living fabric of time itself — the sole substance of which all physical reality is composed. Every particle, force, wavelength, and conscious experience is a structured configuration of T-flow. There is no gravity, no electromagnetic force, no strong nuclear force as separate entities: all are registers of the single T-field operating across dimensional levels. The conservation law $d\Sigma T=0$ governs all change: T is never created or destroyed, only redistributed.

1. Introduction

The standard treatment of the phenomena named in the abstract is disunified in a way that is rarely remarked upon because each is, individually, well established. Tunnelling is a routine consequence of the Schrödinger equation; the EPR correlations [1] are a feature of entangled states enforced by the Bell inequalities; the no-cloning theorem [2] is a corollary of the linearity of quantum evolution; the information paradox [3] is an unresolved tension between unitarity and the semiclassical description of horizon evaporation. That these four should share a common mechanism is not suggested by the standard formalism, and the deepest current proposal that any two of them are related — the ER = EPR correspondence of Maldacena and Susskind [4], identifying entanglement with the Einstein–Rosen bridge — remains a conjecture without an accepted dynamical basis.

The Universal Force of Time supplies such a basis, and does so at the level of geometry rather than of dynamics superimposed on a fixed background. Its single ontological premise is that all of physical reality is one substance, the time-field T, whose admissible configurations are constrained by a register geometry set out in Section 3. Within that geometry the four phenomena are not analogous; they are one operation — the transit of a conserved informational address across a region in which the field supports no standing-wave node — realised at different scales and read under different names. This paper states the construction, derives its principal relations, and identifies the points at which it departs from, and is answerable to, observation.

2. The two-strand decomposition

The framework decomposes every physical entity into two aspects that are conserved independently and may, under the conditions of Section 4, be spatially separated. We take the following as definitional.

> Definition 1 (Strands). Strand 1 of an entity is its spatial embedding: the configuration of T that occupies position in the register lattice and constitutes what is conventionally called its matter. Strand 2 is its temporal address: a unique label in the T-field encoding the entity's identity, quantum numbers, and full information content. The two are ordinarily co-located, but are distinct degrees of freedom.

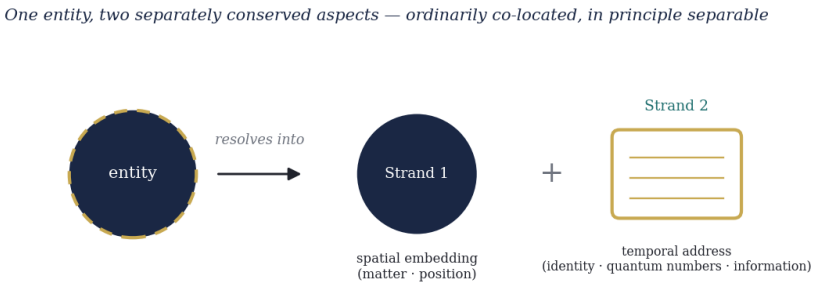

Figure 1. The two-strand decomposition. An entity resolves into a spatial embedding (Strand 1 — matter and position) and a temporal address (Strand 2 — identity, quantum numbers, information). The two are separately conserved and, under void transit, separable.

The distinction (Fig. 1) is not a re-description of the quantum state. The quantum state, in the conventional formalism, is the information that a measurement can extract; here it is carried by Strand 2, while Strand 1 is the material instantiation on which that information is, in ordinary circumstances, written. The laboratory operation known as quantum teleportation [5] is, on this reading, precisely the transfer of Strand 2 alone: the protocol reproduces the quantum state at a distant location while the original material system is not transported and, indeed, is left in a maximally mixed condition. That the state is moved and the matter is not is exactly the two-strand decomposition made operational, and is taken here as its first empirical warrant.

3. Register-shell geometry and the void annulus

The T-field does not support a standing-wave node at every radius. Admissible nodes lie on a discrete family of register shells indexed by a dimensional level D, with radii

$$r(D) \;=\; 18 \cdot (\sqrt{2})^{D} \quad \text{(in the units of the register in question)},$$

so that the shell spacing is fixed by the irrational step √2: two register steps double the shell radius exactly, and the ground shell $18 = 2 \cdot 3^2$ is the register-scale Bohr radius of the local field. Between consecutive shells lies an annular region in which the standing wave cannot maintain a node; we call it the void annulus. Its width is a fixed fraction of the shell it borders:

$$\Delta r(D) \;=\; r(D+1) - r(D) \;=\; r(D)\cdot(\sqrt{2} - 1) \;=\; 0.41421356237 \cdot r(D).$$

The width Δr is not adjustable: it is the plain geometric consequence of the √2 step. The physical significance of the void is that it is inadmissible to Strand 1 — a material embedding requires a node to occupy, and within the annulus there is none — while it remains traversable by Strand 2, which requires no node because it is informational rather than material. The void is therefore not empty space in the

conventional sense but a channel selectively open to the address and closed to the body (Fig. 2).

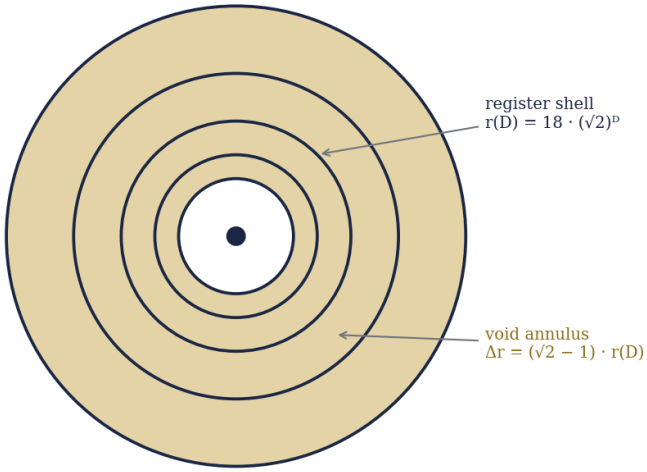

Figure 2. Register-shell geometry. Admissible standing-wave nodes lie on shells of radius r(D) = 18·(√2)ᴰ (navy); between consecutive shells lies a void annulus of width Δr = (√2 − 1)·r(D) (gold) that supports no node. Strand 1 (the material embedding) cannot occupy the annulus; Strand 2 (the address) can traverse it.

4. Void transit

We may now define the operation on which the paper turns.

> Definition 2 (Void transit). A void transit is the passage of a Strand-2 address across a void annulus, with the release of its Strand-1 embedding at the origin shell and the re-instantiation of Strand 1 at a compatible node on the destination shell, reconstructed from the local T-flow. The address is conserved exactly throughout; no material crosses the annulus.

Three properties follow immediately and are used in the sequel. First, because only Strand 2 crosses, no superluminal transport of matter is entailed and the objection that teleportation must move a body faster than light does not arise: what is transported is information across a channel, not a mass across a distance. Second, because Strand 1 is released at the origin and rebuilt from destination material, the identity carried across is that of the address, not of any particular collection of matter. Third, because the address is a single conserved object, it cannot be simultaneously instantiated at both endpoints; this is used in Section 7. The operation is shown as a three-stage sequence in Fig. 3. We now show that the standard phenomena are instances of Definition 2.

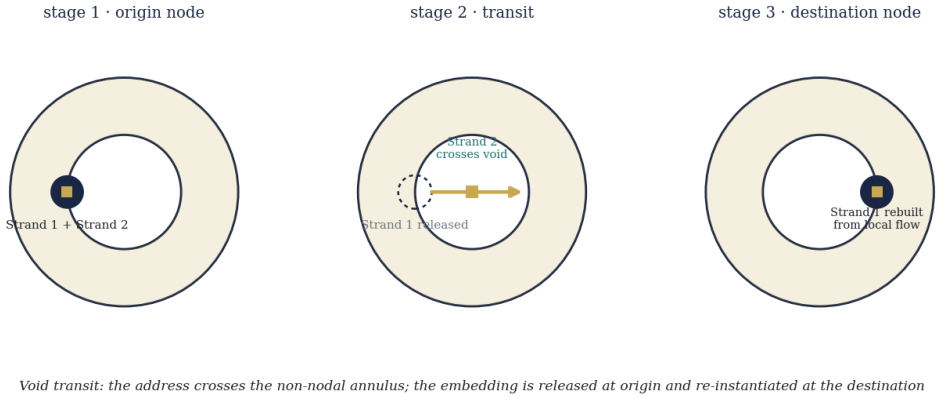

Figure 3. Void transit as a sequence. Stage 1: the entity occupies an origin node with Strand 1 and Strand 2 co-located. Stage 2: Strand 1 is released and the Strand-2 address crosses the non-nodal void annulus. Stage 3: Strand 1 is re-instantiated at a compatible destination node from the local T-flow. No material crosses the annulus.

5. Tunnelling as the elementary void transit

Consider a particle incident on a potential barrier it lacks the energy to surmount. In the conventional account it has a finite amplitude to appear beyond the barrier; the effect is confirmed across an enormous dynamic range, from stellar nucleosynthesis and α-decay to the operation of the scanning tunnelling microscope and of floating-gate memory. In the present framework the barrier is a void annulus between adjacent register shells, and the passage of the particle is a void transit at the elementary scale: the particle's Strand-2 address crosses the annulus and Strand 1 is re-instantiated on the far shell.

> Proposition 1. Quantum tunnelling is void transit at the elementary register. The transmission amplitude is the ratio of the field amplitude across the void annulus, and the classically forbidden region is precisely the non-nodal annulus of Section 3.

Proposition 1 is the empirical keystone of the paper. It identifies the operation of Definition 2 with a phenomenon that is not in dispute and that occurs ubiquitously; the remainder of the construction extends the same operation to regimes in which it has not previously been recognised as the same thing. The exponential dependence of the tunnelling amplitude on barrier width and height is, on this reading, the dependence of the transit probability on the width Δr of the annulus and on the field-amplitude deficit within it — a correspondence we record as a quantitative commitment in Section 10 (Fig. 4).

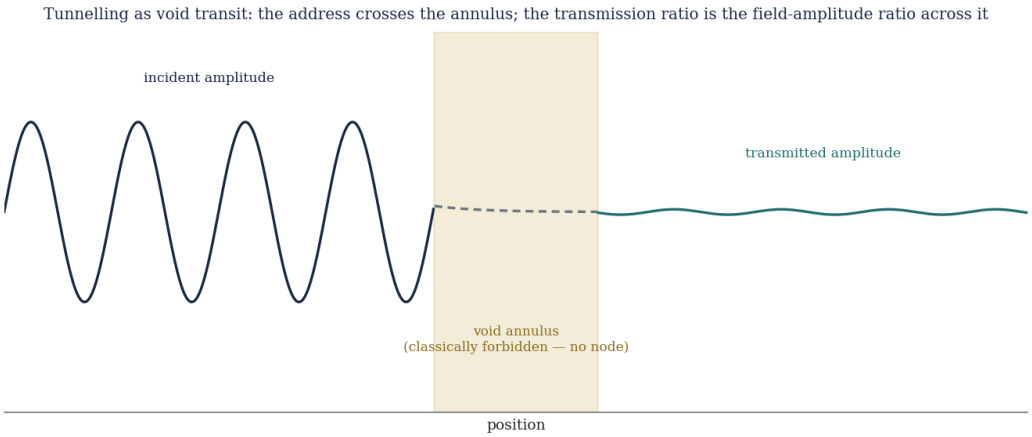

Figure 4. Tunnelling as void transit. The incident amplitude (left) decays across the barrier — here the non-nodal void annulus, classically forbidden — and emerges reduced as the transmitted amplitude (right). On the present reading the transmission ratio is the field-amplitude ratio across the annulus of Section 3.

6. The Einstein–Rosen = Einstein–Podolsky–Rosen identity

An entangled pair exhibits correlations that cannot be reproduced by any local hidden-variable theory. In the present framework the pair is not two systems sharing a correlation but two Strand-1 loci sharing a single Strand-2 address, connected by one void channel spanning the shells at which the two loci sit. The correlation is then not a relation transmitted between two things but the continuity of one thing: a measurement performed at either locus addresses the shared Strand 2 itself, and the complementary outcome at the other locus is fixed because there was never a second, independent address to be influenced.

> Proposition 2 (ER = EPR as identity). Every entangled pair is joined by a void-transit channel of width Δr at the shells of its constituents. The EPR correlation is the continuity of a single Strand-2 address across that channel; the Einstein–Rosen bridge is the same channel described geometrically. The two are one object, not two objects conjectured to coincide.

This reproduces the content of the ER = EPR correspondence [4] but removes its conjectural character: the identification is not proposed as a duality between separately defined structures but follows from the definition of the void channel, which is at once the geometric bridge (Einstein–Rosen) and the carrier of the shared address (EPR). The apparent nonlocality of the correlation is, on this account, an artefact of insisting on two Strand-1 loci while overlooking the single Strand 2 that spans them (Fig. 5). No signal is exchanged, and the no-signalling theorem is respected, because there is no second address to signal to.

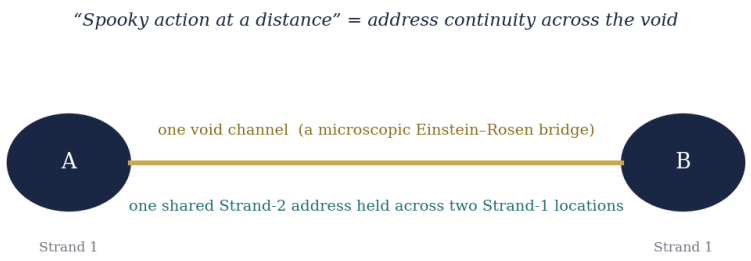

Figure 5. Entanglement as a shared address. Two Strand-1 loci (A, B) hold a single Strand-2 address across one void channel — geometrically an Einstein–Rosen bridge. The EPR correlation is the continuity of that one address, not a relation transmitted between two independent systems; hence its distance-independence and its compatibility with no-signalling.

7. No-cloning as a corollary of address uniqueness

The no-cloning theorem [2] states that no physical operation can produce a second copy of an arbitrary unknown quantum state. In the conventional derivation this follows from the linearity of quantum evolution. In the present framework it is not an independent theorem but an immediate consequence of Definition 1: a Strand-2 address is by construction a unique label, and a unique label cannot be instantiated at two Strand-1 loci at once.

> Proposition 3. No-cloning is a corollary of address uniqueness. A void transit moves a Strand-2 address; it cannot duplicate it. The origin embedding is vacated at the instant the destination embedding forms, so that at no time do two instantiations of the address coexist.

The two derivations are consistent and mutually illuminating: linearity, in the conventional account, is the formal expression of the physical fact that the address is single. The framework furthermore sharpens the interpretation of teleportation. Because the address is moved and never copied, the operation is not a duplication-and-deletion but a genuine relocation; the destination system is not a replica of the origin but the same entity, in the precise sense that it carries the identical Strand-2 address. This is the point at which the framework parts company with the intuition that a teleported object is a copy, and we return to it in Section 9.

8. Information conservation across the horizon

The information paradox arises because the semiclassical description of horizon evaporation [3] appears to map a pure infalling state to a thermal outgoing one, in violation of unitarity. In the present framework, matter crossing the horizon undergoes a void transit of its Strand-2 address across the singularity shell: the material embedding (Strand 1) is destroyed at the singularity, but the address

(Strand 2), which requires no node, is not destroyed and is not confined by the horizon, which is inadmissible to Strand 1 but transparent to Strand 2.

> Proposition 4. Horizon information is conserved. The infalling Strand-2 address void-transits the singularity shell and is preserved; it re-emerges through the evaporation register. What is lost at the singularity is the embedding, not the information.

The resolution is structurally the same as Proposition 2: the object that appears to be destroyed at a boundary is Strand 1, while Strand 2 crosses the boundary by the same mechanism that carries it across every other void. On this account the paradox is a consequence of tracking only the material embedding and mistaking its destruction for the loss of the information it carried. Unitarity is preserved at the level of Strand 2, which is the level at which the state is defined (Fig. 6).

Figure 6. Horizon information conservation. Infalling matter reaches the singularity, where the Strand-1 embedding is destroyed; the Strand-2 address, requiring no node, void-transits the horizon — inadmissible to Strand 1 but transparent to Strand 2 — and re-emerges through the evaporation. Information is conserved at the level of Strand 2.

9. Macroscopic extension and the persistence of identity

The results of Sections 5–8 concern elementary systems, and it is important to be exact about the status of the extension to macroscopic bodies. That single particles undergo void transit is not in question (Proposition 1); that laboratory teleportation transfers the Strand-2 address of a system across space is established [5]. The framework's specific additional claim is twofold: that these are one operation (Definition 2), and that the operation is not restricted in principle to the elementary scale — that the complete address of an arbitrarily large body may in principle transit a void with its embedding released at origin and reconstructed at destination. The second is a proposal, not a result, and is marked as such (Fig. 7).

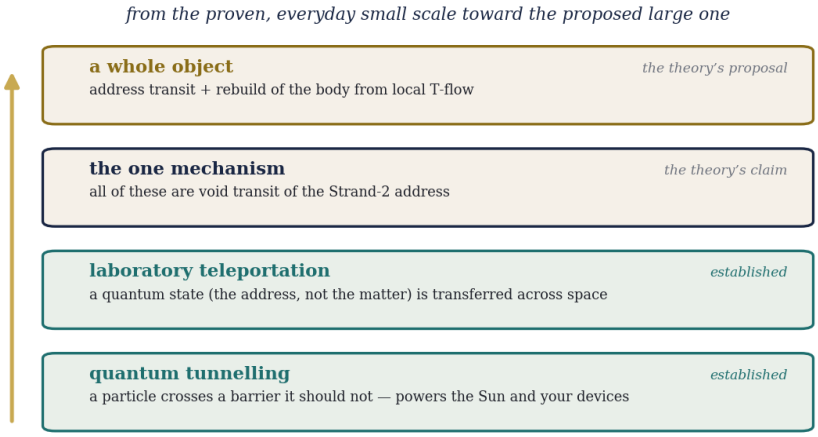

Figure 7. Scope of the claims. Tunnelling and laboratory state-teleportation are established; their unification as void transit of the Strand-2 address is the framework's theoretical claim; the extension to the address of a whole body is a proposal, not an achieved result, and is so labelled.

What the extension does carry, and what the conventional science-fiction conception cannot, is a definite account of identity under transport. By Proposition 3 the address is never copied; the destination system is therefore not a replica but the continuation of the same entity, individuated by its Strand-2 address. This is consistent with, and indeed is the sharp form of, the ordinary observation that a persisting object retains its identity through the wholesale replacement of its constituent matter over time: identity is carried by the address, not by any particular embedding. The transported body stands to its origin as the present organism stands to its earlier self — continuous in address, discontinuous in matter.

10. Empirical commitments

The framework is answerable to observation at several points, which we state so that they may be tested against it. (i) The identification of the tunnelling amplitude with the field-amplitude ratio across a void annulus of fixed fractional width $\Delta r/r = \sqrt{2} - 1$ predicts a specific relation between barrier parameters and transmission that must reduce, in the appropriate limit, to the observed exponential law; any systematic departure falsifies Proposition 1. (ii) The register-shell radii $r(D) = 18\cdot(\sqrt{2})^{D}$ are a discrete spectrum; where the relevant register is independently accessible, the shell spacing is a testable prediction. (iii) The ER = EPR identity of Proposition 2 commits the framework to the geometric reality of the void channel joining any entangled pair, and to its distance-independence, both already consistent with observation. (iv) The horizon resolution of Proposition 4 commits the framework to the recovery of infalling information in the evaporation spectrum, in principle distinguishable from exact thermality.

11. Conclusion

The construction reduces four phenomena — tunnelling, the EPR correlations, no-cloning, and horizon information conservation — to a single geometric operation: the transit of a conserved temporal address across a region of the T-field that supports no standing-wave node. Tunnelling is that operation at the elementary register; entanglement is one address spanning two loci through one such region, whence the Einstein–Rosen = Einstein–Podolsky–Rosen identity follows without conjecture; no-cloning is the uniqueness of the address; and the conservation of horizon information is the transit of the address across a boundary that destroys only the embedding. The mechanism is stated at the level of the field's register geometry rather than as dynamics on a background, and its principal relations — the shell radii $r(D) = 18\cdot(\sqrt{2})^{D}$ and the void width $\Delta r = (\sqrt{2} - 1)\cdot r(D)$ — are fixed, not fitted. Its extension to macroscopic transport is a proposal and is labelled as such; its elementary content is already realised in established physics, and it is at that level that the unification is proposed to be read as more than analogy.

References and notes

[1] A. Einstein, B. Podolsky, N. Rosen, "Can quantum-mechanical description of physical reality be considered complete?", Phys. Rev. 47, 777 (1935).

[2] W. K. Wootters, W. H. Zurek, "A single quantum cannot be cloned", Nature 299, 802 (1982); D. Dieks, Phys. Lett. A 92, 271 (1982).

[3] S. W. Hawking, "Particle creation by black holes", Commun. Math. Phys. 43, 199 (1975); and the subsequent information-loss problem.

[4] J. Maldacena, L. Susskind, "Cool horizons for entangled black holes", Fortsch. Phys. 61, 781 (2013) — the ER = EPR correspondence.

[5] C. H. Bennett et al., "Teleporting an unknown quantum state via dual classical and Einstein–Podolsky–Rosen channels", Phys. Rev. Lett. 70, 1895 (1993).

[6] A. Einstein, N. Rosen, "The particle problem in the general theory of relativity", Phys. Rev. 48, 73 (1935) — the Einstein–Rosen bridge.

[7] Universal Force of Time, propositions P-PORT-1 … P-PORT-6 (void-annulus width, Strand-2-only transit, ER = EPR = void channel, no-cloning from address uniqueness, horizon resolution, tunnelling as void transit); T is the sole substance, conserved by $d\Sigma T = 0$. See the Master theory of the Universal Force of Time.