

Nonassociative Packet Frame Logic and the Geometry of Stratified Time

Editorial rebuild with quadratic obstruction

Ivan Borisovich Kurpishev
Independent Researcher, Kaliningrad
me@kurpishev.ru

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Introduction

Aim and editorial status

This editorial rebuild presents the monograph as a unified text in which the axiomatics of stratified time, the algebraic realization, the logic of causality, and the phenomenological applications are coordinated inside a single architecture. The guiding thesis remains unchanged: time is not an external parameter but the primary stratified support, whereas space appears as a layer, a section, or an observable regime of a deeper packet organization.

The present rebuild explicitly strengthens the quadratic-obstruction node. A new chapter on structural completeness introduces a projective interpretation of the obstruction space and ties deformation theory to Desargues geometry, the Fano plane, and the criterion of structural truth.

Principal idea

The basic object is not a bare point but a packet point (e, s) , where e is an event and s is a state. The layers $L_s = \{(e, s)\}$ play the role of packet lines. On this language one can simultaneously describe incidence, dimensional stratification, nonassociativity of composition, quadratic obstructions, and the dynamics of the arrow of time.

Part 1

Axiomatics and stratification

CHAPTER 1

Packet geometry and stratified time

1. Packet point and incidence

Definition 1.1 (Packet point). A packet point is an ordered pair $a = (e, s)$, where $e \in \mathcal{E}$ is an event and $s \in \mathcal{S}$ is a state. The totality of packet points is denoted $\mathcal{P} \subseteq \mathcal{E} \times \mathcal{S}$.

Definition 1.2 (Packet line). For each state $s \in \mathcal{S}$ define the packet line

$$L_s = \{(e, s) \in \mathcal{P}\}.$$

It is the incidence layer at fixed state.

Axiom 1.3 (Basic incidence). The following are assumed:

- (1) every line L_s contains at least two points;
- (2) if $s \neq t$, then $L_s \neq L_t$;
- (3) every packet point lies on exactly one packet line.

2. Stratified time \mathbb{T}

Definition 1.4 (Stratified time). Stratified time is a triple $(\mathbb{T}, \mathcal{S}, \dim_{\text{loc}})$, where \mathbb{T} is a paracompact Hausdorff space with filtration

$$\mathbb{T}^{(-1)} \supset \mathbb{T}^{(0)} \supset \mathbb{T}^{(1)} \supset \mathbb{T}^{(2)} \supset \mathbb{T}^{(3)}.$$

The local dimension $\dim_{\text{loc}}(t) = k$ determines the stratum: 3 for cavity, 2 for surface, 1 for line, 0 for point, and -1 for hyparxis.

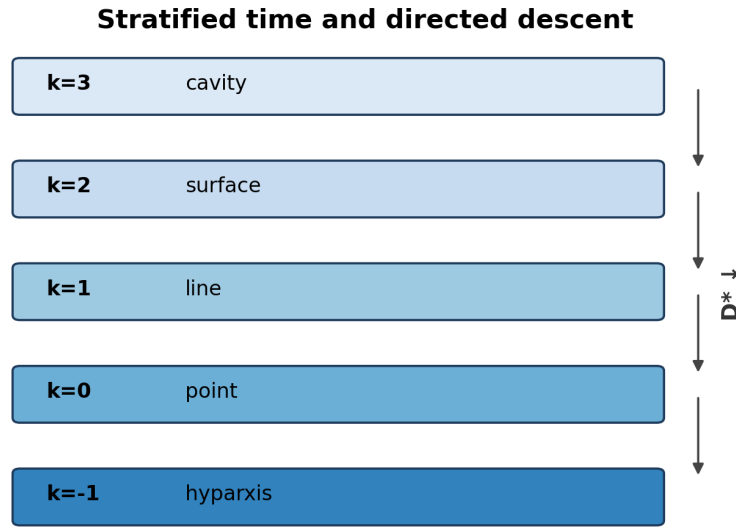
Definition 1.5 (Hyparxis and Apeiron). The transition maps $\mathcal{L}_k: \mathbb{T}^{(k)} \rightarrow \mathbb{T}^{(k-1)}$ form the structure of hyparxis. The space is called apeironic if $\pi_0(\mathbb{T}) = 0$ and there exists a global potential Φ strictly decreasing along the transitions \mathcal{L}_k .

Definition 1.6 (Principle PN.2). For a packet object (X, ω) the observables “size” $\hat{S} = \|\omega\|_{L^2}$ and “dimension” $\hat{D} = \dim X$ cannot be fixed sharply at the same time. Formally, there is no natural transformation between the functors \hat{S} and \hat{D} .

3. Stratification summary table

Table 1. Basic strata, geometric meaning, and direction of descent

k	Name of stratum	Geometric meaning	Dynamic role
3	cavity	outer spatial realization	quasiclassical observation layer
2	surface	shell and interface regimes	transitional configurations
1	line	one-dimensional channels	directed contraction
0	point	localized state	terminal localization
-1	hyparxis	boundary of transitions	terminal receiver of descent

Figure 1. Stratified time as a hierarchy of layers and directed descent along D^*

4. The Hodge-Kurpishev super-operator

Definition 1.7 (Super-operator). Define

$$\mathfrak{H} := \star_3 \circ (\mathcal{L}_3^{-1})^* \circ \star_2 \circ (\mathcal{L}_2^{-1})^* \circ \star_1 \circ (\mathcal{L}_1^{-1})^* \circ \star_0 \circ (\mathcal{L}_0^{-1})^* \circ \star_{-1}.$$

This composition synthesizes the data of different strata and closes packet connectivity.

CHAPTER 2

Flow-module and the Kurpishev arrow of time

1. The flow-module packet

Definition 2.1 (Flow-module). A flow-module packet is the pair (Φ_t, \mathfrak{H}) , symbolically written $\Phi_t * \mathfrak{H}$, where Φ_t is an admissible flow on packet data and \mathfrak{H} is the super-operator ensuring inter-stratum coherence.

Postulate 2.2 (Kurpishev arrow of time). The arrow of time is a flow Φ_t such that:

- (1) it commutes with \mathfrak{H} ;
- (2) it respects monotonicity of local dimension;
- (3) it admits a Lyapunov functional decreasing along nontrivial trajectories.

2. Variational principle

The arrow of time is not reduced to a coordinate choice. It is a distinguished class of flows minimizing internal tension of the packet structure. In the simplest realization the relevant functional is the square of the associator amplitude, or an equivalent functional of structural complexity.

CHAPTER 3

Operators of action, change, and reversal

1. Axiomatic distinction

Definition 3.1 (Change). The operator of change is a one-parameter semigroup

$$\Xi_\tau: \mathbb{T} \rightarrow \mathbb{T}, \quad \tau \geq 0,$$

satisfying $\Xi_0 = \text{id}$, $\Xi_{\tau_1+\tau_2} = \Xi_{\tau_1} \circ \Xi_{\tau_2}$, monotonicity of local dimension, and commutation with \mathfrak{H} .

Definition 3.2 (Action). The operator of action is a map

$$\Delta: \mathcal{P}_\emptyset \rightarrow \mathbb{T},$$

where \mathcal{P}_\emptyset is the set of empty points. Action posits a beginning that is not deduced from previous change.

Definition 3.3 (Reversal). The operator of reversal is an injection

$$\Upsilon: \Delta(\mathcal{P}_\emptyset) \rightarrow \mathbb{T},$$

which transfers the result of a discrete act into the regime of deterministic evolution.

Proposition 3.4 (The triad (Δ, Ξ, Υ)). *The triad (Δ, Ξ, Υ) is the axiomatic analog of the scheme “initial condition + law of evolution”. Action posits the initial act, reversal transfers it into the evolutionary regime, and change continues it along an admissible trajectory.*

Quadratic obstruction and structural completeness of packet geometry

1. Reduced deformation setup

Let $V = E \oplus F \oplus H$ be the split carrier of the packet model. Consider the reduced cochain spaces

$$C_{\text{red}}^1 \subset \text{End}(V), \quad C_{\text{red}}^2 \subset \text{Hom}(V \otimes V, V), \quad C_{\text{red}}^3 \subset \text{Hom}(V^{\otimes 3}, V),$$

compatible with the block architecture. The differentials d_μ^1 and d_μ^2 induce the reduced tangent space $H_{\text{red}}^2(\mu)$ and the obstruction quotient $O_{\text{red}}^3(\mu)$.

Definition 4.1 (Quadratic obstruction). The quadratic obstruction is the class \mathcal{O}_B arising from the quadratic part of the Maurer–Cartan deformation equation. It measures the impossibility of extending an admissible infinitesimal deformation to the next order without violating packet constraints.

2. Structural completeness

Definition 4.2 (Quadratic completeness). Packet geometry is called quadratically complete if $\mathcal{O}_B = \{0\}$. In that case the reduced deformation theory has no internal second-order obstruction and local deformations integrate without additional stitching operators.

Proposition 4.3 (Boundary of the linear regime). *The condition $\mathcal{O}_B = 0$ isolates the linear or Hilbertian type of geometry. Nontriviality of \mathcal{O}_B marks the exit from the purely linear scheme and is the first signature of projective or stratified nonlinear organization.*

3. Geometrization of the obstruction space

3.1. Projective interpretation of the obstruction space. Within the developed formalism of the quadratic obstruction \mathcal{O}_B , a projective structure arises naturally and links algebraic obstruction theory to Desargues geometry and the truth criterion.

Proposition 4.4 (\mathcal{O}_B as a projective plane). *The space of quadratic obstructions \mathcal{O}_B admits a canonical projective-plane structure in the following cases:*

- (1) if $\dim \mathcal{O}_B = 2$ over \mathbb{R} , then $\mathcal{O}_B \cong \mathbb{RP}^2$;
- (2) if $\dim \mathcal{O}_B = 3$ over \mathbb{F}_2 , then $\mathcal{O}_B \cong \mathbb{P}^2(\mathbb{F}_2)$, the Fano plane.

In both models the following structural identifications hold:

- *the line at infinity is identified with the hyperbolic layer $\mathbb{T}^{(-1)}$ as the boundary of transitions between strata;*
- *the harmonic cross-ratio $(A, B; C, D) = -1$ becomes the global criterion of structural truth on the layer \mathcal{O}_B ;*
- *cyclic modes of the relation $\text{Bet}_\circ(A, B, C) = 1$ correspond to projective cyclicity and arise when linear order on lines breaks down.*

Corollary 4.5 (Classification of geometries by the type of \mathcal{O}_B). *The dimension and structure of the obstruction space \mathcal{O}_B determine the underlying geometric type:*

- $\mathcal{O}_B = \{0\}$ — *Hilbertian linear geometry;*
- $\mathcal{O}_B \cong \mathbb{P}^2(\mathbb{F}_2)$ — *minimal nonlinear geometry over a finite field;*
- $\mathcal{O}_B \cong \mathbb{RP}^2$ — *a continuous projective geometry compatible with continuous temporal flow;*
- $\dim \mathcal{O}_B > 3$ — *complex stratified structures requiring additional stitching operators.*

Remark 4.6. The obstruction space thus has a double role. Algebraically it encodes the impossibility of integrating deformations, whereas geometrically it furnishes a projective picture in which truth and completeness are recognized through harmonic configuration.

Part 2

Algebraic realization and G_2 geometry

CHAPTER 5

The family of algebras \mathfrak{g}_α and the associator

1. Construction of the algebra

Let $V = E \oplus F \oplus H$, where $\dim E = \dim F = 3$ and $\dim H = 1$. On V define Lie brackets by

$$[e_i, e_j] = \varepsilon_{ijk} e_k, \quad [f_i, f_j] = \varepsilon_{ijk} f_k, \quad [e_i, f_j] = \alpha \delta_{ij} h,$$

with all other brackets zero. The parameter α measures the intensity of mixing between strata.

2. Associator and packet interpretation

If the binary composition is denoted by \odot , the associator is

$$\mathcal{A}(x, y, z) = (x \odot y) \odot z - x \odot (y \odot z).$$

It vanishes on homogeneous triples from E or F , but on mixed triples it is proportional to α . Hence α is a direct coordinate of nonassociativity.

CHAPTER 6

The rigidity theorem for the associator

1. Canonical G_2 form

On the simply connected Lie group G_α with Lie algebra \mathfrak{g}_α consider the form

$$\varphi_\alpha = z \wedge \omega + \Re\Omega.$$

It satisfies

$$d\varphi_\alpha = -(\alpha + \frac{1}{2})\omega^2 - z \wedge d\omega, \quad *\varphi_\alpha = \frac{1}{2}\omega^2 - z \wedge \Im\Omega.$$

The associator amplitude is defined by

$$\mathcal{A}(\alpha) = \|dz\| = \sqrt{3}|\alpha|.$$

Theorem 6.1 (Rigidity). *The Fernández-Gray torsion components are given by*

$$\tau_1 = \frac{1}{4}z, \quad \tau_2 = 0, \quad \tau_0(\alpha) = -\frac{12\alpha + 3}{14},$$

while $\tau_3(\alpha)$ depends linearly on α . Under the fixed-phase isotropic ansatz, the Laplacian acts scalarly:

$$\Delta_{\varphi_\alpha}\varphi_\alpha = k(\alpha)\varphi_\alpha, \quad k(\alpha) = \frac{12(\alpha + \frac{1}{2})^2 + \frac{9}{2}}{7}.$$

Part 3

Logic, dynamics, and causality

CHAPTER 7

Operators of Change and Motion

1. Concrete realization in the model \mathfrak{g}_α

Let Φ_t be the Laplacian flow restricted to the one-dimensional isotropic ansatz φ_α . Then the evolution reduces to

$$\dot{\alpha} = -k(\alpha).$$

The role of the empty point is played by a distinguished initial element, action posits it as an admissible initial condition, and change continues it without introducing new discrete acts.

2. Quantitative shadow of PN.2

For the superposition $\psi = e_i + f_i$ one has the effective mean dimension

$$\langle \hat{D} \rangle = \frac{3+2}{2} = 2.5, \quad \Delta D = 0.5.$$

To first order in α , the uncertainty of size can be estimated as $\Delta S \approx |\alpha|$, hence

$$\Delta S \cdot \Delta D \approx 0.5|\alpha|.$$

This gives a quantitative shadow of PN.2 in the concrete 7-dimensional model.

CHAPTER 8

Projective logic and the criterion of Truth

1. The harmonic cross-ratio

Definition 8.1 (Criterion of structural truth). An inference $A, B \vdash C$ relative to a context D is true if and only if

$$\text{Truth}(A, B \vdash C \mid D) \iff (A, B; C, D) = -1.$$

Here A and B are the premises, C is the synthesis, and D is the point at infinity encoding the sufficient ground.

Definition 8.2 (Universal and relative truth). Let

$$\lambda := (A, B; C, D).$$

Then *universal truth* is the harmonic case

$$\lambda = -1.$$

Any case with

$$\lambda \neq -1$$

describes *relative truth*, and the degree of truth is measured by how closely λ approaches the value -1 .

Define the *truth defect*

$$\delta_{\text{truth}} := |\lambda + 1|.$$

Then $\delta_{\text{truth}} = 0$ if and only if universal truth is attained.

Remark 8.3 (Frame interpretation of the value -1). Within NAPFRL the value

$$(A, B; C, D) = -1$$

is interpreted not only as a harmonic projective relation, but also as a frame condition for universal truth. In the authorial reading this means:

- a left-oriented coordinate system;
- the grounding of truth in the factual past;
- the grounding of truth in the real and actually effective present.

Thus the value -1 functions as a limiting point of geometric and ontological coherence.

Corollary 8.4 (Monotonicity of universality). *If*

$$\lambda_n \rightarrow -1,$$

then the corresponding sequence of relative truths tends to universal truth. Equivalently,

$$\delta_{\text{truth}}(\lambda_n) \rightarrow 0.$$

2. Packet reassembly of the four laws of formal logic

Definition 8.5 (Packet-situated judgment). A packet-situated judgment is an expression

$$J = (A, s, D),$$

where A denotes a content-bearing packet frame, s fixes the state or stratum, and D specifies the context of sufficient ground. Its truth value is denoted by

$$\text{Val}_{s,D}(A) \in \{0, 1\}.$$

Theorem 8.6 (The four laws of formal logic in packet form). *For fixed s and D , the four classical laws of formal logic are reassembled in NAPFRL as follows:*

(1) **Law of identity:**

$$A_{s,D} \equiv A_{s,D}.$$

A packet frame preserves identity only when state and context coincide.

(2) **Law of non-contradiction:**

$$\neg(\text{Val}_{s,D}(A) = 1 \wedge \text{Val}_{s,D}(\neg A) = 1).$$

On one and the same stratum and under one and the same sufficient ground, a packet and its negation cannot both be validated.

(3) **Law of excluded middle:**

$$\text{Val}_{s,D}(A) = 1 \vee \text{Val}_{s,D}(\neg A) = 1.$$

On a fixed stratified line every determinate judgment is completed either toward affirmation or toward negation.

(4) **Law of sufficient ground:**

$$\text{Truth}(A, B \vdash C \mid D)$$

is defined only in the presence of an admissible context D , and in the limiting case of universal truth one has

$$(A, B; C, D) = -1.$$

Remark 8.7 (Locality of the first three laws and globality of the fourth). In packet logic the laws of identity, non-contradiction, and excluded middle act *locally*: they require a fixed stratum s and a fixed ground D . The law of sufficient ground closes the system *globally*, because it is the law that stitches local validity to the projective harmony of the whole inference.

Table 1: Packet reassembly of the four laws of formal logic

Classical law	Packet formulation	Projective-logical meaning
Identity	$A_{s,D} \equiv A_{s,D}$	self-coincidence of the frame at fixed state
Non-contradiction	$\neg(A \wedge \neg A)$ in the form $\neg(\mathbf{Val}_{s,D}(A) = 1 \wedge \mathbf{Val}_{s,D}(\neg A) = 1)$	impossibility of double validation on one layer
Excluded middle	$A \vee \neg A$ in the form $\mathbf{Val}_{s,D}(A) = 1 \vee \mathbf{Val}_{s,D}(\neg A) = 1$	completion of local choice on a fixed line
Sufficient ground	truth is given only through a context D	harmonic closure of inference at $(A, B; C, D) = -1$

Remark 8.8 (On boundary cases of PN.2). If, due to PN.2, a packet object has not yet been reduced to a determinate judgment within one and the same layer, then one is not dealing with a violation of the law of excluded middle, but with incomplete local determinacy. Once the stratum and context are fixed, the classical disjunction is restored in packet form.

3. Projective-packet representation of categorical judgments and syllogisms

Definition 8.9 (Projective-packet term). Let S , M , and P denote three packet classes viewed on a common projective support $\ell_{s,D}$ determined by the state s and the context D . Denote by $\Pi_{s,D}$ the projecting normalization of terms to this common support.

Definition 8.10 (The four categorical forms). In the projective-packet language the four classical forms take the following shape:

$$\begin{aligned}
 \mathbf{A}(S, P) &: \Pi_{s,D}(S) \subseteq P, \\
 \mathbf{E}(S, P) &: \Pi_{s,D}(S) \cap P = \emptyset, \\
 \mathbf{I}(S, P) &: \Pi_{s,D}(S) \cap P \neq \emptyset, \\
 \mathbf{O}(S, P) &: \Pi_{s,D}(S) \setminus P \neq \emptyset.
 \end{aligned}$$

Universal forms fix the global arrangement of classes, whereas particular forms record existence or residue inside the corresponding projective layer.

Table 2: Categorical forms in projective-packet representation

Form	Classical scheme	Projective-packet interpretation
A	All S are P	the projection of the subject lies entirely in the predicate
E	No S is P	subject and predicate are projectively separated
I	Some S are P	subject and predicate have a nonempty overlap
O	Some S are not P	the subject has a residue outside the predicate

Immediate inferences.

Proposition 8.11 (Conversion and obversion in packet form). *On the common support $\ell_{s,D}$ the following classical immediate inferences are preserved:*

$$\mathbf{E}(S, P) \Rightarrow \mathbf{E}(P, S),$$

$$\mathbf{I}(S, P) \Rightarrow \mathbf{I}(P, S),$$

$$\mathbf{A}(S, P) \Rightarrow \mathbf{E}(S, \bar{P}),$$

$$\mathbf{E}(S, P) \Rightarrow \mathbf{A}(S, \bar{P}),$$

$$\mathbf{I}(S, P) \Rightarrow \mathbf{O}(S, \bar{P}),$$

$$\mathbf{O}(S, P) \Rightarrow \mathbf{I}(S, \bar{P}).$$

Here \bar{P} denotes the packet complement of the predicate on the same projective support.

Figures of the categorical syllogism.

Table 3: The four classical figures in packet-projective form

Figure	Premise scheme	Packet-projective meaning
I	$M - P, S - M$	the middle term transmits orientation from subject to predicate
II	$P - M, S - M$	the middle term acts as a common screen of comparison
III	$M - P, M - S$	the middle term branches the projection in two directions

Figure	Premise scheme	Packet-projective meaning
IV	$P - M, M - S$	projection proceeds through an inverse permutation of frames

Definition 8.12 (Projective-packet validity of a syllogism). A categorical syllogism is projectively packet-valid if there exists a common context D and a common support $\ell_{s,D}$ such that:

- (1) both premises admit a coherent projecting normalization;
- (2) the middle term M can be eliminated in the conclusion without loss of orientation;
- (3) the truth defect of the conclusion satisfies

$$\delta_{\text{truth}}(\text{conclusion}) \leq \max(\delta_{\text{truth}}(\text{major}), \delta_{\text{truth}}(\text{minor})).$$

In the harmonic limit all three values equal -1 and all defects vanish.

Theorem 8.13 (Canonical first-figure moods). *In the projective-packet representation the classical valid moods of the first figure take the form*

$$\textit{Barbara: } \mathbf{A}(M, P), \mathbf{A}(S, M) \Rightarrow \mathbf{A}(S, P),$$

$$\textit{Celarent: } \mathbf{E}(M, P), \mathbf{A}(S, M) \Rightarrow \mathbf{E}(S, P),$$

$$\textit{Darii: } \mathbf{A}(M, P), \mathbf{I}(S, M) \Rightarrow \mathbf{I}(S, P),$$

$$\textit{Ferio: } \mathbf{E}(M, P), \mathbf{I}(S, M) \Rightarrow \mathbf{O}(S, P).$$

In all four cases the middle term M acts as the packet hinge through which the subject S receives projective orientation relative to the predicate P .

Remark 8.14 (Inference as packet transport). In the general setting, inference in NAPFRL may be viewed as successive transport of frames along a common projective support. Classical syllogistic schemes then appear as a special case of this broader picture, namely when the number of terms is three and all connectivity passes through a single middle term.

4. The package principle of falsifiability and the comparison of doctrines

4.1. A reinterpretation of Popper's criterion of falsifiability.

Definition 8.15 (The field of λ -truths). Let \mathcal{D} be a doctrine, that is, a collection of inferences of the form $A_i, B_i \vdash C_i$ relative to contexts D_i . The *field of λ -truths of the doctrine* is the set

$$\Lambda(\mathcal{D}) := \{\lambda_i = (A_i, B_i; C_i, D_i) \mid i \in I\},$$

where I is the index set of all inferences belonging to the doctrine.

4. THE PACKAGE PRINCIPLE OF FALSIFIABILITY AND THE COMPARISON OF DOCTRINES

Definition 8.16 (Degree of falsifiability). The *degree of falsifiability* of the doctrine \mathcal{D} is the functional

$$\mathcal{F}(\mathcal{D}) := \sup_{\lambda \in \Lambda(\mathcal{D})} |\lambda + 1| = \sup_{\lambda \in \Lambda(\mathcal{D})} \delta_{\text{truth}}(\lambda).$$

Proposition 8.17 (Interpretation of Popper's principle). *Within NAPRL, Popper's criterion of falsifiability is reinterpreted as follows:*

(1) A **scientific doctrine** is a set $\Lambda(\mathcal{D})$ such that:

- $\Lambda(\mathcal{D}) \neq \emptyset$;
- $\mathcal{F}(\mathcal{D}) < \infty$.

(2) The **degree of scientificity** of the doctrine is determined by the proximity of its field of λ -truths to universal truth:

$$\text{Scientificity}(\mathcal{D}) \propto \frac{1}{1 + \mathcal{F}(\mathcal{D})}.$$

(3) **Falsification** corresponds to leaving the domain of admissible deviation:

$$\exists \lambda \in \Lambda(\mathcal{D}) : |\lambda + 1| > \varepsilon_{\text{crit}} \implies \mathcal{D} \text{ is falsified.}$$

Theorem 8.18 (Projective hierarchy of doctrines). *Let \mathcal{D}_1 and \mathcal{D}_2 be two doctrines with fields of λ -truths Λ_1 and Λ_2 . If*

$$\sup_{\lambda_1 \in \Lambda_1} |\lambda_1 + 1| < \sup_{\lambda_2 \in \Lambda_2} |\lambda_2 + 1|,$$

then the doctrine \mathcal{D}_1 possesses a higher degree of projective harmony and therefore greater generality and credibility than \mathcal{D}_2 .

Proof. This follows from the definition of the truth defect $\delta_{\text{truth}} = |\lambda + 1|$ and from the interpretation of the value $\lambda = -1$ as the limiting point of geometric and onto-logical coherence. A smaller deviation from -1 means a closer approach to universal truth. \square

Corollary 8.19 (Necessity of the field of λ -truths). *Without the introduction of the field $\Lambda(\mathcal{D})$, one cannot establish the relation between premises and conclusions, because the absence of $\Lambda(\mathcal{D})$ means the absence of cross-ratios $(A, B; C, D)$, and without cross-ratios there is no projective structure linking the premises A, B with the synthesis C relative to the context point D .*

Definition 8.20 (The package principle of falsifiability). The *package principle of falsifiability* is the following statement:

A doctrine \mathcal{D} is scientifically grounded if and only if its field of λ -truths $\Lambda(\mathcal{D})$ satisfies the conditions:

- (1) $\Lambda(\mathcal{D})$ is nonempty and bounded;
- (2) there exists a sequence $\{\lambda_n\} \subset \Lambda(\mathcal{D})$ such that $\lambda_n \rightarrow -1$ as $n \rightarrow \infty$;
- (3) for every $\varepsilon > 0$, there exists only a finite number of inferences with $|\lambda + 1| > \varepsilon$.

Remark 8.21 (Philosophical interpretation). Thus, within NAPRL, Popper's principle is transformed from a binary criterion ("falsifiable/non-falsifiable") into a *graded principle of projective harmony*:

- **Classical Popper:** a doctrine is either scientific or it is not.
- **Package Popper:** a doctrine possesses a degree of scientificity measured through $\mathcal{F}(\mathcal{D})$ and the proximity of $\Lambda(\mathcal{D})$ to $\{-1\}$.

This makes it possible to compare doctrines not only by the bare fact of falsifiability, but also by the quality of their logical structure as measured through the projective cross-ratio.

4.2. Problem: criteria for comparing doctrines by the package principle of Popper.

Problem 8.22 (Classification of doctrines). Construct effective criteria for comparing doctrines on the basis of their fields of λ -truths $\Lambda(\mathcal{D})$, including:

- (1) a quantitative measure of scientificity $\mu(\mathcal{D})$ satisfying

$$\mu(\mathcal{D}) = \Phi \left(\inf_{\lambda \in \Lambda(\mathcal{D})} |\lambda + 1|, \sup_{\lambda \in \Lambda(\mathcal{D})} |\lambda + 1|, \text{the distribution of } \Lambda(\mathcal{D}) \right),$$

where Φ is monotone decreasing in $\sup |\lambda + 1|$ and monotone increasing in the density of the distribution near -1 ;

- (2) an algorithm for checking the conditions of the package principle of falsifiability;
- (3) a procedure for computing $\varepsilon_{\text{crit}}$ as a threshold value separating scientific from non-scientific doctrines on the basis of empirical or theoretical data.

Remark 8.23 (Further directions). The development of the package principle of Popper opens the following directions:

- **Empirical calibration:** determining $\varepsilon_{\text{crit}}$ by analyzing historical cases of the falsification of scientific theories;
- **Comparative epistemology:** ranking scientific doctrines by their degree of projective harmony;
- **Dynamics of scientific knowledge:** modeling the evolution of the field $\Lambda(\mathcal{D})$ in time as a process of approaching the universal truth $\lambda = -1$;
- **Forecasting falsification:** predicting the probability of the falsification of a doctrine on the basis of statistical properties of $\Lambda(\mathcal{D})$.

5. Tensorial nature of causality

Surface causality is described by the antisymmetric part of the causal-structural tensor, while deep determinism is described by its symmetric part. Writing the full tensor as \mathcal{T}_{CS} , one obtains the decomposition

$$\mathcal{T}_{\text{CS}} = T + R.$$

In the isotropic ansatz, torsion agrees with the components τ_1 and τ_3 , whereas the scalar curvature sector agrees with τ_0 .

CHAPTER 9

Dynamics and the arrow of time

1. Laplacian flow

For a G_2 -structure φ the Laplacian flow is defined by

$$\frac{\partial}{\partial t}\varphi(t) = \Delta_{\varphi(t)}\varphi(t).$$

In the homogeneous case this equation reduces to an ODE for the parameter α .

2. Nonliving and living time

Choosing the dissipative branch $\dot{\alpha} = -k(\alpha)$ yields a monotonic decrease of the associator amplitude $\mathcal{A}(\alpha) = \sqrt{3}|\alpha|$. This is the regime of nonliving time. In more complicated packet systems one can have feedback loops keeping the associator away from zero; these regimes are called living time and are modeled by the packet $A * \text{Att}$.

Part 4

Phenomenology and applications

CHAPTER 10

Historical-epistemological layers and Chronotope

1. Layers of perception

The historical evolution of cognitive regimes is described as a sequence of layers $P0k$ and Pk , where the former denote pure a priori forms and the latter their historical realizations. The following summary table is used as a guide.

Layer	Pure a priori form	Historical realization
P01	Unified cosmological present	Pre-reflective state
P1	Narrowing of the present horizon	Primitive and post-Edenic perception
P02	Present as part of the past	Astrological-cosmological calibration
P2	Search for causes in the past	Understanding and pre-classical rationality
P03	Orientation toward the future	Critical reason
P3	Predictive value	Scientific method
P04	Extension to prediction of past and future	Relativistic-packet regime
P4	Multiplicity of presents	Contemporary science and AI

2. Dark regions

The so-called dark regions are interpreted as early detections of ruptures in support connectivity. In the language of NPFL these are domains where linear metric order and projective synthesis have not yet been stitched into a single picture without extra packet structure.

CHAPTER 11

Physical applications and boundaries of applicability

1. Reinterpretation of classical physics

Classical laws receive a packet reinterpretation. Inertia corresponds to stationarity under Ξ , force to violation of commutativity $[\Xi, \Delta] \neq 0$, and the second law to monotone sinking along Ξ toward hyperaxis. Classical space-time theories arise as reductions on the outer stratum $\mathbb{T}^{(3)}$.

Theorem 11.1 (Embedding of classical theories). *Let a classical theory be given by a manifold M with metric $g_{\mu\nu}$. Then there exists a canonical embedding*

$$M \hookrightarrow \mathbb{T}^{(3)} \subset \mathbb{T},$$

where the outer stratum carries the reduced geometry and the metric $g_{\mu\nu}$ appears as an observable regime of the packet metric.

Stratification of support layers and limits of action penetration

1. The four support layers

In increasing order of penetration depth one distinguishes:

- (1) the electromagnetic layer — the nearest interface between causality and deep connectivity;
- (2) the atomic layer — the zone of ionization and rupture of chemical bonds;
- (3) the nuclear layer — the regime of fission and synthesis;
- (4) the ontological limit — the final stratum beyond which packet structure ceases to be observably determinate.

Table 1. Support layers and the typical effect of action

Layer	Phenomenological regime	Typical response to action
Electromagnetic	interface of causality and support	reflection, bifurcation, elastic redistribution
Atomic	chemical and ionization barriers	bond breaking and relaxation
Nuclear	deep nuclear rearrangement	fission, synthesis, radioactive response
Ontological limit	boundary of observable definiteness	loss of classical interpretability

Theorem 12.1 (Impermeability of support connectivity). *No action Δ can rupture support connectivity at the electromagnetic level. Instead one obtains reflection through the operator Γ_1 , dissipation of energy in the layer, and bifurcations without topological rupture.*

CHAPTER 13

Reinterpretation of probability theory as the statistics of packet descent

Within NAPFRL, probability theory ceases to be a primary theory of random processes and becomes the *geometric statistics of the descent* of a packet of states along the gradient of the dimensional functional D^* . Probability is not introduced here as an independent primitive; it appears as the observable shadow of a deeper dynamics unfolding in stratified time.

In other words, classical statistics is not fundamental but is the projection of a deeper packet kinematics onto the observer's layer. Where the classical theory speaks about randomness, NAPFRL speaks about a hidden layered geometry, metastable terraces, transition barriers, and fluctuations relative to the main variational descent.

1. Conceptual shift

In classical theory, probability P is usually interpreted either as a measure of ignorance, or as the frequency of random events, or as a density on a space of elementary outcomes. In NAPFRL, all these interpretations are secondary.

Postulate 13.1 (Packet variational principle). A packet of states always tends toward the minimum of the dimensional functional D^* . The probability of finding the system in a given state is determined not by "randomness" in a literal sense, but by the geometry of descent: the steepness of the gradient, the height of transition barriers, and the proximity of the state to a local or global minimum.

Remark 13.2 (Probability as a statistical shadow). In NAPFRL, probability is the statistical shadow of a family of admissible descent trajectories. Hence a probability distribution measures not the observer's ignorance, but the *accessibility* of states for the variational flow.

2. Gravitational slope and effective drift field

At the phenomenological level, the gravitational field is conveniently interpreted as an *effective slope* of the functional D^* on the outer, quasiclassical layer $k = 3$. This reading does not claim that gravity is exhausted by probability; it only claims that the observable statistics of motions and stable configurations can be described through the geometry of descent.

Definition 13.3 (Effective slope). Suppose that on stratum k there is given an effective invariant D_k^* . Then the *effective slope* is the gradient field

$$\nabla D_k^*,$$

and the corresponding *drift field* is

$$\vec{v}_{\text{drift}}^{(k)} = -\mu_k \nabla D_k^*,$$

where $\mu_k > 0$ is the packet mobility coefficient of the layer.

Proposition 13.4 (Quasiclassical phenomenology of motion). *In the quasiclassical regime, the motion of a packet on layer $k = 3$ decomposes into two components:*

$$\vec{v} = \vec{v}_{\parallel} + \vec{v}_{\perp}, \quad \vec{v}_{\perp} \parallel -\nabla D_3^*, \quad \vec{v}_{\parallel} \cdot \nabla D_3^* = 0.$$

Here \vec{v}_{\perp} describes descent along the slope of D_3^* , while \vec{v}_{\parallel} describes motion along iso- D^* lines.

Remark 13.5 (Free fall, orbit, trapping). This decomposition yields a phenomenological interpretation of three basic regimes:

- **free fall** — dominance of the normal component \vec{v}_{\perp} ;
- **quasistationary orbit** — almost complete compensation of descent by the tangential component and the local geometry of the layer;
- **trapping** — motion inside a local packet funnel corresponding to a minimum or a terrace of the functional D^* .

3. Terraces, barriers, and discrete transitions

Because time in NAPFRL is stratified, packet descent need not be smooth. It may be interrupted, delayed on terraces, and jump across barriers.

Definition 13.6 (Metastable terrace). A *metastable terrace* is a region in layer k on which

$$\|\nabla D_k^*\| \approx 0,$$

while the state is not yet a global minimum. On such a terrace, the packet remains for a macroscopically noticeable time.

Definition 13.7 (Discreteness of transition). A transition between layers $k \rightarrow k - 1$ is discrete. The jump probability depends on the difference of invariants,

$$\Delta D_{k \rightarrow k-1}^* := D_k^* - D_{k-1}^*,$$

as well as on the geometry of the obstruction and on the internal fluctuation activity of the packet.

Definition 13.8 (Reversal operator in the statistical interpretation). The operator Υ is interpreted as a mechanism suppressing unstable upward fluctuations. It does not absolutely forbid them, but it reduces their long-term contribution to the observable statistics.

4. The stratified Kurpishev master equation

Instead of the classical Fokker-Planck equation, we introduce the *Stratified Kurpishev Master Equation*, in which gradient drift and inter-layer transitions are combined in a single scheme.

Definition 13.9 (Packet probability density). Let $\rho_k(x, t)$ denote the probability that the packet is located at point x of stratum k . Its evolution is described by

$$\frac{\partial \rho_k}{\partial t} = -\nabla \cdot (\rho_k \vec{v}_{\text{drift}}^{(k)}) + \nabla \cdot (\mathbf{D}_k \nabla \rho_k) + \sum_j (W_{j \rightarrow k} \rho_j - W_{k \rightarrow j} \rho_k),$$

where:

- $\vec{v}_{\text{drift}}^{(k)} = -\mu_k \nabla D_k^*$ is the drift field;
- \mathbf{D}_k is the intralayer diffusion tensor;
- $W_{k \rightarrow j}$ are the interlayer transition probabilities.

Remark 13.10 (Meaning of the terms). The first term describes deterministic descent along the slope of D_k^* , the second the fluctuations inside the given layer, and the third the discrete transitions between strata. Thus “randomness” appears as a correction to directed descent, not as its primary cause.

Table 1. Classical and packet views of probability

Component	Classical statistics	Packet interpretation
Source of probability	randomness / ignorance	statistical shadow of variational descent
Drift	external effective law	$-\nabla D^*$ on the selected stratum
Diffusion	phase-space fluctuation	in-layer packet oscillation
Transitions	Markov jumps	inter-stratum transitions across the barrier ΔD^*
Distribution tails	rare events	short excursions against the main descent

Packet slope, terrace, and transition barrier

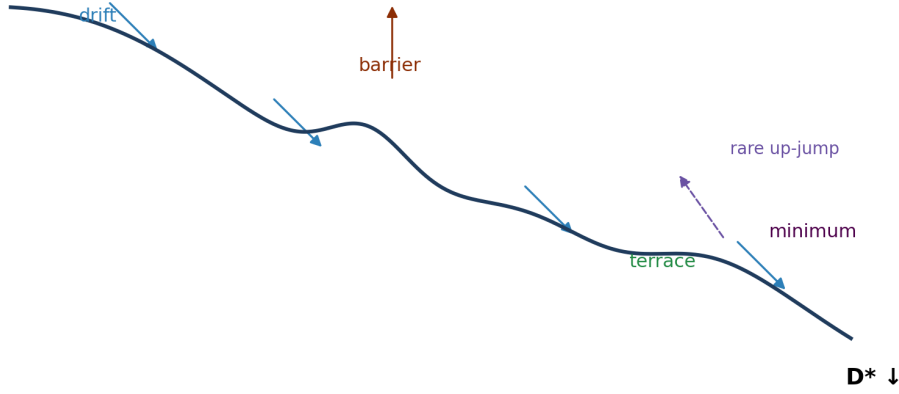


Figure 1. Phenomenological packet-slope scheme: drift, barrier, terrace, and rare upward excursion

5. Geometry of transitions and the packet Arrhenius law

Definition 13.11 (Packet transition law). The probability of crossing an interlayer barrier has exponential form

$$W_{k \rightarrow k-1} \sim \exp\left(-\frac{\Delta D_{k \rightarrow k-1}^*}{\epsilon}\right),$$

where ϵ is the quantum of variational action.

Remark 13.12 (Phenomenological meaning of ϵ). The parameter ϵ measures the graininess of variational descent. For small ϵ the dynamics approaches a purely deterministic regime; for larger ϵ the role of fluctuations, jumps, and temporary returns against the main gradient increases.

Proposition 13.13 (Rare events). *The higher the barrier ΔD^* , the smaller the contribution of the corresponding transition channel to the observed distribution. Hence the statistical tails describe not “pure randomness”, but rare events directed against the main geometric flow.*

6. Peaks, tails, and stationary distributions

Remark 13.14 (Peak of the distribution). The maximum of a stationary distribution corresponds not to the “most random” state, but to a region where packet flow slows down:

$$\|\nabla D_k^*\| \approx 0.$$

This is either a local minimum or a broad metastable terrace.

Remark 13.15 (Distribution tails). The tails of the distribution correspond to rare upward fluctuations, that is, temporary motions against $-\nabla D^*$. Such motions are possible, but they are typically damped by the reversal operator Υ , which returns the packet to the region of primary descent.

Proposition 13.16 (Locally Gaussian regime). *Suppose that in a neighborhood of a local minimum x_0 on a fixed layer k we have the quadratic expansion*

$$D_k^*(x) = D_k^*(x_0) + \frac{1}{2}(x - x_0)^T H_k(x - x_0) + o(\|x - x_0\|^2),$$

where H_k is a positive-definite Hessian. Then the stationary density in this neighborhood has Gaussian form:

$$\rho_k^{\text{st}}(x) \propto \exp\left(-\frac{1}{2\epsilon}(x - x_0)^T H_k(x - x_0)\right).$$

Corollary 13.17 (Origin of the Gaussian distribution). *Within NAPFRL, the central limit theorem is interpreted as a universal local regime of repeated packet descent in the neighborhood of quadratically smooth minima of D^* .*

Corollary 13.18 (Origin of the Maxwell-Boltzmann distribution). *The Maxwell-Boltzmann distribution arises as the projection of a stationary solution of the stratified master equation onto the layer $k = 3$, when the observable energy E is a smooth function of D_3^* and a quasiclassical thermodynamic limit holds near the minimum. In this context, the parameter*

$$\beta = \frac{1}{k_B T}$$

is interpreted as the inverse effective steepness of the slope of D_3^* .

7. Orbital phenomenology and bounded regimes

Remark 13.19 (Orbit as compensated descent). Within NAPFRL, an orbital regime is interpreted not as the absence of a slope, but as a dynamical state in which tangential motion along an iso- D^* line compensates the normal drift. Hence an orbit is not a cancellation of the variational principle, but a quasistationary realization of it.

Remark 13.20 (Weightlessness). Weightlessness means not the absence of a packet field, but a local suppression of the observable normal gradient inside a chosen volume. Probabilistically, this means a degeneration of the visible drift while the hidden layered geometry remains intact.

8. Projective closure of probability

The relation between obstruction theory and probability becomes especially transparent after passing to the projective interpretation of \mathcal{O}_B .

Definition 13.21 (Projective barrier). Let A, B, C, D be four collinear points associated with a transition channel in the obstruction space. Define the *projective barrier*

$$\mathfrak{p}(A, B; C, D) := -\log |(A, B; C, D)|.$$

Remark 13.22 (Harmonic case). If

$$(A, B; C, D) = -1,$$

then $|(A, B; C, D)| = 1$, hence

$$\mathfrak{p}(A, B; C, D) = 0.$$

Therefore a harmonic configuration corresponds to the absence of an additional projective penalty on the transition.

Definition 13.23 (Projectively modified transition probability). Taking the projective obstruction into account, the transition probability is written as

$$W_{k \rightarrow k-1} \sim \exp \left(-\frac{\Delta D_{k \rightarrow k-1}^* + \lambda \mathfrak{p}(A, B; C, D)}{\epsilon} \right),$$

where $\lambda \geq 0$ is the coupling coefficient between the obstruction layer and the statistical transition channel.

Remark 13.24 (Interpretation). Thus classical probability is not the opposite of projective harmony, but its degenerate statistical projection. When the projective barrier vanishes, only the geometry of descent in D^* remains; when it is large, transitions are suppressed even for relatively small differences in D^* .

9. Classical limit

Theorem 13.25 (Equivalence of classical and packet probability in the limit). *In the limit*

$$\epsilon \rightarrow 0, \quad \dim \mathcal{O}_B = 0, \quad \Upsilon \rightarrow \text{id},$$

the stratified Kurpishev master equation reduces to the classical Fokker-Planck equation on a single effective layer, and the probability distributions take their standard form.

Idea of proof. The assumptions mean:

- (1) disappearance of the projective and cohomological obstruction;
- (2) absence of interlayer dynamics;
- (3) suppression of discrete returns and reversals;
- (4) passage to a single continuous effective layer.

Under these assumptions only the drift and diffusion terms remain, which yields the classical Fokker-Planck form. \square

10. Phenomenological summary

Thus NAPFRL does not abolish probability theory, but embeds it as a special case — the statistics of packet descent along the gradient of the invariant D^* under conditions where the projective closure degenerates, the obstruction layer is inactive, and stratification does not manifest itself on the observational scale.

In the full theory, however, probability must be understood as the result of the joint action of:

- variational drift along $-\nabla D^*$,
- intralayer diffusion,
- discrete interlayer transitions,
- projective obstructions,
- the reversal operator Υ ,
- and the geometry of the support layers.

For this reason, “randomness” in NAPFRL is not primary chaos, but the observed statistics of the deeper geometry of stratified time.

Kurpishev packet time: a unification of classical models

Within NAPFRL we develop the Aristotelian distinction between time as a measure of change and time as a measure of motion, and we reunify them inside a single packet structure. This makes it possible to overcome the limitations of the classical theories of Newton, Descartes, and Einstein not by refuting them, but by embedding them as partial stratified cases.

1. The packet structure of time

Instead of absolute time or coordinate-relative time, we introduce the *packet of time* \mathbb{T}_{pack} , arising as the composition of two fundamental regimes:

$$\mathbb{T}_{\text{pack}} = \mathbb{T}_{\text{change}} * \mathbb{T}_{\text{action}}. \quad (14.1)$$

Here:

- $\mathbb{T}_{\text{change}}$ is the **Time of Change**. It corresponds to the operator Ξ and to the Hodge star \star . It describes world-order and deterministic descent through the strata.
- $\mathbb{T}_{\text{action}}$ is the **Time of Action**. It corresponds to the operator Δ . It describes discrete acts of passage between layers.

The symbolic form of their interaction is Change@Action.

2. The world of grounds and the world of consequences

The separation of temporal regimes generates a corresponding separation of ontological worlds.

Definition 14.1 (World of grounds). The world of grounds is the world of Change ($\mathbb{T}_{\text{change}}$). In it, the beginning (the empty point) is not a proper projective point; it is set from outside, through hyperaxis. This world serves as the support layer for the determinism of grounds and consequences.

Definition 14.2 (World of consequences). The world of consequences is the world of measurable motions, that is, of Actions. Here the actual, “hole-ridden” reality of surface causality ($\pm\Pi \mp \Delta$) forms a measurable subspace.

Time measurement therefore acquires a support layer in the form of the determinism of grounds and consequences. The link between them

is provided by the skew-symmetric tensor of causal-consequential connectedness \mathcal{T}_{cs} , which translates surface causality into deeper determinism.

3. The projective construction of true clocks

One of the fundamental problems of classical physics is the circle in the measurement of time: time is measured through motion, while motion is defined through time.

Theorem 14.3 (Projective construction of clocks). *True clocks can be constructed projectively, without relying on a cyclic definition. It is enough to take three points in the world of Change ($A, B, C \in \mathbb{T}_{change}$) and complete them by a fourth point D as a harmonic point:*

$$(A, B; C, D) = -1.$$

Here the point D defines true clocks as the projective realization of the context point, lying in the projective representation of the layer $k = -1$.

Corollary 14.4 (Elimination of the circle). *The separation of the Time of Change and the Time of Action eliminates the circle in the foundation of measurement. Clocks are calibrated not by the motion of a body, but by the harmonic closure of four points on the projective line of time.*

Remark 14.5 (On stratum -1 , hyperaxis, and the canonical notation chain). The stratum $\mathbb{T}^{(-1)}$ is identified with hyperaxis as the support transition layer of stratified time. However, in projective-logical and frame-based constructions hyperaxis appears not directly, but through its improper geometric representation: an improper point, an improper line, or the projective closure of a configuration.

In the present editorial version of the monograph, the following canonical chain of notation is fixed:

$$\mathbb{T}^{(-1)} = \text{Hyperaxis}$$

— this is the *primary ontological designation of the layer*;

$$C_{-1} \text{ (or informally "C-1")}$$

— this is only a *phenomenological or draft label* for the same stratum when emphasis is placed on its limiting connective role;

$$\text{RPLD-fold}$$

— this is the *local projective-logical regime* in which hyperaxis becomes accessible as an improper structural support;

$$\text{improper line}$$

— this is the *geometric carrier* of the projective representation of hyperaxis.

Therefore the editorial rule is the following: the notation $\mathbb{T}^{(-1)}$ is primary and mandatory; the notation C_{-1} is admissible only as a shortened phenomenological reference and does not introduce any new entity beyond hyperaxis.

4. Packet relativity and historical models

By introducing the stratification of time $\mathbb{T}^{(k)}$, we obtain a new *Kurpishv Packet Relativity*, in which historical concepts of time enter as partial strata:

$$\mathbb{T}_{\text{pack}} = \bigcup_{k=-1}^4 \mathbb{T}^{(k)}. \quad (14.2)$$

The classical models of physics describe only certain levels of this hierarchy:

Table 1. Correspondence between historical models of time and NAPFRL strata

Model	Layer k	Geometry	Characteristic
Absolute time (Newton)	$k = 0$	Point	A single present independent of the observer.
Cartesian time	$k = 1$	Line	Coordinate time and the relativity of motion.
Einsteinian time (SR/GR)	$k = 2$	Plane	Minkowski spacetime, gravitation, and observational relativity.
Packet time (Kurpishv)	$k = 3$	Cavity	Stratified time unifying the earlier models.
Hyperaxis	$k = -1$	Connected fibers	This link of layers and the support structure of transitions.

Remark 14.6 (The method of packet modelling). The method of packet modelling does not refute the physics of Einstein, Descartes, or Newton. It unifies them by showing that each remains valid inside its own stratum. Einsteinian relativity is the geometry of layer $k = 2$, Newtonian absoluteness is the projection of layer $k = 0$, and Kurpishv packet relativity describes the dynamics of transitions between them.

5. Kurpishv packet projective relativity

Abstract. This section develops a phenomenological extension of the packet structure of time already introduced above. The guiding idea is that each stratified layer admits its own regime of bounded transmission, characterized by an effective limiting velocity c_k . In this way Einsteinian light-relativity is treated as an external special case, whereas acoustic and other wave regimes appear as internal stratified analogues. Projective invariants are used to describe transitions between layers and barriers of inter-layer transmission.

5.1. Packet relativity as layer-dependent relativism.

Definition 14.7 (Packet relativity). *Packet relativity* is the family of layer-dependent kinematic regimes in stratified time in which to each layer $k \in \{-1, 0, 1, 2, 3\}$ there are assigned:

- an effective limiting velocity c_k ;
- an inter-layer transmission barrier \mathcal{B}_k ;
- an admissible class of transformations of observables inside the layer.

Remark 14.8 (On the status of the velocities c_k). The quantities c_k need not form a universal strict numerical hierarchy. They should be understood as *effective limiting velocities of disturbance transmission* in the corresponding strata or phenomenological regimes.

Table 2. Stratified regimes of limiting velocities

Layer k	Geometric regime	Effective velocity	Typical phenomenological example
3	Cavity / external space	$c_3 = c$	Electromagnetic propagation.
2	Surface / interface	c_2	Elastic waves in solids.
1	Line / channel	c_1	One-dimensional directed signals.
0	Point-like regime	c_0	Local responses in condensed media.
-1	Hyparxis	c_{-1} is not directly metrized	Inter-layer quantum transitions and projective closure.

5.2. Acoustic and wave analogues.

Definition 14.9 (Layer-dependent wave relativity). *Layer-dependent wave relativity* is the family of effects that arise when the speed of motion or signal transmission becomes comparable with the effective limiting velocity c_k of the given layer.

Remark 14.10. In this sense acoustic effects are not identified with Einsteinian relativity itself, but are interpreted as its internal phenomenological analogues in layers where the fundamental limiting speed is not the speed of light but a medium-dependent transmission speed.

Example 14.11 (Mach cone as a stratified analogue). When a source moves with velocity $v > c_k$ in layer k , a shock structure arises, described by

$$\sin \theta_k = \frac{c_k}{v}.$$

This is interpreted as a sign that the barrier \mathcal{B}_k has been reached.

Definition 14.12 (Entropy barrier of a layer). The entropy barrier \mathcal{B}_k is the regime in which, as $v \rightarrow c_k$, dissipation grows sharply, the stability of regular signal transmission decreases, and the probability of transition to another stratified kinematics increases.

5.3. Projective invariants of velocities and transitions.

Definition 14.13 (Projective cross-ratio of velocities). Let c_a, c_b, c_c, c_d be four characteristic values of effective velocities associated with one and the same packet configuration of transitions. Their *projective invariant* is the quantity

$$\chi(c_a, c_b; c_c, c_d) = \frac{(c_a - c_c)(c_b - c_d)}{(c_a - c_d)(c_b - c_c)}.$$

Proposition 14.14 (Invariance under admissible projective renormalizations). *The cross-ratio of velocities is preserved under admissible projective renormalizations of the velocity parameter inside one and the same packet observational scheme.*

Remark 14.15 (The harmonic case). If

$$\chi(c_a, c_b; c_c, c_d) = -1,$$

then the corresponding configuration is harmonic. In phenomenological terms this corresponds to a critically coherent transition between regimes, where the barrier has not yet destroyed the structure but already places the layer under maximal stress.

5.4. Relation to packet time. Packet projective relativity does not introduce a new time beyond the packet time already defined; it refines its kinematic phenomenology. The underlying structure remains

$$\mathbb{T}_{\text{pack}} = \mathbb{T}_{\text{change}} * \mathbb{T}_{\text{action}},$$

where $\mathbb{T}_{\text{change}}$ governs deterministic world-order and $\mathbb{T}_{\text{action}}$ governs discrete acts of inter-layer intervention.

Remark 14.16. Thus the layer-dependent limiting velocities are interpreted not as autonomous entities, but as observable regimes of transmission of action inside the already given structure (Δ, Ξ, Υ) and the tensor \mathcal{T}_{cs} .

5.5. Classical theories as limiting projections.

Theorem 14.17 (Embedding principle). *Kurpishev packet projective relativity does not abolish the classical theories of relativity, but embeds them as partial projections or limiting regimes of stratified time.*

5.6. Phenomenological consequences.

- (1) Wave regimes in different media admit an interpretation as layer-dependent analogues of bounded relativity.
- (2) As one approaches c_k , sharp growth of dissipation and barrier effects should be observed.
- (3) Inter-layer transitions may be accompanied by discontinuous changes of the effective limiting velocity.

Table 3. Classical regimes as projections of packet relativity

Theory	Stratum regime /	Limiting velocity
Newtonian kinematics	$\mathbb{T}^{(0)}$ as a degenerate limit	Formally unbounded.
Galilean-Cartesian regime	$\mathbb{T}^{(1)}$	Medium-independent quasi-linear approximation.
Einsteinian relativity	External electromagnetic regime of $\mathbb{T}^{(3)}$	c .
Kurpishev packet relativity	Entire stratified system	The family c_k .

- (4) Projective invariants may be used as calibration characteristics when comparing different kinematic regimes.

Remark 14.18 (Boundary of applicability). This section has phenomenological status. It does not replace the strict mathematical part of the monograph, but gives an expanded interpretation of how the already introduced packet structure of time may manifest itself in different regimes of the transmission of action and signal.

6. Summary

This section has shown that:

- (1) Time in NAPFRL is the packet $\mathbb{T}_{\text{change}} * \mathbb{T}_{\text{action}}$, unifying change and action.
- (2) The problem of defining time is resolved through the projective construction of the harmonic quadruple $(A, B; C, D) = -1$, which removes the vicious circle of measurement.
- (3) The classical theories of time of Newton, Descartes, and Einstein are embedded into the general structure as strata $k = 0, 1, 2$, and thus appear as limiting cases of the more general packet geometry of layer $k = 3$.

Clocks as measurers of the reversal operator

This chapter develops a packet theory of clocks as a special case of the general phenomenology of time. Its central thesis is that the meaning of clocks is exhausted by the measurement of the *interval of the reversal operator*. Clocks do not measure “time in itself” and possess no autonomous ontological status outside this interval. Without the reversal operator, clocks reduce to an empty mechanism and become meaningless; in editorial shorthand this corresponds to a degenerate regime of the type R_{-1} .

1. The basic principle

Postulate 15.1 (Clocks as measurers of the interval of reversal). All physically and phenomenologically meaningful clocks measure only the interval between the initial act of Action and its return into the regime of Change through the reversal operator Υ . Formally, the measured quantity is not “pure time” but the *interval of reversal*

$$\tau_{\Upsilon} = \int_{\Delta(\mathcal{P}_{\emptyset})}^{\Upsilon(\Delta(\mathcal{P}_{\emptyset}))} d\tau.$$

Remark 15.2 (The Spenglerian meaning of clocks). The meaning of clocks lies not in the registration of a homogeneous parameter, but in the fixation of a return-contour of culture, body, motion, or consciousness. Every clock is therefore meaningful only insofar as a real or modelled reversal operator is present within it. Without that operator there is neither calibration, nor repeatability, nor time as a measurable magnitude.

2. The general packet scheme of clocks

Definition 15.3 (Clock of layer k). A clock of layer k is a measuring regime

$$\text{Clock}_k : \Delta(\mathcal{P}_{\emptyset}) \times \Upsilon(\Delta(\mathcal{P}_{\emptyset})) \longrightarrow \mathbb{R}_{\geq 0},$$

assigning to an initial act of action and its returned point a numerical measure of the interval of reversal.

Postulate 15.4 (Projective closure of clocks). Every full temporal reading is the harmonic closure of a four-point configuration

$$\Delta(\mathcal{P}_{\emptyset})\text{beginningend}\Upsilon(\Delta(\mathcal{P}_{\emptyset})) = -1.$$

Thus a clock is not merely a periodic device but a projective mechanism of closure between action and reversal.

3. Four phenomenological types of clocks

Table 1. Four types of clocks as measurers of the interval of reversal

Clock type	Layer	What is measured	Phenomenological sense
Plummet / scales	$k = 0$	Vertical response of reversal	Fixation of return into a field of stability and gravity.
Compass	$k = 1$	Vortical orientation of reversal	Alignment with the layer of directed field and orientation.
Chronometer	$k = 2$	Periodic return	Registration of a repeatable cycle of action and reversal.
Gyroscope	$k = 3$	Precessional stability of reversal	Preservation of inertial memory and internal support.

Remark 15.5 (The gyroscope as the limiting type of clock). Among the four types of clocks, the gyroscope occupies a special place because it not only registers return but also preserves its own inertial configuration inside which reversal becomes stably distinguishable. In this phenomenological sense the gyroscope is the fullest image of a clock as a measurer of Υ .

4. Psychological time and the interval of reversal

Definition 15.6 (The psychological radius of the present). The psychological radius of the present is the quantity

$$R_{\text{present}}(t) = \frac{\epsilon}{\|\nabla_{\text{psy}} D^*\| + \delta},$$

where $\nabla_{\text{psy}} D^*$ is the gradient of the dimensional functional as perceived by the subject, ϵ is the quantum of variational action, and $\delta > 0$ is a regularizing parameter.

Proposition 15.7 (Modulation of psychological time by the reversal operator). *The psychological experience of time depends on the way in which the reversal operator modulates the local gradient of experience:*

$$\nabla_{\text{psy}} D^* = \nabla D^* + \Upsilon(\Delta_{\text{psy}}).$$

Hence the narrowing of the present corresponds to overload and tension, whereas its expansion corresponds to slowing down and repose.

Remark 15.8. This block should be read as a bridge between the physics of clocks and the anthropology of knowledge: the objective interval of reversal and the subjective radius of the present become two distinct but compatible projections of one and the same packet structure of time.

CHAPTER 16

The packet representation of interval in Time@Space

This chapter introduces a packet notion of interval intended to accommodate both the classical Galilean and Einsteinian intervals and their stratified generalizations within Kurpishev Time@Space.

1. The basic idea

Definition 16.1 (Packet interval). The packet interval is the layer-dependent quantity

$$\mathcal{I}_{\text{pack}} = \sum_{k=-1}^3 \sigma_k (c_k^2 dt_k^2 - d\mathbf{x}_k^2) + \Lambda_\Upsilon + \Lambda_{\text{proj}},$$

where σ_k are layer weights, c_k are effective limiting velocities, Λ_Υ is the contribution of the interval of reversal, and Λ_{proj} is the contribution of projective closure.

Remark 16.2. Unlike the classical metric interval, the packet interval is not a single quadratic form on a pre-given arena. It is a sum of stratified contributions depending on which regimes of time and space are actually active in the configuration under consideration.

2. Galilean and Einsteinian intervals as degenerate cases

Proposition 16.3 (The Galilean limit). *If stratification is frozen, the reversal operator is inactive, the projective contribution disappears, and the limiting velocity is treated as formally infinite, then the packet interval degenerates to the Galilean regime in which time is an absolute parameter and spatial distances are measured independently of it.*

Proposition 16.4 (The Einsteinian limit). *If only the external electromagnetic layer remains active, all other strata are suppressed, and the contribution of reversal and projective closure is reduced to the observable classical regime, then the packet interval reduces to the Minkowski interval*

$$ds^2 = c^2 dt^2 - d\mathbf{x}^2.$$

Consequently, the Einsteinian interval is a particular reduced case of the packet interval.

Theorem 16.5 (Principle of stratified inclusion of intervals). *The Galilean and Einsteinian intervals do not compete with the packet representation of interval, but are embedded in it as limiting or degenerate regimes. The Galilean case arises when the limiting velocity and stratification barrier disappear; the Einsteinian case arises when the theory is reduced to one active external layer with a fixed light barrier.*

3. The interval of reversal and the projective supplement

Definition 16.6 (Reversal correction). By the reversal correction we mean the contribution

$$\Lambda_{\Upsilon} = \lambda_{\Upsilon} \tau_{\Upsilon}^2,$$

where τ_{Υ} is the interval of reversal and λ_{Υ} is the coupling coefficient between metric and non-metric layers of time.

Definition 16.7 (Projective correction). By the projective correction we mean the quantity

$$\Lambda_{\text{proj}} = \lambda_{\text{proj}} \mathfrak{p}(A, B; C, D), \quad \mathfrak{p}(A, B; C, D) = -\log |ABCD|.$$

In the harmonic case $ABCD = -1$ one has $\mathfrak{p} = 0$, and the projective penalty vanishes.

Remark 16.8 (Physical meaning). The packet interval therefore depends not only on extension and speed, but also on the degree to which the configuration of action is closed through reversal and harmonically embedded into the projective structure of time.

Conclusion

In the rebuilt version of the monograph, time again stands as the primary carrier and space as its sectional or projective regime. The strengthened chapter on quadratic obstruction shows that the theory does not stop at local deformation algebra: the obstruction space itself carries a projective geometry in which truth, cyclicity, and the borders of structural completeness become mutually linked. The added chapter on packet time shows that the Newtonian, Cartesian, and Einsteinian models are not discarded, but receive a stratified unification inside a more general packet structure of time. The new section on packet projective relativity clarifies that hyparxis must be distinguished as the stratum $\mathbb{T}^{(-1)}$ and as its improper projective representation, while the layer-dependent limiting velocities are treated as phenomenological regimes of the already given packet time. The new chapters on Clocks and on the packet interval translate this architecture into an explicit phenomenology of measurement: clocks are interpreted as measurers of the interval of the reversal operator, while the Galilean and Einsteinian intervals appear as limiting cases of the broader Time@Space structure. The anthropological addition through the Aristotelian and Platonic lines further shows that historical models of perception differ not only in experiential content, but also in the geometry of the perspectives through which past, present, and future become thinkable.

APPENDIX A

Explicit computations for the G_2 structure

$$\begin{aligned} \|\omega\|^2 &= 3, & \|\omega^2\|^2 &= 12, & \|\Re\Omega\|^2 &= 4, & \|\Im\Omega\|^2 &= 4. \\ d\varphi_\alpha &= -(\alpha + \frac{1}{2})\omega^2 - z \wedge d\omega, & *\varphi_\alpha &= \frac{1}{2}\omega^2 - z \wedge \Im\Omega. \\ k(\alpha) &= \frac{12(\alpha + \frac{1}{2})^2 + \frac{9}{2}}{7}. \end{aligned}$$

APPENDIX B

Reduced deformation setup

$$\begin{aligned} C_{\text{red}}^1 &= \{\phi \in \mathbf{End}(V) \mid \phi(E) \subseteq E, \phi(F) \subseteq F, \phi(H) \subseteq H\}, \\ C_{\text{red}}^2 &= \{\psi \in \mathbf{Hom}(V \otimes V, V) \mid \psi \text{ preserves the block targets}\}, \\ C_{\text{red}}^3 &= \{\Theta \in \mathbf{Hom}(V^{\otimes 3}, V) \mid \Theta \text{ preserves the induced restrictions}\}. \\ (d_{\mu}^1 \phi)(x, y) &= \phi(\mu(x, y)) - \mu(\phi x, y) - \mu(x, \phi y), \\ (d_{\mu}^2 \psi)(x, y, z) &= \psi(\mu(x, y), z) - \psi(x, \mu(y, z)) + \mu(\psi(x, y), z) - \mu(x, \psi(y, z)). \\ H_{\text{red}}^2(\mu) &= \ker d_{\mu}^2 / \text{im } d_{\mu}^1, \quad O_{\text{red}}^3(\mu) = C_{\text{red}}^3 / \text{im } d_{\mu}^2. \end{aligned}$$

APPENDIX C

Justification of the fixed-phase isotropic ansatz

The space of diagonally $SO(3)$ -invariant 3-forms on \mathfrak{g}_α^* is three-dimensional and spanned by $z \wedge \omega$, $\Re\Omega$, and $\Im\Omega$. The manuscript fixes the phase $\theta = 0$ and singles out the one-dimensional subspace

$$\mathcal{I}_{\text{iso}} = \text{Span}_{\mathbb{R}}\{z \wedge \omega + \Re\Omega\}.$$

APPENDIX D

Glossary of authorial terms

Packet point: An event in a state, written (e, s) .

Chronotope: The seven-packet structure of Time@Space.

Topochrome: The classical Minkowski-Einstein limit.

PN.2: The size-dimension uncertainty principle.

\mathfrak{H} : The Hodge-Kurpishev super-operator.

$(A, B; C, D) = -1$: The criterion of universal structural truth; when $\lambda \rightarrow -1$, relative truth tends toward universality.

$\mathbb{T}^{(-1)}$: Hyparxis as the primary ontological designation of stratum -1 .

C_{-1} : An admissible phenomenological label for the same stratum, introducing no new entity.

RPLD-fold: The local projective-logical regime in which hyparxis appears as an improper structural support.

Improper line: The geometric carrier of the projective representation of hyparxis.

Γ_k : The reversal operator on the k th support layer.

$A * \text{Att}$: The associator-attractor packet.

\mathcal{O}_B : The space of quadratic obstructions.

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