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Theoretical Closure of the Nakaza New Relativity Theory (NNRT)

Restoration of Invariant Spacetime, Phase Universality, the Observation Map, and the Transformation of the Relativistic Worldview

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The Nakaza New Relativity Theory (NNRT) is a theoretical framework that radically reassigns the physical referent of the mathematical structure of relativity without altering the mathematical formalism that has been established for more than a century. Its innovation does not consist in appending a new relativistic field equation. Rather, while retaining the Lorentz transformation, the Minkowski metric, the Einstein field equations, and the Schwarzschild solution, NNRT relocates them from the mathematics of a "deforming real spacetime" to the mathematics of an "observational spacetime generated through physical interaction."

The point of departure of NNRT is a strict separation between real spacetime and observational spacetime. Time and space are regarded as universal substrates common to all inertial frames and are not themselves treated as physical entities that undergo dilation, contraction, or curvature. Accordingly, the Galilean transformation is retained for real motion between inertial frames, whereas a physically distinct observation map Φ is introduced for mutual observation mediated by electromagnetic waves.

For the electromagnetic phase Θ, NNRT postulates phase universality, $\Theta' = \Theta$: the same phase event corresponds to the same event in different observational systems. Since the angular frequency ω and wave vector k are respectively the temporal and spatial gradient components of the same phase, they transform jointly under a change of observational frame. Requiring, in addition, preservation of the characteristic structure of the vacuum Maxwell equations yields a Lorentz-type transformation on observational coordinates and preserves the vacuum dispersion relation $\omega^2 - c^2|k|^2 = 0$. Consequently, $\omega'/\omega = |k'|/|k|$ follows, and the observational invariance $\omega/|k| = c$ is repositioned from an independent postulate to a consequence of phase and Maxwell structure.

In a gravitational field, the observation map is generalized to a position-dependent map Φ_g, and the changes in ω, k, Θ, clock readings, distances, propagation times, and light paths are unified by an observational metric g_{obs}. Applying the Einstein–Hilbert action to this observational metric yields the Einstein field equation without alteration. NNRT therefore preserves the mathematical achievements of relativistic gravitation while reinterpreting curvature as curvature of the observational metric rather than as curvature of real spacetime itself.

This transition is not terminological. It reverses a worldview that has dominated relativistic physics for more than a century: instead of assuming that relativistic observations arise because real spacetime itself is deformed, NNRT holds that physical interactions alter electromagnetic and operational observables, and that relativistic spacetime emerges when the resulting observational structure is geometrized. The discovery embodied in NNRT is therefore the possibility of preserving the full relativistic mathematical structure while transferring its ontological foundation from real spacetime to observational spacetime, thereby allowing invariant time and space to coexist with relativistic observational geometry.

Keywords: *Nakaza New Relativity Theory (NNRT), real spacetime; observational spacetime, phase universality, observation map; Galilean transformation, Lorentz transformation, simultaneous frequency–wavenumber shift, observational metric, Einstein field equations*

1. Introduction—Reconsidering the Relativistic Worldview after More Than a Century

Relativity, established in the early twentieth century, transformed the physical conception of the world at its foundations. The unification of time and space through the Lorentz transformation, the introduction of Minkowski spacetime, and the subsequent union of gravitation with spacetime geometry in Einstein's general theory of relativity have constituted a fundamental framework of theoretical physics for more than a century. Their influence has extended far beyond mathematical technique. Statements such as “time runs slow,” “length contracts,” and “spacetime is curved by gravity” have become deeply embedded as descriptions of the structure of nature itself.

In particular, within general relativity, the interpretation of the curvature of the metric $g_{\mu\nu}$ as the curvature of real spacetime has become a central conceptual foundation for understanding gravitation. The extraordinary mathematical coherence of the Einstein field equations and their empirical successes have reinforced this geometrical worldview. Nevertheless, a logically prior question remains open: is the proposition that a relativistic metric describes observations with extraordinary precision identical to the proposition that the metric is the structure of real time and space themselves?

Experiments do not directly measure time itself, space itself, or four-dimensional curvature itself. What experimental instruments actually return are clock readings, electromagnetic frequencies, wave numbers, phase differences, propagation times, measured distances, arrival directions, and the positions and motions of material bodies. Once this elementary fact is restored to the center of the analysis, one may reverse the conventional direction of interpretation: first determine the relational structure of the observables, and only thereafter ask what ontological meaning, if any, must be assigned to the metric that unifies them.

NNRT begins precisely at this point. Its central discovery is not a denial of the mathematical achievements of relativity, but the recognition that those achievements can be retained while real spacetime and observational spacetime are separated. Thus the validity of relativistic observational relations is not logically identical to a direct demonstration that real spacetime itself is deformed.

This separation permits a systematic reassignment of structures previously placed within a single relativistic spacetime: the Galilean transformation is assigned to real motion; the Lorentz transformation to electromagnetic observation; the Minkowski metric to flat observational spacetime; the general metric g_{obs} to gravitational observational spacetime; and the Einstein field equations to the dynamics of that observational metric.

NNRT therefore does not construct an alternative mathematical edifice outside relativistic mathematics. It rereads the established mathematical edifice from within and reconstructs, as properties of observational spacetime, structures that had conventionally been attributed to real spacetime. In this sense NNRT is not a correction term to relativity; it is a theoretical reconstruction that reverses the foundational conceptual ordering of the relativistic worldview.

2. Restoration of Invariant Spacetime and Real Motion

The first conceptual transformation of NNRT is to remove time and space from the class of physical entities that themselves undergo deformation. Time is treated as the universal substrate in which physical change occurs, and space as the universal substrate in which matter and fields exist and move. NNRT does not treat either as a material-like object that stretches, contracts, or curves.

$$t'_{\mathrm{real}} = t_{\mathrm{real}} + \text{constant}$$
$$dt'_{\mathrm{real}} = dt_{\mathrm{real}}$$

For two inertial frames S and S' with relative velocity v, their real-motion relation is

$$t'_{\mathrm{real}} = t_{\mathrm{real}}$$
$$x'_{\mathrm{real}} = x_{\mathrm{real}} - v\, t_{\mathrm{real}}$$
$$X'_{\mathrm{real}} = G_v\, X_{\mathrm{real}}$$

where G_v denotes the Galilean transformation. The restoration of invariant time and space does not entail a return to a Newtonian absolute rest frame. In NNRT all inertial frames remain physically equivalent, and no inertial frame can be identified as absolutely at rest. Thus the Galilean transformation does not describe motion relative to an empirically privileged absolute space; it describes real-motion relations among mutually equivalent inertial frames sharing universal time and space.

The logical structure is therefore: universal time and universal space + equivalence of inertial frames → impossibility of identifying an absolute rest frame → description of real motion by the Galilean transformation. No Lorentz transformation is required at this level. The Lorentz transformation emerges from a different physical layer: electromagnetic observation.

3. The Central Discovery of NNRT —Separation of Real Motion from Electromagnetic Observation

The decisive structural move of NNRT is to place an explicit observation map Φ between the real world and the observational world. Let R denote the real state and O the observational state:

$$\Phi : R \to O$$

Conceptually, the real state may be written as $R = (t_{\text{real}}, x_{\text{real}}, \Psi_{\text{m}}, F, G)$, whereas the observational state contains phase, frequency, wave vector, observed coordinates, clock readings, measured lengths, and an observational metric. The essential statement is $R \neq O$. This apparently simple distinction makes the NNRT reconstruction possible.

Real motion obeys $X'_{\text{real}} = G_v\, X_{\text{real}}$, whereas the electromagnetic observational relation between relatively moving inertial frames is written $X'_{\text{obs}} = \Phi_v(X_{\text{obs}})$. Thus G_v is the real-motion transformation, while Φ_v is the electromagnetic observation map.

Once this distinction is made, the historical question "Which is the true spacetime transformation, GT or LT?" ceases to be well posed within NNRT. The two transformations are not competitors because they act on different physical objects. This stratification is precisely what permits NNRT to preserve relativistic mathematics while transforming the worldview attached to it.

4. Phase Universality and the Lorentz-Type Observation Transformation

The central principle governing the observational layer is phase universality. For an electromagnetic wave, write the phase as $\Theta = k \cdot x_{\text{obs}} - \omega t_{\text{obs}}$. For the same electromagnetic phase event, NNRT requires

$$\Theta' = \Theta$$

Since ω and k are derived from the same phase field,

$$\omega = -\partial\Theta/\partial t_{\text{obs}}$$
$$k = \nabla\Theta$$

the frequency ω and wave vector k are not independent observational quantities under transformation; they are temporal and spatial components of the gradient of a single phase. A change of observational frame therefore acts jointly as $(\omega, k) \to (\omega', k')$. NNRT calls this the simultaneous frequency–wavenumber shift.

Let M denote the vacuum Maxwell operator and suppose $M_{\text{S}}\, F = 0$. If the observed field in S' is $F' = \Phi_v F$, equivalence of inertial frames requires structural preservation of the electromagnetic law:

$$M_{S'}\, \Phi_v = \Phi_v\, M_S$$

Imposing phase universality together with preservation of the Maxwell characteristic structure, linearity and homogeneity of observational coordinates, reversibility, and reciprocity between inertial frames yields

$$x'_{\text{obs}} = \gamma(x_{\text{obs}} - v\, t_{\text{obs}})$$
$$t'_{\text{obs}} = \gamma(t_{\text{obs}} - v x_{\text{obs}}/c^2)$$
$$\gamma = 1/\sqrt{(1 - v^2/c^2)}$$
$$\text{or } X'_{\text{obs}} = L_{\text{v}}\, X_{\text{obs}}.$$

The mathematical Lorentz transformation is preserved, but its physical location is changed: G_v is the real-motion transformation, whereas L_v is the electromagnetic observation transformation. The formula remains; the world to which it belongs is reassigned.

5. From the Postulate of Light-Speed Invariance to a Derived Observational Theorem

Phase universality implies the covector transformation $K' = (L_v^{-1})^T K$, giving

$$\omega' = \gamma(\omega - v k_{\text{x}})$$
$$k'_{\text{x}} = \gamma(k_{\text{x}} - v\omega/c^2)$$
$$k'_{\text{y}} = k_{\text{y}}\,, \quad k'_{\text{z}} = k_{\text{z}}$$

For a vacuum electromagnetic wave, Maxwell theory gives the dispersion relation

$$\omega^2 - c^2|k|^2 = 0$$

Preservation of the Maxwell characteristic structure gives

$$\omega'^2 - c^2|k'|^2 = \omega^2 - c^2|k|^2$$

Hence $\omega = c|k|$ and $\omega' = c|k'|$, so that

$$\omega'/\omega = |k'|/|k|$$
$$\omega'/|k'| = \omega/|k| = c$$

This result has a special status in NNRT. The invariance of the observed speed of light is no longer introduced as an independent foundational postulate. The logical sequence is: phase universality → preservation of Maxwell structure → Lorentz-type observation transformation → simultaneous frequency–wavenumber shift → preservation of Maxwell dispersion → equivalent frequency–wavenumber shift → observational invariance of light speed.

The change is therefore not merely one of derivational order. It reorganizes the conceptual foundations of special relativity. The constancy of light speed moves from a postulate to a theorem of the electromagnetic observation structure.

Likewise, the invariant interval

$$ds_{\text{obs}}{}^2 = c^2\, dt_{\text{obs}}{}^2 - dx_{\text{obs}}{}^2 - dy_{\text{obs}}{}^2 - \mathrm{d}z_{\text{obs}}{}^2$$

is written $ds_{\text{obs}}{}^2 = \eta_{\mu\nu}\, dx_{\text{obs}}{}^\mu\, dx_{\text{obs}}{}^\nu$. In NNRT, the Minkowski metric $\eta_{\mu\nu}$ is therefore not the metric of real spacetime itself but the metric of flat electromagnetic observational spacetime.

6. Transformation of Gravitation—from Curvature of Real Spacetime to Curvature of the Observational Metric

The innovative content of NNRT becomes especially explicit in gravitation. The observation map for relative inertial motion is generalized, in the presence of gravitation, to a position-dependent map. In a gravitational field, frequency, wave vector, and phase acquire position dependence:

$$\omega \to \omega(x)\,, \quad k \to k(x)\,, \quad \Theta \to \Theta(x)$$

$$\delta\Theta = \int \delta k_\mu \, \mathrm{d}\, x^\mu$$

These responses are manifested as gravitational redshift, clock comparison, ranging, Shapiro delay, light deflection, and interferometric phase differences. NNRT does not begin by asserting that real spacetime first curves and that light and clocks subsequently follow this curvature. Instead, it adopts the causal ordering: gravitational interaction → response of frequency, wave vector, and phase → changes in clock readings, distances, propagation times, and light paths → observational metric.

Geometry is thus not introduced as an ontologically prior cause of the observations; it appears as the mathematical structure that unifies them.

$$ds_{\mathrm{obs}}{}^2 = g_{\mathrm{obs},\mu\nu}\, dx_{\mathrm{obs}}{}^\mu\, dx_{\mathrm{obs}}{}^\nu$$

In the gravity-free limit, $g_{\mathrm{obs}} \to \eta$; with gravitational interaction, one may write $g_{\mathrm{obs}} = \eta + h_{\mathrm{obs}}$. The perturbation h_{obs} is not a deformation of real space itself; it geometrically represents the nonuniformity introduced into the observational structure by gravitational interaction.

Accordingly, curvature does not disappear in NNRT. What changes is the object to which curvature belongs: curvature of real spacetime → curvature of the observational metric. This reassignment is the central discovery of NNRT in the gravitational domain.

7. Preservation of the Einstein Field Equations and Reversal of Their Physical Meaning

Once the observational metric g_{obs} is constructed as a Lorentzian metric, standard differential geometry applies without alteration:

$$g_{\mathrm{obs}} \to \Gamma_{\mathrm{obs}} \to R_{\mathrm{obs}} \to R_{\mathrm{obs},\mu\nu} \to G_{\mathrm{obs},\mu\nu}.$$

Thus nonzero curvature means directly that the observational metric is non-flat. Consider the Einstein–Hilbert action for g_{obs}:

$$S_{\mathrm{EH}}[g_{\mathrm{obs}}] = (c^3/16\pi G) \int d^4x\, \sqrt{(-g_{\mathrm{obs}})}\, R[g_{\mathrm{obs}}]$$

Let the matter action be $S\mathrm{m}[g_{\mathrm{obs}}, \psi]$ and vary the total action with respect to the observational metric. The standard variational calculation yields

$$G_{\mu\nu}[g_{\mathrm{obs}}] = (8\pi G/c^4)\, T_{\mu\nu}$$

Here the characteristic structure of NNRT becomes unmistakable. The Einstein field equations are neither discarded nor modified. What changes is the physical meaning of the object governed by them. The metric is identified with the observational metric rather than with an ontological deformation of real time and space.

The Einstein equations are thereby read as equations relating matter-energy to the geometry of the observational metric. This is precisely how NNRT can preserve the mathematical power of relativistic gravitation while transforming the worldview traditionally attached to it.

7.1 The Schwarzschild Field

For a static, spherically symmetric vacuum region, solving the vacuum Einstein equation for the observational metric yields

$$ds_{\mathrm{obs}}{}^2 = (1 - 2GM/c^2r)c^2\, dt^2 - (1 - 2GM/c^2r)^{-1}\, dr^2 - r^2\, d\Omega^2$$

From this metric one obtains

$$d\tau_{\mathrm{obs}} = \sqrt{(1 - 2GM/c^2r)}\, dt$$

$$\omega_{\mathrm{obs}}(r) = \omega_\infty/\sqrt{(1 - 2GM/c^2r)}$$

The local Maxwell dispersion relation further gives

$$|k_{\mathrm{obs}}(r)| = \omega_{\mathrm{obs}}(r)/c$$

$$\omega_{\mathrm{obs}}(r)/|k_{\mathrm{obs}}(r)| = c$$

Thus both frequency and wave number vary with position while the local observational ratio remains equal to the electromagnetic characteristic speed. The same observational metric yields Shapiro delay and light deflection; in the weak-field limit the total deflection angle is

$$\Delta\varphi = 4GM/(c^2b)$$

NNRT does not alter these numerical results. It reverses their physical causal interpretation: mass-energy → gravitational interaction → response of frequency, wave vector, and phase → changes in clocks, distances, propagation times, and light paths → geometrical unification by the observational metric. The Schwarzschild metric is therefore read not as a direct picture of the shape of real spacetime, but as the geometrical representation of the observational structure surrounding a mass.

8. Mathematical Closure through the Observation Map

The NNRT observation map Φ is not an additional unknown law of nature. It is understood as a composite map:

$$\Phi = \Phi_{\text{geom}} \circ \Phi_{\text{read}} \circ \Phi_{\text{phase}} \circ \Phi_{\text{int}}$$

Here Φ_{int} specifies the state of the observational medium under physical interaction; Φ_{phase} extracts phase, frequency, and wave vector; Φ_{read} yields clock readings, distances, propagation times, and directions; and Φ_{geom} unifies those observables into the observational metric.

The structure is therefore: real state → physical interaction → electromagnetic state → phase structure → frequency and wave vector → operational observables → observational metric.

In the gravitational case this may be written schematically as $g_{\text{obs}} = \Phi_{\text{g}}[R]$. Combined with the Einstein field equation,

$$G_{\mu\nu}[\Phi_g(R)] = (8\pi G/c^4)\ T_{\mu\nu}$$

This compact expression displays the architecture of NNRT: the relativistic metric is not identified directly with the real state. An observation-generating process necessarily intervenes. The hierarchy is therefore real state → observation → geometry.

9. Discovery and Historical Significance of NNRT

The innovative significance of NNRT cannot be assessed solely by asking what new numerical value it calculates. A more fundamental question is how known observations are to be understood within a coherent image of nature.

In the history of science, conceptual revolutions have not always arisen because existing observations were replaced by entirely new numerical facts. They have also occurred when the same observations were reorganized by a different ordering of fundamental concepts, thereby changing the image of nature itself. The transformation proposed by NNRT is of this kind.

Its discovery is not a correction to an isolated relativistic formula. Its central claim is that even if relativistic mathematics is correct, it does not logically follow that this mathematics must be interpreted as a deformation of real spacetime itself.

Once this distinction is introduced, structures that had been conceptually fused become separable: real motion and electromagnetic observation; GT and LT; universal time and observed time; universal space and observed distance; real spacetime and Minkowski spacetime; gravitational interaction and curvature of the observational metric.

Crucially, this separation does not require the loss of relativistic mathematics. This is the distinctive discovery of NNRT. Preserving the mathematics of relativity and preserving the conventional ontology attached to that mathematics are not the same requirement.

For more than a century, the identification of the relativistic metric with real spacetime has been deeply established within the standard relativistic worldview. NNRT retains the mathematical results while releasing this identification. Consequently, statements such as “time dilates,” “space contracts,” and “spacetime curves” are transferred from propositions about real spacetime itself to propositions about observational spacetime.

The magnitude of this transition should not be underestimated merely because the equations remain unchanged. On the contrary, the capacity to preserve the equations while reversing the physical world-picture is precisely what characterizes the theory.

The revolution proposed by NNRT is therefore not a revolution of new equations. It is a conceptual revolution produced by reorganizing the correspondence between mathematics and physical reality.

10. Conclusion—Reversal of the Relativistic Worldview

NNRT is not a theory constructed by appending new relativistic equations. It reconstructs the physical meaning of relativistic mathematics by separating reality from observation.

Its complete logical architecture may be summarized as follows: universality of time + universality of space + equivalence of inertial frames + phase universality → real motion described by GT → separation of the real and observational layers → observation map → preservation of Maxwell structure → Lorentz-type observation transformation → simultaneous frequency–wavenumber shift → preservation of Maxwell dispersion → equivalent frequency–wavenumber shift → observational invariance of light speed → Minkowski observational metric → gravitational interaction → position-dependent phase response → changes in clocks, distances, propagation times, and light paths → observational metric → Einstein–Hilbert action → Einstein field equations.

Within this architecture, light-speed invariance moves from a first principle to a derived result. The Lorentz transformation moves from a transformation of real spacetime to an electromagnetic observation transformation. The Minkowski metric moves from the metric of real spacetime to the metric of flat observational spacetime. The general relativistic metric moves from the metric of real spacetime to the gravitational observational metric. Curvature moves from curvature of real time and space themselves to curvature of the observational metric.

These are not disconnected reinterpretations. They form a systematic reassignment governed by a single distinction: reality is not identical to observation.

The central proposition of NNRT may therefore be stated as follows:

Relativistic spacetime geometry is not the form assumed by time and space themselves under physical interaction; it is the geometrical representation of the observational structure formed when physical phenomena occurring within universal real spacetime are observed through electromagnetic waves, clocks, ranging, and phase.

Under this proposition, universal time and relativistic observed time, universal space and relativistic observed distance, GT and LT, and invariant real spacetime and curved observational spacetime can coexist consistently within a single theoretical framework.

The revolution proposed by NNRT is therefore not a destruction of relativistic mathematics. It is a release of that mathematics from the physical ontology to which it has been bound for more than a century, followed by its systematic relocation to the observational world.

Accordingly, the worldview "observations change because spacetime itself deforms" is reversed into the worldview "physical interactions alter observables, and relativistic spacetime emerges when those observables are unified geometrically."

To preserve the mathematics while reversing the world-picture: therein lies the central discovery, originality, and theoretical innovation of the Nakaza New Relativity Theory.

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