

Foundational suite and review guide

PDT Foundations R00

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What this suite provides

This is a reconstruction of the PDT foundations from the lowest mathematical layer upwards. It preserves Graham’s proposed relational account of the world and the last coherent survivor realisation principle. Its purpose is to give Dan a set of linked papers whose claims, assumptions and limits can be reviewed directly.

The result is a consistent formal core, proved restrictions on selection and transport, and explicit conditional models of quantum records, internal geometry, gravitational dynamics and cosmological evolution. The complete physical theory has not been closed. In particular, an intrinsic robust record law, a common microscopic matter and gravity model, and independently selected physical constants remain open. The ultimate actuality boundary is kept separate from these unfinished physical tasks.

The documents are research drafts prepared for review. They do not imply that either recipient has approved the new organisation, the proposed model choices or every proof. Standard mathematical results are identified as such. No new experimental confirmation or mathematical priority is claimed.

Reading order

Paper	Subject	Main result or boundary
<u>R01</u>	Core axioms and consistency	Explicit models and precise phase faithfulness
<u>R02</u>	Phase transport and complex structure	Loop phase, minimal carrier and transport limits
<u>R03</u>	Selection and persistent records	Singleton criterion, symmetry obstruction and stability
<u>R04</u>	Quantum states probability and dynamics	Conditional density operator law and unitarity
<u>R05</u>	Exclusion dynamics and realisation	Exact histories, pulse law and noise obstruction
<u>R06</u>	Composite systems Bell correlations and prediction	Explicit nonlocal conditional choice and no signalling
<u>R07</u>	Spatial carriers metric and orientation	Conditional frame, metric and orientation persistence

Paper	Subject	Main result or boundary
<u>R08</u>	Clocks scales and physical identification	Exact calibration and its remaining freedoms
<u>R09</u>	Interactions matter and refinement	Compatible gauge models and a continuum obstruction
<u>R10</u>	Gravity and conditional Einstein dynamics	Conditional action classification and stress obligation
<u>R11</u>	Cosmology and effective stress	Dilution constraints and nonempty evolution models
<u>R12</u>	Joint closure and the realisation boundary	Common model requirements and abandonment criteria
<u>R13</u>	Mathematical audit and reproducibility	Verification record, provenance and review targets

The full volume contains all papers in this order. The individual Word documents use the same stable paper and theorem numbers. The sources archive contains the editable mathematical text, document builder, dependency register and verification code. Links inside the combined volume point to its paper headings. Links between individual papers work when the documents are kept together in one folder.

The three layers

The structural layer, PDT F, supplies relations, their phase representation and retained history. A6 is explicitly marked as the additional realisation commitment. [R01](#) through [R03](#) set out this layer and its limits.

The physical layer, PDT P, introduces identified preparations, clocks, interactions, apparatus and geometry. [R04](#) through [R11](#) state these bridges separately. A mathematical carrier becomes a physical state space only through such an identification. The papers prove consequences inside declared classes rather than silently importing the desired physics into the core.

The realised layer, PDT U, concerns a complete physical history and its observable records. [R12](#) asks whether the physical modules share a common solution, observation map and conserved stress. Separate compatible models do not establish this joint layer.

This retains the earlier F, P and U architecture while using one numbering scheme for the review suite. No theorem is proved by importing its own conclusion from a later layer.

Repairs to the axiom account

The appendix criticised in the recent review used a vertex phase assignment as though it were the whole connection. [R02](#) proves why that exact construction has trivial closed loop phase. The rebuilt A1 and A2 use a phase functor on relational arrows, as the September 12 canonical foundations already allowed. Pure vertex assignments remain a special case.

Faithfulness is restricted to encoding the phase group. It is not injectivity of every full transport arrow. A3 is kept as a legacy label for a coordinate convention, with its redundancy acknowledged. Full transport may be noncommuting even though its scalar phase projection is abelian. This allows richer interactions without deriving the observed gauge groups.

A5's record number and A6's episode development parameter are distinguished. A6 now explicitly stops at the first attained singleton. Its conditions do not guarantee that every candidate law terminates, and the failure cases are proved in R03.

The Bell issue is answered for one conditional completion. B1 retains measurement independence and permits a Bell nonlocal joint outcome law. The quantum model's full local statistics do not signal. A relativistic mechanism for those actual joint events remains open. A6 by itself does not choose this route or automatically imply determinism.

The cosmology paper states the stress and dilution requirements explicitly. Radiationlike transport cannot be called cold dark matter or dark energy under the same conserved isotropic assumptions. The example cosmology declares its scalar potential, dust and initial data. It does not use their successful evolution as evidence that the core selected them.

Register of additional premises

The following are inputs to particular constructions. They are not all proposed as new indispensable axioms. A paper can use a model class without claiming that class is uniquely selected by PDT.

Label	Supplied content	Used in
FCS	Nonempty finite invariant admissible set	<u>R03</u>
Q1	Full finite quantum effect interpretation and context independent probabilities	<u>R04</u>
Q2	Mixture consistent operations, ancilla positivity and a physical inverse	<u>R04</u>
Q3	Continuous coherent time group	<u>R04</u>
Q4	Physical preparation and measurement instrument	<u>R04</u> and <u>R05</u>
C1	Complex tensor composition and local operation identification	<u>R04</u> and <u>R06</u>
E1	The specified exclusion instrument	<u>R05</u>
E2	The chosen pulse or jump implementation	<u>R05</u>
E3	Intrinsic trigger or protection law	Open obligation, not supplied
B1	Measurement independence with a Bell nonlocal joint law	<u>R06</u>

Label	Supplied content	Used in
S1	Four vertex comparison seed and its loop data	<u>R07</u>
S2	Carrier identified as measured displacement	<u>R07</u> and <u>R08</u>
S3	A specified orientation preserving barrier	<u>R07</u>
T1	Physical clock identification	<u>R08</u>
T2	Common proper time and causal identification	<u>R08</u> and <u>R10</u>
K1	Frozen mechanical calibration convention	<u>R08</u>
M1	Matter multiplets, representation and microscopic action	<u>R09</u>
M2	Regulator family and continuum observation map	<u>R09</u>
G1	Common four dimensional Lorentzian metric	<u>R10</u>
G2	Local pure metric action restricted to two total derivatives	<u>R10</u>
G3	Matter action and conserved total stress	<u>R10</u>
G4	Lorentz scattering and a massless helicity two soft sector	<u>R10</u>
K2	Homogeneous geometry and cosmological initial data	<u>R11</u>
K3	Cosmological matter action and stress	<u>R11</u>

Some premises constrain different descriptions of the same physical content. For example T2 and G1 overlap at the spacetime interface. They must be identified consistently in a joint model rather than counted as separate discoveries. C1 is a joint premise of the operational quantum package, even though R06 examines it after R04. That ordering is exposition, not a circular proof.

What Dan should review first

Begin with the scope of A1 through A4 and the distinction between the full groupoid and its phase quotient. The proposed convention preserves the corrected canonical sources but is weaker than the erroneous all arrow faithfulness phrase in the book appendix. That change needs to remain visible when the book is updated.

Next check A6's domain. The primitive realisation principle does not create its own candidate process. R05 proves a conditional quantum instrument and explicitly avoids treating branchwise cancellation as selection of one branch. The generic noise obstruction and the distinction between exact exclusion and operationally stable memory are central to any stronger physical claim.

Then inspect the optional choices B1, S1 through S3 and G1 through G4. Each has mathematical consequences and clear limits. In particular, choosing a four vertex seed is not deriving physical dimension, and selecting a two derivative metric action is not deriving its selection from relational phase.

Finally assess the shared state and stress problem in R12. The suite does not introduce a master theorem asserting that separately valid modules must coexist. A genuine completion needs a common witness and preservation of its constraints through evolution and record updates.

The intended stopping point

Graham's realisation boundary is respected. The suite does not claim to explain why an actual event exists merely because a mathematical candidate has survived. It also does not turn the God metaphor into an unmeasured force or a formal variable. Physical persistence can be studied conditionally, as in R03, while ultimate actuality remains adopted through A6.

The honest current statement is that PDT has a mathematically explicit relational and last survivor framework with several proved conditional physical constructions. Whether one independently selected dynamics produces the observed world is still a research question. The revised documents make that question precise enough to work on and to criticise.