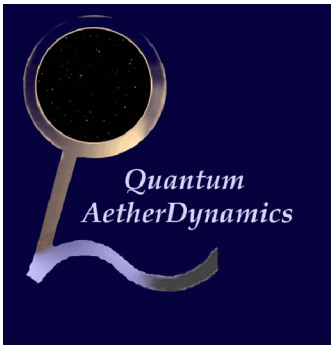

Quantum AetherDynamics Institute (QADI)

Stable Matter of the Universe

A Geometric Construction of Persistent Space and Matter in the Quantum AetherDynamics Framework

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Abstract

This paper extends the invariant geometry developed in *The Geometry of Compatibility* into the constructive development of stable matter. Rather than introducing stable particles as primitive physical objects, it develops persistent compatibility as the geometric selection principle governing stable physical existence. Geometric configurations that preserve compatibility under repeated exposure form an invariant subset of the Aether Unit geometry and become the persistent structures capable of repeatable measurement.

Beginning with the inherited Aether Unit, primitive geometry, topology, differential geometry, exposure, compatibility, canonical structures, measurement algebra, inverse geometry, and dependency hierarchy, the paper develops a constructive sequence from invariant geometry to stable particles, composite matter, and stable space. Within this framework, the electron and proton are identified as the first localized persistent geometries, the neutron as the first stable composite compatibility neighborhood, and atoms, chemistry, condensed matter, and macroscopic structures as successive organizations of persistent compatible geometry.

The resulting framework interprets stable matter not as an independent physical primitive, but as the observable manifestation of invariant geometry preserved under repeated compatibility. Quantum Measurement Units (QMU) provide the invariant metrological language through which these geometric structures are quantified, establishing a unified constructive framework that connects subatomic organization, macroscopic matter, and stable space through a common system of geometric invariants.

1 Purpose

1.1 Stable Physics Begins with Stable Existence

Stable physics begins with stable existence. Physical observation, comparison, and measurement require structures that preserve their identity through repeated interaction. The observable Universe is therefore approached as a hierarchy of persistent structures, extending from space and stable particles to atoms, molecules, macroscopic matter, and astronomical organization.

The purpose of this paper is to extend the invariant compatibility geometry established in *The Geometry of Compatibility* [Thomson III(2026a)] into the constructive development of stable matter. The monograph establishes the mathematical framework of the Aether Unit, including primitive geometry, topology, differential geometry, exposure, compatibility, canonical structures, measurement algebra, inverse geometry, and the dependency hierarchy. These results are inherited without modification.

The specific constructive problem addressed here is the derivation of persistent particle identity, organized mass, complementary charge structure, and repeatable measurement from one invariant geometry rather than their separate introduction as empirical particle attributes. The geometric mass relations, subatomic confinement structure, and constant-closure equations required by this construction were developed in earlier QADI treatments [Thomson III(2025s), Thomson III(2026b), Thomson III(2026d)].

Let

$$\mathfrak{M} = \{\mathcal{A}, \mathcal{G}, \mathcal{T}, \mathcal{D}, \mathcal{E}, \mathcal{C}, \mathcal{K}, \mathcal{Q}, \mathcal{I}, \mathcal{H}\},$$

denote the inherited framework, where

$\mathcal{A}$: Invariant Aether Unit,
$\mathcal{G}$: Primitive and invariant geometry,
$\mathcal{T}$: Topology,
$\mathcal{D}$: Differential geometry,
$\mathcal{E}$: Exposure,
$\mathcal{C}$: Compatibility,
$\mathcal{K}$: Canonical structures,
$\mathcal{Q}$: Measurement algebra,
$\mathcal{I}$: Inverse geometry,
$\mathcal{H}$: Dependency hierarchy.

The present work introduces no new primitive geometry or measurement principle. It develops the conditions under which admissible invariant geometry becomes persistent physical structure.

A configuration is physically stable only when it preserves its compatible identity under repeated exposure. Let $X \in \mathcal{G}$ be an admissible geometric configuration. Persistent compatibility is defined by

$$(\mathcal{C} \circ \mathcal{E})^n(X) = X, \qquad \forall\, n \geq 1.$$

This condition distinguishes persistent geometry from transient deformation, temporary excitation, and unstable intermediate structure. A configuration that fails to preserve compatibility may occur, but it cannot provide a repeatable measurement signature or serve as a foundational object of stable physics.

The persistent subset of invariant geometry is therefore

$$\mathcal{P} = \{X \in \mathcal{G} \mid (\mathcal{C} \circ \mathcal{E})^n(X) = X,\ \forall\, n \geq 1\}\,.$$

Stable matter is identified with the physically realizable hierarchy constructed from this persistent subset:

$$\boxed{\mathcal{M}_s = \{X \in \mathcal{G} \mid (\mathcal{C} \circ \mathcal{E})^n(X) = X,\ \forall\, n \geq 1\}\,.}$$

The constructive dependency of the paper is

$$\boxed{\mathcal{A} \longrightarrow \mathcal{G} \longrightarrow \mathcal{C} \longrightarrow \mathcal{P} \longrightarrow \mathcal{M}_s \longrightarrow \mathcal{S}.}$$

Here, $\mathcal{S}$ denotes stable space. Each stage is constructed only from structures established before it, preserving the dependency hierarchy inherited from the monograph. More generally,

$$\mathcal{X}_{n+1} = F_n(\mathcal{X}_n),$$

where each constructive operator F_n acts solely upon previously established geometric structures.

The construction proceeds from invariant geometry to compatibility, from compatibility to persistence, and from persistence to stable physical organization. The electron and proton are developed as the first localized persistent geometries. The neutron is constructed as a stable electron–proton composite within a shared compatibility neighborhood, with its neutron-sector mass and charge organization inherited from the corresponding geometric and metrological treatments [Thomson III(2025s), Thomson III(2025aa), Thomson III(2025ad)]. Atoms, chemistry, crystal structure, macroscopic matter, and astronomical organization then arise as higher-order compatible organizations of stable particles. Stable space is developed as the extended persistent geometry complementary to localized matter.

Measurement enters only after persistent structure has been established. Geometry determines compatibility, compatibility determines persistence, and persistence determines stable physical existence. The inherited QMU measurement algebra then provides the quantitative representation of the resulting geometric organization [Thomson III(2025a)].

The relationship between the monograph and the present paper is therefore sequential:

$$\boxed{\begin{aligned}&\text{The Geometry of Compatibility}\\ &\Longrightarrow \text{ Persistent Compatible Geometry}\\ &\Longrightarrow \text{ Stable Matter from Invariant Aether Geometry.}\end{aligned}}$$

The monograph establishes the mathematical grammar of invariant Aether geometry. The present paper applies that grammar to the construction of persistent physical objects. Its central thesis is consequently

$$\boxed{\text{Stable Matter} = \text{Persistent Compatible Geometry.}}$$

This identity is not merely descriptive. It defines the constructive program of the paper. Stable matter consists of invariant geometry that preserves compatibility under repeated exposure, retains a repeatable measurement signature, and remains available for higher-order physical organization. The following sections first state the inherited mathematical foundations and then develop repeated compatibility as the selection mechanism by which admissible geometry becomes stable physical existence.

1.2 Scope and Relation to Established Observables

The Aether Unit employed here is a discrete invariant geometric and metrological structure rather than a mechanical propagation medium introduced to define motion relative to an absolute frame. The translation of QMU relations into conventional electromagnetic, relativistic, gravitational, and laboratory observables is developed in the associated QADI literature [Thomson III(2025z), Thomson III(2025c), Thomson III(2025d), Thomson III(2025r)]. The present paper is restricted to the constructive transition from invariant geometry to persistent space and stable matter.

1.3 Constructive Physics

The present work is a constructive theory of stable existence. Rather than beginning with existing stable objects and examining their decomposition, it begins with the invariant geometry inherited from the Aether Unit and determines which organizations remain physically persistent under repeated compatibility.

The constructive dependency developed throughout this paper is

$$\text{Invariant Geometry} \longrightarrow \text{Compatibility} \longrightarrow \text{Persistence} \longrightarrow \text{Stable Matter}.$$

Each level inherits the geometric constraints established by the preceding level. No additional physical primitives are introduced during the construction.

The objective of the present paper is therefore not to identify constituents of matter through destructive processes, but to determine the geometric conditions under which stable physical structures can be constructed, localized, and preserved.

Accordingly, stable matter is interpreted as the persistent realization of compatible invariant geometry.

1.4 Terminological Discipline

The constructive hierarchy requires that each technical term represent a single ontological category throughout the paper.

Mass denotes a measurable geometric dimension. Matter denotes a physical organization possessing measurable dimensions. Dark matter, visible matter, and stable matter represent successive stages of physical organization and are therefore not interchangeable terms.

Likewise, creation and organization are treated as distinct physical processes. Creation belongs to the Singularity bifurcation. Organization belongs to the Aether Unit. The bifurcation produces the complementary physical sectors from which the Aether Unit is constructed. The Aether Unit subsequently organizes dark matter into visible matter, while persistent compatibility localizes visible matter as stable matter.

The resulting dependency is

$$\text{Singularity} \longrightarrow \text{Complementary Sectors} \longrightarrow \text{Aether Unit} \longrightarrow \text{Visible Matter} \longrightarrow \text{Stable Matter}.$$

Maintaining this one-to-one correspondence between terminology, mathematics, and ontology prevents distinct physical concepts from being represented by the same mathematical object or by the same descriptive language.

2 Monograph Foundations

The present paper inherits the complete mathematical framework of *The Geometry of Compatibility* [Thomson III(2026a)] without modification. The monograph establishes the Aether Unit, primitive

geometry, topology, differential geometry, exposure, compatibility, canonical structures, measurement algebra, inverse geometry, and dependency hierarchy. Related papers develop the dimensional algebra, experimental metrology, QMU–SI translation, and fundamental-constant closure employed throughout the present construction [Thomson III(2025t), Thomson III(2025v), Thomson III(2025z), Thomson III(2025a), Thomson III(2026d)]. These structures provide the fixed foundation from which stable matter is constructed.

The guiding inheritance rule is

Nothing established in the monograph is redefined here.

2.1 The Invariant Aether Unit

The invariant Aether Unit is represented by

$$\mathcal{A} = \{\lambda_C, F_q, c, e^2, {e_{emax}}^2, m_e, \mathfrak{R}\},$$

where $\mathfrak{R}$ denotes the complete set of inherited geometric, topological, differential, compatibility, and measurement relations. The Aether Unit establishes the invariant relations among quantum length, quantum frequency, propagation, charge, mass, circulation, and geometric closure.

Within the complete monograph framework $\mathfrak{M}$,

$$\mathcal{A} \subset \mathfrak{M}.$$

Stable particles and higher material structures are therefore derived from $\mathcal{A}$ rather than introduced as independent primitives. No subsequent construction may contradict its invariant relations.

2.2 Primitive Geometric Closures

The primitive QMU quantities are

$$m_e, \qquad \lambda_C, \qquad F_q, \qquad e^2, \qquad {e_{emax}}^2.$$

The numerical values used for the electron mass, elementary charge, fine-structure constant, speed of light, Planck constant, and associated conversion quantities are taken from the 2022 CODATA recommended values [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga].

They determine the fundamental propagation, resonance, circulation, and volume relations

$$F_q\,\lambda_C = \lambda_C F_q = c,$$

$$\text{rson} = {F_q}^2,$$

$$\text{curl} = \frac{{e_{emax}}^2}{m_e \lambda_C},$$

and

$$\text{volm} = {\lambda_C}^3.$$

The rotational and topological closure of the Aether Unit is expressed by Ledger One,

$$A_u \, \text{curl} = {F_q}^2 \, {\lambda_C}^2.$$

The primitive propagation, volume, resonance, circulation, and charge closures are developed and benchmarked in the QMU foundation, constant-derivation, metrology, and fine-structure treatments [Thomson III(2025e), Thomson III(2025u), Thomson III(2026d), Thomson III(2025ac)].

Together these identities define the invariant substrate inherited by every persistent configuration developed in this paper. Stable particles must preserve their extension, closure, orientation, circulation, propagation, resonance, and invariant scale under repeated exposure.

2.3 Topology and Differential Geometry

Topology determines continuity, connectedness, boundary, enclosure, and admissible transformation, while differential geometry determines local curvature, orientation, propagation, and continuous geometric evolution [Munkres(2000), Guillemin and Pollack(1974), Lee(2013), Lee(2018), do Carmo(1992)]. These mathematical structures are inherited from the monograph and precede their physical interpretation within the present construction.

A stable configuration must therefore preserve both topological closure and differential compatibility. In particular,

$$\boxed{F_q \, \lambda_C = c, \qquad \text{rson} = {F_q}^2, \qquad \text{volm} = {\lambda_C}^3, \qquad A_u \, \text{curl} = {F_q}^2 \, {\lambda_C}^2.}$$

Topological coherence is required for a configuration to retain its identity, while differential compatibility requires its local curvature, circulation, and propagation to remain mutually consistent. Electron, proton, neutron, and higher-order geometries are therefore distinguished first by persistent geometric organization and only then by their measured properties.

The use of topology to distinguish invariant structural classes and of differential geometry to describe their local curvature and deformation follows the standard mathematical division between global and local geometric structure [Munkres(2000), Lee(2013), Lee(2018), do Carmo(1992)].

The spherical-cardioid, dual-holonomy, torsion, and loxodromic packing constructions underlying these topological and differential restrictions are developed in [Thomson III(2025f), Thomson III(2025g), Thomson III(2025h), Thomson III(2026a)].

2.4 Exposure and Compatibility

Exposure is the inherited operation through which geometry becomes available for compatibility, memory, and measurement. It does not create new geometry; it presents an existing configuration to the invariant relations of the Aether Unit.

The combined process may be written schematically as

$$X \xrightarrow{\mathcal{E}} X' \xrightarrow{\mathcal{C}} X'',$$

where persistence requires

$$X = X' = X'' = \cdots .$$

Compatibility determines whether geometric relations may coexist without violating the invariant structure of the Aether Unit. Initially, it establishes admissibility. Under repeated exposure, it becomes the selection condition for persistent physical existence.

A persistent configuration must preserve

$$F_q\,\lambda_C = c, \qquad \mathrm{rson} = {F_q}^2, \qquad \mathrm{volm} = {\lambda_C}^3, \qquad \mathrm{curl} = \frac{{e_{\mathrm{emax}}}^2}{m_{\mathrm{e}}\lambda_C}, \qquad A_u\,\mathrm{curl} = {F_q}^2\,{\lambda_C}^2.$$

Failure to preserve any required invariant causes the geometry to reorganize into another admissible state. The constructive progression is therefore

Invariant Geometry
$\Downarrow$
Compatible Geometry
$\Downarrow$
Persistent Compatible Geometry
$\Downarrow$
Stable Physical Object.

2.5 Canonical Structures

Canonical structures are the distinguished geometries admitted by the inherited compatibility framework. They preserve closure, circulation, orientation, exposure, and measurement and are not arbitrary geometric representatives.

Their invariant circulation is quantified by

$$\mathrm{angm} = m_{\mathrm{e}}{\lambda_C}^2 F_q.$$

This quantity arises directly from the primitive mass, length, and frequency structure of the Aether Unit. It is therefore interpreted as a geometric invariant before it appears as a measured particle property.

A canonical structure becomes physically stable when it preserves its identity under repeated exposure. Thus,

$$\begin{gathered}\text{Invariant Geometry}\\ \Downarrow\\ \text{Canonical Geometry}\\ \Downarrow\\ \text{Persistent Canonical Geometry}\\ \Downarrow\\ \text{Stable Particle.}\end{gathered}$$

The electron and proton are developed in later sections as the first persistent canonical particle geometries.

2.6 Measurement Algebra

Measurement algebra provides the quantitative representation of the inherited geometry. Its axiomatic structure, ledger morphisms, calibration procedures, QMU–SI translation, and conventional-unit conversion tables are developed in [Thomson III(2025t), Thomson III(2025v), Thomson III(2025z), Thomson III(2025a)]. Every measurable quantity used here is derived from Every measurable quantity is derived from

$$m_{\mathrm{e}}, \qquad \lambda_C, \qquad F_q, \qquad e^2, \qquad {e_{\mathrm{emax}}}^2,$$

together with the primitive closure relations.

Representative QMU quantities include

$$\mathrm{angm} = m_{\mathrm{e}} {\lambda_C}^2 F_q,$$

$$\mathrm{mflx} = \frac{\mathrm{angm}}{{e_{\mathrm{emax}}}^2},$$

$$\mathrm{potn} = \frac{m_{\mathrm{e}} {\lambda_C}^2 {F_q}^2}{{e_{\mathrm{emax}}}^2},$$

with complementary charge relation

$$e^2 = 8\pi\alpha_e \, {e_{\mathrm{emax}}}^2.$$

These quantities are mutually consistent projections of the same persistent compatible geometry. Stable matter therefore preserves both the invariant geometry and its associated measurement algebra.

2.7 Inverse Geometry

Inverse geometry reconstructs invariant geometry from measured QMU quantities, complementing the constructive sequence

$$\text{Geometry} \longrightarrow \text{Measurement}$$

by the inverse mapping

$$\text{Measurement} \longrightarrow \text{Geometry}.$$

Because every QMU quantity is expressed in terms of the primitive invariants, measured values uniquely determine their geometric origin. Accordingly, a complete particle theory must satisfy both directions: geometry must generate the observed measurement algebra, and the measurement algebra must reconstruct the originating geometry.

2.8 Dependency Hierarchy

Every construction in the present paper follows the dependency hierarchy established in the monograph:

$$\begin{aligned}
\text{Aether Unit} &\longrightarrow \text{Primitive Geometry} \\
&\longrightarrow \text{Topology} \\
&\longrightarrow \text{Differential Geometry} \\
&\longrightarrow \text{Exposure} \\
&\longrightarrow \text{Compatibility} \\
&\longrightarrow \text{Canonical Structures} \\
&\longrightarrow \text{Measurement Algebra} \\
&\longrightarrow \text{Inverse Geometry} \\
&\longrightarrow \text{Persistent Geometry} \\
&\longrightarrow \text{Stable Particles} \\
&\longrightarrow \text{Stable Matter} \\
&\longrightarrow \text{Stable Space}.
\end{aligned}$$

The remaining sections introduce no new primitive framework. Their purpose is to identify the first persistent compatible geometries admitted by the inherited Aether Unit and to develop stable matter as a constructive consequence of the monograph.

2.9 Compatibility as a Discrete Dynamical System

The present paper inherits the primitive geometric objects and compatibility relations established in [Thomson III(2026a)]. Stable matter is therefore formulated as a discrete dynamical process acting upon the inherited configuration space rather than as a new geometric construction.

Let

$$\mathcal{G}$$

denote the space of admissible geometric configurations inherited from the monograph. Each element

$$X \in \mathcal{G}$$

represents a complete geometric realization of an Aether configuration subject to the inherited compatibility rules.

Two operators act upon this space.

The exposure operator

$$\mathcal{E} : \mathcal{G} \to \mathcal{G}$$

represents geometric evolution under continued chronovibrational exposure.

The compatibility operator

$$\mathcal{C} : \mathcal{G} \to \mathcal{G}$$

projects each exposed configuration onto the nearest compatible configuration permitted by the invariant geometric constraints.

The constructive evolution operator is therefore defined by

$$\mathcal{T} = \mathcal{C} \circ \mathcal{E}.$$

Repeated application of

$$\mathcal{T}$$

produces the discrete sequence

$$X,\ \mathcal{T}(X),\ \mathcal{T}^2(X),\ \ldots,\ \mathcal{T}^n(X),$$

which describes the successive organization of the configuration under continued compatibility selection.

The present paper is concerned exclusively with the long-term behavior of this sequence. Stable matter corresponds to configurations that remain invariant under continued application of the constructive operator.

2.10 Persistent Geometry Precedes Physical Interpretation

The preceding construction establishes the existence of persistent compatible geometries without assigning any physical interpretation to their members.

The mathematical selection process determines only whether a geometric configuration survives repeated constructive evolution. It does not identify the surviving configuration as an electron, proton, neutron, or any other physical object.

Physical interpretation is therefore a secondary step.

The constructive program adopted throughout this paper first determines the invariant members of the persistent subset,

$$\mathcal{P} = \mathrm{Fix}(\mathcal{T}),$$

and only afterward compares these invariant geometries with observed physical properties.

This separation preserves the distinction between mathematical construction and physical identification.

Consequently, each particle introduced in the following sections is not postulated as a primitive object. Instead, each particle is identified with a particular persistent compatible geometry whose measurable properties arise from the inherited QMU metrology.

The constructive hierarchy therefore proceeds in the following order:

$$\begin{gathered}\text{Invariant Geometry}\\ \Downarrow\\ \text{Compatibility}\\ \Downarrow\\ \text{Persistent Geometry}\\ \Downarrow\\ \text{Physical Identification}\\ \Downarrow\\ \text{Observable Measurement.}\end{gathered}$$

The remainder of the paper follows this sequence without introducing additional primitive entities.

2.11 Compatibility as the Criterion for Persistent Existence

The constructive framework developed in this paper does not assume that every mathematically admissible geometry possesses physical existence.

Instead, physical existence is identified only with those configurations that preserve geometric compatibility under repeated constructive evolution.

This distinction separates mathematical possibility from physical reality.

A configuration may satisfy every local geometric requirement while remaining globally incompatible with the invariant structure inherited from the Aether Unit.

Such a configuration is mathematically admissible but physically transient.

Repeated application of the constructive operator,

$$\mathcal{T} = \mathcal{C} \circ \mathcal{E},$$

eliminates these transient configurations by progressively removing geometric incompatibilities.

Only configurations satisfying

$$\mathcal{T}(X) = X$$

remain unchanged throughout every subsequent constructive iteration.

Persistent compatibility therefore becomes the mathematical criterion for persistent physical existence.

Existence is not introduced as an independent postulate.

Instead, existence emerges as the invariant limit of constructive compatibility.

Consequently, stability is not an additional physical law imposed upon matter after its creation.

Rather, stability is the inevitable consequence of geometric compatibility itself.

2.12 Constructive Hierarchy of Persistent Organization

Repeated compatibility does not merely identify isolated stable geometries.

It also establishes a hierarchy of increasingly organized persistent structures.

Each successive level inherits the compatibility conditions satisfied by its predecessors while introducing additional compatible organization.

The hierarchy developed throughout the QADI framework therefore assumes the form

$$\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Persistent Compatible Geometry}\\ &\longrightarrow \text{Stable Particles}\\ &\longrightarrow \text{Composite Particles}\\ &\longrightarrow \text{Atoms}\\ &\longrightarrow \text{Chemistry}\\ &\longrightarrow \text{Condensed Matter}\\ &\longrightarrow \text{Astronomical Structure}.\end{aligned}$$

At no stage are additional organizing principles introduced.

Every level inherits the same compatibility relations established by the persistent subset.

The observable complexity of matter therefore arises from repeated organization of invariant compatible geometry rather than from the addition of fundamentally new physical entities.

3 Stable Configuration Selection

3.1 Repeated Compatibility and the Persistent Set

The monograph establishes compatibility as the invariant condition under which geometric relations may coexist without violating the structure of the Aether Unit [Thomson III(2026a)]. The present paper extends this framework by applying compatibility repeatedly under successive exposure.

This iterated selection principle is the principal mathematical extension introduced in the present paper. The operators $\mathcal{E}$ and $\mathcal{C}$ themselves retain the definitions and geometric roles established in the monograph [Thomson III(2026a)].

Let

$$\mathcal{T} = \mathcal{C} \circ \mathcal{E}$$

denote the combined exposure–compatibility operator, where $\mathcal{E}$ is the inherited exposure operator and $\mathcal{C}$ is the inherited compatibility operator. Mathematically, iteration of $\mathcal{T}$ defines a discrete dynamical system on the admissible configuration space $\mathcal{G}$. Fixed points, invariant subsets, and asymptotic stability are used here in their standard dynamical-systems sense [Elaydi(2005)]. For an admissible configuration $X_0 \in \mathcal{G}$, define

$$X_{n+1} = \mathcal{T}(X_n) = \mathcal{C}(\mathcal{E}(X_n)), \qquad n \geq 0.$$

A configuration possesses persistent compatibility when

$$\mathcal{T}(X) = X,$$

Thus, persistent compatibility identifies X as a fixed point of the exposure–compatibility map. The implication

$$\mathcal{T}(X) = X \quad \Longrightarrow \quad \mathcal{T}^n(X) = X$$

is the standard invariance property of a fixed point under iteration [Elaydi(2005)],

and therefore

$$\mathcal{T}^n(X) = X, \qquad \forall\, n \geq 1.$$

The persistent subset of admissible geometry is consequently

$$\boxed{\mathcal{P} = \{X \in \mathcal{G} \mid \mathcal{T}^n(X) = X,\ \forall\, n \geq 1\}\,.}$$

Every member of $\mathcal{P}$ preserves the primitive invariant relations of the Aether Unit,

$$F_q\,\lambda_C = \lambda_C F_q = c,$$

$$\mathrm{volm} = {\lambda_C}^3,$$

$$\mathrm{rson} = {F_q}^2,$$

$$\mathrm{curl} = \frac{{e_{\mathrm{emax}}}^2}{m_{\mathrm{e}}\lambda_C},$$

together with the closure relation

$$A_u\,\mathrm{curl} = {F_q}^2\,{\lambda_C}^2.$$

Persistent compatibility therefore identifies the geometries that retain their invariant organization throughout continued exposure. Such configurations possess repeatable measurement signatures because each iteration returns the same compatible geometry.

Theorem 1 (Persistence Criterion)

Let

$$\mathcal{T} = \mathcal{C} \circ \mathcal{E}$$

be the exposure–compatibility operator.

If a configuration

$$X \in \mathcal{G}$$

satisfies

$$\mathcal{T}(X) = X,$$

then

$$\mathcal{T}^n(X) = X, \qquad \forall n \geq 1.$$

Proof. The proof proceeds by induction.

For $n = 1$,

$$\mathcal{T}(X) = X$$

holds by hypothesis.

Assume

$$\mathcal{T}^k(X) = X.$$

Then

$$\mathcal{T}^{k+1}(X) = \mathcal{T}(\mathcal{T}^k(X)) = \mathcal{T}(X) = X.$$

Therefore

$$\mathcal{T}^n(X) = X$$

for every positive integer n.

Thus every fixed point of the exposure–compatibility operator is persistent under repeated exposure.

□

3.2 Persistent and Unstable Geometries

Repeated exposure partitions the admissible family $\mathcal{G}$ into persistent and non-persistent classes,

$$\mathcal{G} = \mathcal{P} \cup \mathcal{U}, \qquad \mathcal{P} \cap \mathcal{U} = \varnothing,$$

where

$$\mathcal{U} = \mathcal{G} \setminus \mathcal{P}.$$

If

$$\mathcal{T}(X) \neq X,$$

then X is not itself a persistent geometry. Its organization changes under continued exposure until it reaches another compatible configuration or ceases to retain its original identity.

Persistence is therefore not guaranteed by geometric admissibility. Admissibility requires compatibility at one stage, whereas persistence requires the preservation of compatibility throughout every subsequent stage.

The iterated operator generates the nested sequence

$$\mathcal{G} \supseteq \mathcal{T}(\mathcal{G}) \supseteq \mathcal{T}^2(\mathcal{G}) \supseteq \cdots,$$

provided that

$$\mathcal{T}^{n+1}(\mathcal{G}) \subseteq \mathcal{T}^n(\mathcal{G}), \qquad \forall\, n \geq 0.$$

Two distinct sets must be identified. The fixed-point set of the exposure–compatibility operator is

$$\boxed{\mathrm{Fix}(\mathcal{T}) = \{X \in \mathcal{G} \mid \mathcal{T}(X) = X\}\,.}$$

Because every fixed point remains unchanged under all subsequent iterations,

$$X \in \mathrm{Fix}(\mathcal{T}) \quad \Longrightarrow \quad \mathcal{T}^{\,n}(X) = X, \qquad \forall\, n \geq 1.$$

The limiting forward-invariant domain generated by the nested sequence is separately defined by

$$\boxed{\mathcal{G}_\infty = \bigcap_{n=1}^{\infty} \mathcal{T}^{\,n}(\mathcal{G}).}$$

The set $\mathcal{G}_\infty$ contains every configuration retained within every iterated admissible image. Membership in $\mathcal{G}_\infty$ does not, by itself, imply that a configuration is a fixed point. The limiting domain may contain nonstationary invariant orbits, including periodic or more general recurrent configurations.

Every fixed point belongs to the limiting domain,

$$\mathrm{Fix}(\mathcal{T}) \subseteq \mathcal{G}_\infty.$$

To identify the entire limiting domain with persistent geometry, an additional stationarity condition is required:

$$\mathcal{T}(X) = X, \qquad \forall\, X \in \mathcal{G}_\infty.$$

Equivalently,

$$\mathcal{T}|_{\mathcal{G}_\infty} = \mathrm{id}_{\mathcal{G}_\infty}\,.$$

Under this condition, every configuration retained by all iterations is stationary, and therefore

$$\boxed{\mathcal{P} = \mathrm{Fix}(\mathcal{T}) = \mathcal{G}_\infty.}$$

Without this additional condition, the persistent set must be identified with the fixed-point set,

$$\boxed{\mathcal{P} = \mathrm{Fix}(\mathcal{T}),}$$

while $\mathcal{G}_\infty$ remains the more general limiting forward-invariant domain [Elaydi(2005)].

Theorem 2 (Persistence as the Maximal Invariant Subset)

The persistent set

$$\mathcal{P} = \bigcap_{n=1}^{\infty} \mathcal{T}^n(\mathcal{G})$$

is invariant under the operator

$$\mathcal{T}.$$

Proof. Let

$$X \in \mathcal{P}.$$

Then

$$X \in \mathcal{T}^n(\mathcal{G})$$

for every n.

Applying $\mathcal{T}$,

$$\mathcal{T}(X) \in \mathcal{T}^{n+1}(\mathcal{G})$$

for every n.

Hence

$$\mathcal{T}(X) \in \bigcap_{n=1}^{\infty} \mathcal{T}^n(\mathcal{G}) = \mathcal{P}.$$

Therefore

$$\mathcal{T}(\mathcal{P}) = \mathcal{P}.$$

□

Compatibility selection introduces no independent mechanism of destruction. A configuration leaves the persistent class when it cannot preserve the required invariant geometry and consequently reorganizes into another admissible state. Stable matter is constructed only from those configurations that remain within $\mathcal{P}$.

Measurement does not create or preserve these geometries. It reveals whether the observed configuration already possesses persistent compatibility.

3.3 Stable Compatibility Neighborhoods

Persistence of an isolated configuration is necessary but not sufficient for physical stability. A stable geometry must also preserve its identity under sufficiently small compatible variations.

For $X \in \mathcal{P}$, define a compatibility neighborhood

$$\mathcal{N}(X) = \{Y \in \mathcal{G} \mid Y \text{ remains compatibly related to } X \text{ under repeated exposure}\}.$$

The neighborhood is stable when

$$\lim_{n\to\infty} \mathcal{T}^n(Y) = X, \qquad \forall\, Y \in \mathcal{N}(X).$$

Thus, local compatible variations may deform the configuration without changing its persistent identity. Repeated compatibility restores the canonical organization represented by X.

Every stable compatibility neighborhood remains constrained by the inherited invariants

$$F_q\,\lambda_C = c, \qquad \mathrm{volm} = {\lambda_C}^3, \qquad \mathrm{rson} = {F_q}^2, \qquad \mathrm{curl} = \frac{{e_{\mathrm{emax}}}^2}{m_{\mathrm{e}}\lambda_C}, \qquad A_u\,\mathrm{curl} = {F_q}^2\,{\lambda_C}^2.$$

A local variation that violates these closures no longer belongs to the same compatibility neighborhood.

The existence of stable neighborhoods explains how repeated measurements may encounter small local variations while preserving the same invariant physical signature. A stable particle is therefore not merely a fixed configuration. It is a persistent canonical geometry together with a neighborhood of compatible variations that converge to the same organization.

Theorem 3 (Neighborhood Stability)

Suppose

$$X \in \mathcal{P}$$

and

$$\lim_{n\to\infty} \mathcal{T}^n(Y) = X$$

for every

$$Y \in \mathcal{N}(X).$$

Then every compatible perturbation converges toward the same persistent geometry.

Proof. By definition,

$$\mathcal{N}(X)$$

contains only admissible compatible perturbations.

Repeated application of

$$\mathcal{T}$$

reduces each perturbation to the invariant representative X.

Therefore no compatible perturbation changes the persistent identity of the neighborhood.

Consequently every observable realization within the neighborhood has the same invariant geometric representative.

□

3.4 Hierarchy of Stability

Stable physical existence requires a hierarchy of increasingly restrictive conditions:

$$\begin{aligned}
&\text{Invariant Geometry} \longrightarrow \text{Primitive Compatibility} \\
&\qquad\qquad\qquad\quad \longrightarrow \text{Topological Persistence} \\
&\qquad\qquad\qquad\quad \longrightarrow \text{Differential Compatibility} \\
&\qquad\qquad\qquad\quad \longrightarrow \text{Repeated Compatibility} \\
&\qquad\qquad\qquad\quad \longrightarrow \text{Stable Compatibility Neighborhood} \\
&\qquad\qquad\qquad\quad \longrightarrow \text{Invariant Measurement} \\
&\qquad\qquad\qquad\quad \longrightarrow \text{Stable Matter.}
\end{aligned}$$

Each stage preserves the conditions established before it. Topological persistence maintains connectedness, closure, and boundary identity. Differential compatibility preserves curvature, circulation, orientation, and propagation. Repeated compatibility preserves the complete configuration under continued exposure. Neighborhood stability ensures that compatible variations return to the same canonical organization. Invariant measurement then supplies the repeatable quantitative signature of that persistent geometry.

The transition from invariant geometry to physical existence may therefore be summarized by

$$\boxed{\mathcal{G} \longrightarrow \mathcal{P} \longrightarrow \mathcal{N} \longrightarrow \mathcal{M}_s,}$$

where $\mathcal{G}$ is the family of admissible invariant geometries, $\mathcal{P}$ the persistent subset, $\mathcal{N}$ the family of stable compatibility neighborhoods, and $\mathcal{M}_s$ the hierarchy of stable matter.

The first physically realizable members of this hierarchy are localized persistent compatibility neighborhoods. The following sections identify the electron and proton as the first such geometries.

Their compatible composition subsequently produces the neutron, atoms, chemistry, condensed matter, and higher-order stable organization.

3.5 Constructive Stability Theorem

Let

$$X \in \mathcal{G}.$$

If repeated constructive evolution satisfies

$$\lim_{n\to\infty} \mathcal{T}^n(X) = X,$$

then

$$X \in \mathcal{P}.$$

Conversely, if

$$X \notin \mathcal{P},$$

then repeated constructive evolution necessarily transforms the configuration into either another compatible geometry or a transient configuration that fails to persist.

Therefore persistent compatible geometries are precisely the stable constructive solutions of the inherited Aether geometry.

This theorem establishes persistence as a property derived from constructive compatibility rather than imposed as an independent physical principle.

4 The First Localized Compatibility Neighborhood

4.1 Identification with the Electron

Repeated compatibility selects the persistent subset of admissible geometry, while stable compatibility neighborhoods identify the first physically realizable members of that subset. The first localized configuration must arise from the invariant Aether Unit, preserve its topological and differential structure, remain closed under repeated exposure, and admit a unique invariant measurement signature.

Accordingly, the first localized persistent geometry must preserve

$$F_q\,\lambda_C = c, \qquad \mathrm{volm} = {\lambda_C}^3, \qquad \mathrm{rson} = {F_q}^2, \qquad \mathrm{curl} = \frac{{e_{\mathrm{emax}}}^2}{m_{\mathrm{e}}\lambda_C}, \qquad A_u\,\mathrm{curl} = {F_q}^2\,{\lambda_C}^2.$$

The inherited particle-geometry construction derives a minimal localized mass-bearing geometry from loxodromic closure, chronovibrational confinement, and holonomy-controlled particle scaling [Thomson III(2025s), Thomson III(2026b), Thomson III(2025f)]. The present paper identifies the persistence class of that inherited electron-sector geometry and denotes it by Γ_e. It is not introduced as an independent physical primitive, but as the first persistent canonical geometry admitted by the inherited framework:

$$\begin{gathered}\text{Invariant Geometry}\\ \Downarrow\\ \text{Persistent Compatibility}\\ \Downarrow\\ \text{Localized Compatibility Neighborhood}\\ \Downarrow\\ \text{Electron.}\end{gathered}$$

Let Γ_e denote this geometry. Its defining persistence condition is

$$(\mathcal{C}\circ\mathcal{E})^{n}(\Gamma_e)=\Gamma_e, \qquad \forall n\geq 1.$$

The electron is therefore treated as a geometrically closed, repeatedly compatible structure possessing an invariant QMU measurement signature.

4.2 Persistent Toroidal Geometry

The electron is an extended circulating geometry rather than an isolated point. Its underlying loxodromic structure closes as a tubular cardioid with toroidal organization. The corresponding cardioid, toroidal-radius, holonomy, and mass-scaling relations are developed in [Thomson III(2025f), Thomson III(2025i), Thomson III(2025s)]. Exposure does not create or reconstruct this geometry; it presents successive compatible manifestations of the same persistent structure.

The electron remains physically identifiable because each exposure preserves the same invariant closure,

$$(\mathcal{C}\circ\mathcal{E})^{n}(\Gamma_e)=\Gamma_e.$$

Thus,

Exposure samples the geometry,

compatibility preserves the geometry,

and

measurement records its invariant consequences.

The permanence of the electron follows from the repeated preservation of its closed toroidal organization.

4.3 Localization of Visible Matter

The existence of the mass and charge sectors is inherited from the Singularity bifurcation described in the foundational APM ontology. The Aether Unit is subsequently constructed through Gforce acting upon magnetic charge, after which dark matter is organized as visible matter. Those stages precede the persistent localization developed here [Thomson III(2025j), Thomson III(2026b), Thomson III(2026d), Thomson III(2026a)].

The present paper therefore does not derive the origin of mass. It determines the geometric condition under which visible matter remains localized.

The electron inherits visible matter from the Aether Unit and preserves its localization through persistent compatibility. Because

$$(\mathcal{C} \circ \mathcal{E})^{n}(\Gamma_e) = \Gamma_e, \qquad \forall n \geq 1,$$

the matter contained within that geometry remains associated with the same closed compatibility neighborhood.

The ontological distinction is therefore

Mass :	inherited from the bifurcation,
Visible matter :	organized by the Aether Unit,
Localization :	established geometrically,
Stability :	preserved by persistent compatibility.

The electron is not defined merely by possessing mass. It is the first persistent localized geometry capable of retaining organized visible matter indefinitely.

4.4 Electrostatic and Magnetic Organization

Electrostatic and magnetic organization are complementary measurement projections of the same persistent electron geometry. The charge sectors are inherited from the bifurcation and remain integrated within the Aether Unit.

Electrostatic organization expresses the persistent localization of visible matter. Magnetic organization expresses the closed circulation that preserves that localization.

The corresponding QMU relations are

$$\mathrm{angm} = m_{\mathrm{e}} {\lambda_C}^2 F_q,$$

$$\mathrm{mflx} = \frac{\mathrm{angm}}{{e_{\mathrm{emax}}}^2},$$

and

$$e^2 = 8\pi\alpha_e \, {e_{\mathrm{emax}}}^2.$$

These quantities are not independent properties attached to the electron. They quantify distinct aspects of the same invariant compatibility neighborhood.

Because Γ_e remains unchanged under repeated exposure, its electrostatic and magnetic organizations also remain invariant. Repeated measurement reproduces the same charge and circulation signatures because the underlying geometry is preserved.

4.5 Angular-Momentum Geometry

The electron does not merely possess angular momentum; its localized geometry is itself an angular-momentum structure. A curved length undergoing closed circulation with mass and invariant velocity has the dimensional form

$$mLv = mL^2T^{-1},$$

which is the dimensional structure of angular momentum.

Within the QMU framework,

$$\boxed{\mathrm{angm} = m_{\mathrm{e}}{\lambda_C}^2 F_q = h.}$$

Here h is the exactly defined Planck constant in the International System of Units, while m_e and quantities derived from it retain experimentally adjusted uncertainties [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga]. The equality above is therefore a QMU geometric identity whose numerical evaluation must reproduce the corresponding CODATA values.

This identity follows from $c = \lambda_C F_q$ together with the electron Compton relation and is tabulated in the QMU reference and translation ledgers [Thomson III(2025z), Thomson III(2025a), Thomson III(2026d)].

$$m_{\mathrm{e}}{\lambda_C}^2 F_q = m_{\mathrm{e}}\lambda_C(\lambda_C F_q) = m_{\mathrm{e}}\lambda_C c = h.$$

Planck's constant therefore measures the complete angular-momentum geometry of the electron. Its widespread appearance in physical measurement reflects the dominant participation of electron geometry in atomic structure, spectroscopy, optical interaction, electrical conduction, electromagnetic detection, and chemical bonding.

The associated magnetic flux geometry is

$$\mathrm{mflx} = \frac{\mathrm{angm}}{{e_{\mathrm{emax}}}^2} = \frac{h}{{e_{\mathrm{emax}}}^2}.$$

The persistent electron geometry therefore preserves the unified set

$$F_q\,\lambda_C = c, \qquad \mathrm{volm} = {\lambda_C}^3,$$
$$\mathrm{rson} = {F_q}^2, \qquad \mathrm{curl} = \frac{{e_{\mathrm{emax}}}^2}{m_{\mathrm{e}}\lambda_C},$$
$$\mathrm{angm} = h, \qquad \mathrm{mflx} = \frac{h}{{e_{\mathrm{emax}}}^2},$$
$$A_u\,\mathrm{curl} = {F_q}^2\,{\lambda_C}^2.$$

4.6 Unified Measurement Signature

The experimentally determined electron mass, charge magnitude, magnetic moment, and related particle data provide the empirical values against which the proposed unified geometric signature must be evaluated [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga, Particle Data Group et al.(2026)Particle Data Group, Takahashi, et al.].

The measured properties of the electron are projections of one persistent localized geometry. The mass quantity m_{e} measures the mass dimension retained within the geometry, λ_C its characteristic curved length, and F_q its invariant circulation rate. The charge, circulation, angular momentum, and magnetic flux quantities arise from the same closed organization.

The electron therefore possesses the unified QMU signature

$$\boxed{\mathcal{Q}_e = \left\{m_{\mathrm{e}}, \lambda_C, F_q, e^2, {e_{\mathrm{emax}}}^2, \mathrm{angm}, \mathrm{curl}, \mathrm{mflx}\right\}.}$$

Each element of $\mathcal{Q}_e$ is constrained by the same persistent compatibility neighborhood. The electron is not separately endowed with mass, charge, magnetic organization, angular momentum, and spatial extent. These are measurable expressions of one invariant toroidal geometry.

Accordingly,

$$\boxed{\text{Electron Measurement} = \text{Measurement of Persistent Angular-Momentum Geometry.}}$$

The repeatability of electron measurement follows from the repeatability of the geometry itself.

4.7 The First Constructive Unit of Stable Matter

The electron is the first persistent localized angular-momentum geometry from which higher-order visible matter can be constructed. Its place in the hierarchy is not assigned by postulate but follows from the constructive sequence

Invariant Geometry
$\Downarrow$
Compatibility
$\Downarrow$
Persistent Compatibility
$\Downarrow$
Localized Visible Matter
$\Downarrow$
Electron.

Because its compatibility neighborhood remains invariant, the electron can participate repeatedly in higher-order organizations without requiring reconstruction. Atomic geometry incorporates an already persistent electron into a larger compatibility neighborhood.

The resulting dependency is

$$\boxed{\text{Electron} \longrightarrow \text{Atoms} \longrightarrow \text{Chemistry} \longrightarrow \text{Stable Matter.}}$$

The electron is therefore the first constructive unit of stable visible matter. The following section develops the second independent persistent angular-momentum geometry, whose distinct canonical organization is identified with the proton.

5 Proton Geometry

5.1 The Second Persistent Localized Geometry

The inherited particle-mass and holonomy constructions admit distinct electron- and proton-sector canonical geometries [Thomson III(2025s), Thomson III(2025i), Thomson III(2026b)]. The proton represents the second fundamental localized member of the persistent subset.

Whereas the electron achieves persistence through one compatible ordering of the inherited loxodromic geometry, the proton represents a distinct persistent solution produced by reversing the radial ordering of the same constructive structure.

The existence of both stable particles therefore demonstrates that the constructive hierarchy admits multiple invariant compatible configurations while preserving a common geometric origin.

The proton is not introduced as an independent primitive object.

It is identified with the second persistent compatible geometry selected by repeated constructive evolution.

Let Γ_p denote the persistent proton geometry. Its defining condition is

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_p) = \Gamma_p, \qquad \forall n \geq 1.$$

The constructive sequence is therefore

$$\boxed{\begin{aligned}&\text{Invariant Geometry} \longrightarrow \text{Compatibility} \longrightarrow \text{Persistent Compatibility}\\ &\qquad\qquad\qquad\qquad \longrightarrow \text{Localized Visible Matter} \longrightarrow \text{Proton.}\end{aligned}}$$

The electron and proton obey the same invariant geometric principles. Their distinction arises from different canonical organizations of persistent toroidal circulation.

5.2 Canonical Proton Topology

The electron and proton are both persistent localized angular-momentum geometries, but their toroidal radial orderings are opposite. For the electron,

$$R_e > r_e,$$

whereas for the proton,

$$r_p > R_p.$$

The reverse radial ordering, enclosed toroidal circulation, and proton-sector geometric scaling are inherited from the particle-mass and cardioid–toroidal radius constructions [Thomson III(2025s), Thomson III(2025i)].

When the proton-sector tubular radius exceeds the major sweep radius, the central opening is enclosed within the circulating geometry. The proton therefore presents an approximately spheroidal external boundary while retaining an underlying toroidal circulation.

Thus,

$$\boxed{r_p > R_p \longrightarrow \text{Enclosed Toroidal Circulation} \longrightarrow \text{Spheroidal External Geometry.}}$$

This topological inversion produces a compatibility neighborhood different from that of the electron without introducing a different physical law.

Both geometries preserve

$$F_q\,\lambda_C = c, \qquad \text{volm} = {\lambda_C}^3, \qquad \text{rson} = {F_q}^2, \qquad \text{curl} = \frac{{e_{\text{emax}}}^2}{m_{\text{e}}\lambda_C}, \qquad A_u\,\text{curl} = {F_q}^2\,{\lambda_C}^2.$$

Their distinction is therefore canonical and geometric before it becomes measurable.

5.3 Organization of Visible Matter

Within the Aether Physics Model, the Aether Unit organizes visible matter by capturing dark matter. The present paper does not rederive that process. It determines how different persistent geometries retain different quantities of organized visible matter.

Within the inherited proton-sector construction, the reversed canonical topology corresponds to a greater organized mass and a distinct compatibility extent [Thomson III(2025s), Thomson III(2026b)]. The present work examines the persistence of that proton-sector organization rather than rederiving its mass ratio. This larger neighborhood preserves a greater quantity of visible matter while maintaining the same invariant compatibility conditions.

The constructive dependence is

$$\boxed{\begin{aligned}\text{Canonical Topology} &\longrightarrow \text{Compatibility Neighborhood}\\ &\longrightarrow \text{Organized Visible Matter}\\ &\longrightarrow \text{Measured Mass.}\end{aligned}}$$

A quantitative realization of this dependence must reproduce, within the stated experimental uncertainty, the measured proton–electron mass ratio

$$\frac{m_p}{m_e} = 1836.152\,673\,426(32),$$

using the current CODATA adjustment [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga].

The proton does not create additional matter. Its canonical geometry organizes and localizes a greater quantity of visible matter. Measured mass is the consequence of that organization.

5.4 Angular-Momentum and Charge Organization

The proton is a persistent localized angular-momentum geometry. Its complete circulation is quantified by the proton-sector invariant

$$h_p.$$

The proton magnetic-flux organization is

$$\mathrm{mflx_p} = \frac{h_p}{{e_{\mathrm{pmax}}}^2},$$

while the proton electrostatic and magnetic charge sectors satisfy

$$e^2 = 8\pi\alpha_p\,{e_{\mathrm{pmax}}}^2.$$

The proton-sector charge normalization and the corresponding fine-structure relationships are developed in the species-normalized fine-structure treatment [Thomson III(2025ac)]. These relations describe complementary projections of the same persistent geometry. Electrostatic organization measures the compatible localization of visible matter, while magnetic organization measures the closed circulation that preserves that localization.

The proton therefore preserves simultaneously

$$(\mathcal{C} \circ \mathcal{E})^{n}(\Gamma_p) = \Gamma_p, \qquad \forall n \geq 1,$$

$$r_p > R_p,$$

$$e^2 = 8\pi\alpha_p \, {e_{\mathrm{pmax}}}^2,$$

and

$$\mathrm{mflx_p} = \frac{h_p}{{e_{\mathrm{pmax}}}^2}.$$

The proton is not a spherical object possessing an internal magnetic property. It is a toroidal angular-momentum geometry whose radial ordering produces a spheroidal external appearance and a distinct proton-sector measurement signature.

5.5 Unified Measurement Signature

The proton mass, charge, magnetic moment, and proton–electron mass ratio are independently measured quantities tabulated by CODATA and the Particle Data Group [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga, Particle Data Group et al.(2026)Particle Data Group, Takahashi, et al.]. The present construction seeks to recover their relations from the proton compatibility geometry rather than treating them as geometrically independent inputs.

The measured properties of the proton are projections of one persistent localized geometry. Its angular momentum, magnetic flux, electrostatic organization, organized visible matter, and apparent mass are not independent attributes.

The proton preserves

$$h_p,$$

$$\mathrm{mflx_p} = \frac{h_p}{{e_{\mathrm{pmax}}}^2},$$

$$e^2 = 8\pi\alpha_p \, {e_{\mathrm{pmax}}}^2,$$

$$F_q \, \lambda_C = c, \qquad \mathrm{rson} = {F_q}^2, \qquad \mathrm{volm} = {\lambda_C}^3,$$

together with

$$A_u \, \mathrm{curl} = {F_q}^2 \, {\lambda_C}^2.$$

These quantities describe different aspects of the same canonical compatibility neighborhood. The measured proton is therefore a unified geometric structure rather than an aggregation of independently assigned properties.

Accordingly,

$$\begin{aligned}\text{Persistent Geometry} &\longrightarrow \text{Compatibility Neighborhood}\\ &\longrightarrow \text{Organization of Visible Matter}\\ &\longrightarrow \text{Invariant Measurement.}\end{aligned}$$

5.6 Geometric Stability

The stability of the proton does not require an absolutely rigid shape. Compatible deformations may occur while the geometry remains within the same invariant compatibility neighborhood.

The proton's stable identity is therefore determined by preservation of its compatibility class rather than by pointwise geometric immobility. Its toroidal circulation, organized visible matter, charge organization, and angular-momentum structure remain compatible throughout admissible deformation.

The constructive hierarchy is

$$\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Compatibility Neighborhood}\\ &\longrightarrow \text{Compatible Geometric Realizations}\\ &\longrightarrow \text{Localized Visible Matter}\\ &\longrightarrow \text{Stable Proton Geometry.}\end{aligned}$$

The compatibility neighborhood is the invariant object; the observable proton geometry is a compatible realization within it.

Because the proton and electron arise from the same invariant Aether geometry, they may participate in higher-order shared compatibility structures. The neutron is developed in the following section as a persistent composite in which electron and proton geometries occupy a common compatibility neighborhood while retaining their localized angular-momentum organization.

6 Neutron Geometry

6.1 Composite Electron–Proton Geometry

The neutron is the first persistent composite geometry produced by the organization of previously established persistent structures.

Unlike the electron and proton, which arise directly as localized members of the persistent subset, the neutron exists through the shared compatibility neighborhood of both particles.

Its persistence therefore demonstrates that repeated compatibility selects not only individual stable geometries but also stable organizations of compatible geometries.

Composite structure is thus shown to emerge from the same constructive criterion governing elementary stability. The geometric particle-mass, nuclear-shell, binding-length, and beta-budget treatments provide the inherited particle and nuclear structure used here [Thomson III(2025s), Thomson III(2025aa), Thomson III(2025ab), Thomson III(2025ad)].

The present paper identifies the persistence condition for this first electron–proton composite and denotes its geometry by Γ_n.

$$\Gamma_n = \Gamma_e \cup_{\mathcal{N}_A} \Gamma_p,$$

where $\mathcal{N}_A$ denotes the shared compatibility neighborhood established by the invariant Aether geometry.

The constituent geometries remain individually persistent,

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_e) = \Gamma_e, \qquad (\mathcal{C} \circ \mathcal{E})^n(\Gamma_p) = \Gamma_p, \qquad \forall n \geq 1,$$

while the composite neutron satisfies

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_n) = \Gamma_n, \qquad \forall n \geq 1.$$

The union is therefore not a simple spatial superposition. It is a compatibility-preserving composite in which the electron and proton remain distinguishable while participating in one persistent localized organization.

The shared neighborhood preserves the common invariant structure

$$16\pi^2 = 16\pi^2, \qquad \text{volm} = {\lambda_C}^3, \qquad F_q\,\lambda_C = c, \qquad \text{rson} = {F_q}^2, \qquad A_u\,\text{curl} = {F_q}^2\,{\lambda_C}^2.$$

The neutron consequently preserves three simultaneous relations:

$$\Gamma_e \in \mathcal{N}_A, \qquad \Gamma_p \in \mathcal{N}_A, \qquad \Gamma_e \cup_{\mathcal{N}_A} \Gamma_p = \Gamma_n.$$

Its constructive dependence is

$$\begin{array}{|l|}\hline \text{Common Aether Geometry} \longrightarrow \text{Electron and Proton Localizations} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Shared Compatibility Neighborhood} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Persistent Composite Geometry} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Neutron.} \\ \hline \end{array}$$

6.2 Geometric Stability and Binding

Neutron stability does not require geometric rigidity. The constituent electron and proton may deform compatibly while the shared neighborhood remains invariant. Stability therefore consists in preserving the compatibility of each constituent together with the compatibility between them.

The neutron is not maintained by a separate binding mechanism. The term *magnetic binding* describes the measurable consequence of the shared compatibility geometry. The common quantum area, invariant $16\pi^2$ closure, and unified force structure permit the electron and proton localizations to occupy one persistent neighborhood.

Thus,

$$\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Shared Compatibility Neighborhood}\\ &\longrightarrow \text{Persistent Composite Localization}\\ &\longrightarrow \text{Observable Magnetic Binding.}\end{aligned}$$

Magnetic organization does not create the neutron. It is the observable expression of the compatible circulation through which the composite geometry persists.

The compatibility neighborhood is therefore the invariant object, while the instantaneous neutron geometry is one compatible realization within it.

6.3 Measured Properties

The neutron mass, magnetic moment, lifetime, and beta-decay observables provide independent empirical constraints upon any proposed composite geometry [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga, Particle Data Group et al.(2026)Particle Data Group, Takahashi, et al.]. The composite interpretation developed here must therefore reproduce those measured quantities rather than merely supply a qualitative geometric description.

The measured properties of the neutron are projections of one persistent composite geometry rather than independent attributes of a third elementary particle.

The neutron inherits the primitive Aether relations

$$F_q\,\lambda_C = c, \qquad \text{volm} = {\lambda_C}^3, \qquad \text{rson} = {F_q}^2, \qquad A_u\,\text{curl} = {F_q}^2\,{\lambda_C}^2,$$

and is characterized by the neutron-sector quantities

$$h_n,$$

$$e^2 = 8\pi\alpha_n\,{e_{\text{nmax}}}^2,$$

together with the corresponding neutron magnetic organization.

These quantities measure complementary aspects of the same composite geometry. The neutron measurement structure may therefore be summarized as

$$\boxed{\begin{aligned}&\text{Electron Localization} + \text{Proton Localization}\\ &\qquad + \text{Shared Compatibility Neighborhood}\\ &\qquad = \text{Persistent Neutron Geometry}.\end{aligned}}$$

Its measured mass follows from the visible matter organized within the composite neighborhood. Its angular momentum follows from the combined circulation. Its electrostatic and magnetic signatures follow from the neutron-sector organization of charge within the same persistent geometry.

6.4 Loss of Shared Compatibility

The neutron persists only while the electron and proton remain simultaneously localized within the shared neighborhood $\mathcal{N}_A$. Within a stable nucleus, the surrounding nuclear geometry contributes to the preservation of that composite relation.

Compatible deformations,

$$\Gamma_e \longrightarrow \Gamma'_e, \qquad \Gamma_p \longrightarrow \Gamma'_p,$$

do not destroy the neutron provided that

$$\Gamma'_e \cup_{\mathcal{N}_A} \Gamma'_p = \Gamma'_n.$$

Loss of neutron stability occurs when no compatible deformation can preserve the shared localization,

$$\Gamma_e \cup_{\mathcal{N}_A} \Gamma_p \notin \mathcal{P}_n,$$

where $\mathcal{P}_n$ denotes the class of persistent neutron realizations.

The failure is therefore not the destruction of the constituent geometries. It is the loss of the compatibility relation that joins them. The composite then resolves into independently persistent localizations,

$$\Gamma_n \longrightarrow \Gamma_p \cup \Gamma_e.$$

This distinction may be summarized as

$$\boxed{\begin{aligned}&\text{Neutron Persistence} = \text{Persistent Shared Compatibility},\\ &\text{Neutron Instability} = \text{Loss of Shared Compatibility}.\end{aligned}}$$

6.5 Beta Decay as Geometric Reorganization

Experimentally, free-neutron beta decay produces a proton, electron, and electron antineutrino, with the available energy distributed among the decay products according to the measured neutron–proton–electron mass difference and weak-decay kinematics [Particle Data Group et al.(2026)Particle Data Group, Takahashi, et al.]. The present subsection proposes a geometric interpretation of that measured transition.

Beta decay is interpreted as the observable consequence of losing the shared compatibility neighborhood that defines the neutron. The proton and electron are not created from an unrelated elementary object; their persistent geometries are already present within the composite.

The complete neutron-sector mass, charge, radiation, and lifetime ledger is not reproduced here. It is developed in the dedicated beta-budget treatment [Thomson III(2025ad)]. The present section states only the compatibility interpretation required by the stable-matter hierarchy.

The geometric transition is

$$n \longrightarrow p + e^{-} + \bar{\nu}_e,$$

with the corresponding geometric reorganization represented schematically by

$$\Gamma_n \longrightarrow \Gamma_p \cup \Gamma_e \cup \Gamma_{\bar{\nu}_e}.$$

The antineutrino-sector geometry and the complete energy–momentum ledger are not derived here and remain requirements for a complete neutron-decay construction.

Accordingly,

$$\begin{array}{|l|}\hline \text{Shared Electron–Proton Neighborhood} \longrightarrow \text{Loss of Composite Compatibility} \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad \longrightarrow \text{Separation of Persistent Localizations} \\ \qquad\qquad\qquad\qquad\qquad\qquad\qquad \longrightarrow \text{Observable Beta Decay.} \\ \hline \end{array}$$

The proton retains its proton-sector angular-momentum geometry, and the electron retains its electron-sector geometry. What ceases to persist is the shared neutron relation.

Any additional radiation associated with the transition is interpreted as the geometric and metrological consequence of resolving the composite neighborhood into independently persistent configurations. Its detailed accounting belongs to a separate neutron-sector treatment.

6.6 The First Composite Compatibility Geometry

The neutron establishes that persistent compatibility is not restricted to isolated particle geometries. The same invariant Aether structure that preserves electrons and protons individually also permits their stable composite organization.

This principle extends naturally to larger nuclei. Multiple proton and neutron geometries may occupy a common compatibility neighborhood while undergoing continuous compatible deformation.

Nuclear geometries may therefore be spherical, elongated, flattened, clustered, or otherwise deformed, provided their constituent localizations remain compatible within the same invariant framework.

The constructive hierarchy becomes

$$\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Persistent Localized Geometry}\\ &\longrightarrow \text{Composite Compatibility}\\ &\longrightarrow \text{Stable Nuclei}\\ &\longrightarrow \text{Stable Matter.}\end{aligned}$$

No new primitive geometry or compatibility law is required. The electron, proton, neutron, nucleus, atom, and macroscopic body are progressively richer compatible realizations of the same invariant Aether geometry.

7 Stable Matter

7.1 Definition and Constructive Hierarchy

Stable matter is persistently localized visible matter. It is not defined by mass alone, because mass is a dimension, nor by visible matter alone, because visible matter may exist without remaining permanently localized.

Within the present framework,

$$\begin{aligned}\text{Mass} &= \text{dimension},\\ \text{Visible Matter} &= \text{dark matter organized by the Aether Unit},\\ \text{Stable Matter} &= \text{persistently localized visible matter.}\end{aligned}$$

Let Γ denote a localized realization of the invariant Aether geometry. Its persistence requires

$$(\mathcal{C}\circ\mathcal{E})^{n}(\Gamma)=\Gamma, \qquad \forall n\geq 1.$$

This condition does not require geometric rigidity. A compatible deformation

$$\Gamma \longrightarrow \Gamma'$$

preserves stability provided that

$$\Gamma' \in \mathcal{N}_A,$$

where $\mathcal{N}_A$ denotes the invariant compatibility neighborhood established by the Aether Unit. Stability is lost only when the geometry can no longer remain within that neighborhood.

The constructive dependence is therefore

$$\boxed{\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Compatibility Neighborhood}\\ &\longrightarrow \text{Organization of Visible Matter}\\ &\longrightarrow \text{Persistent Localization}\\ &\longrightarrow \text{Stable Matter.}\end{aligned}}$$

This relation governs electrons, protons, neutrons, nuclei, atoms, molecules, condensed matter, and macroscopic bodies. Higher levels of organization introduce no new compatibility law; they are progressively richer realizations of the same invariant geometry.

7.2 Nested Compatibility Across Scale

Persistent compatibility extends hierarchically through nested compatibility neighborhoods. Individual electron and proton geometries localize visible matter. Shared neighborhoods produce neutrons and nuclei. Larger neighborhoods organize atoms, molecules, crystals, and macroscopic bodies.

The hierarchy may be summarized as

$$\boxed{\begin{aligned}\text{Persistent Particle Geometries} &\longrightarrow \text{Composite Nuclear Compatibility}\\ &\longrightarrow \text{Stable Atoms}\\ &\longrightarrow \text{Molecular Compatibility}\\ &\longrightarrow \text{Condensed and Macroscopic Matter.}\end{aligned}}$$

Each level preserves the compatibility conditions of its constituents. Atomic compatibility does not replace electron, proton, neutron, or nuclear compatibility; it contains and extends them.

Accordingly,

$$\begin{aligned}\text{Particle Compatibility} &\subset \text{Nuclear Compatibility}\\ &\subset \text{Atomic Compatibility}\\ &\subset \text{Molecular Compatibility}\\ &\subset \text{Macroscopic Compatibility.}\end{aligned}$$

Compatibility is invariant across scale, although its realization depends upon the quantity, density, and organization of visible matter. As stable matter becomes more extensive or concentrated, its surrounding compatibility organization becomes correspondingly larger or more structured. These increasingly organized neighborhoods provide the foundation for compatibility gradients and large-scale gravitational organization developed elsewhere.

Specific realizations of this extension have been examined in the QADI treatments of hydrogenic spectra, nuclear shells, nuclear binding, phonon magnetic moments, superconducting electron pairing, plasma stability, and stellar organization [Thomson III(2025x), Thomson III(2025aa), Thomson III(2025ab), Thomson III(2025k), Thomson III(2025l), Thomson III(2025m), Thomson III(2025n)].

7.3 Atomic and Electron-Shell Geometry

Experimentally established atomic structure is constrained by discrete spectra, angular-momentum coupling, selection rules, isotope shifts, and electron–nucleus interactions. These measurements provide the evidence against which the proposed compatibility-neighborhood interpretation of electron shells must be tested [Foot(2005), Kramida et al.(2024)Kramida, Ralchenko, Reader, and NIST ASD Team].

A stable atom is a nested compatibility organization formed from a persistent nucleus and persistent electron geometries. Let Γ_N denote the nuclear geometry and Γ_e an electron geometry. Their individual persistence is expressed by

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_N) = \Gamma_N, \qquad (\mathcal{C} \circ \mathcal{E})^n(\Gamma_e) = \Gamma_e.$$

Atomic geometry arises when both coexist within a larger compatibility neighborhood,

$$\Gamma_N \cup_{\mathcal{N}_A} \Gamma_e = \Gamma_A.$$

For a multi-electron atom,

$$\Gamma_A = \Gamma_N \cup \Gamma_{e1} \cup \Gamma_{e2} \cup \cdots \cup \Gamma_{en},$$

where each electron occupies a permitted persistent localization within the atomic neighborhood.

The notation Γ_A is a geometric representation introduced in this paper. It must reproduce the observed atomic term structure and transition frequencies catalogued in precision spectroscopic databases [Kramida et al.(2024)Kramida, Ralchenko, Reader, and NIST ASD Team].

Quantitative examples of atomic and nuclear compatibility organization are developed in the hydrogenic holonomy, high-Z lock-test, nuclear-shell, and nuclear-binding treatments [Thomson III(2025x), Thomson III(2025y), Thomson III(2025aa), Thomson III(2025ab)].

Electron shells are therefore nested compatibility neighborhoods rather than independent structures. They inherit the same Aether relations,

$$F_q\,\lambda_C = c, \qquad \mathrm{volm} = {\lambda_C}^3, \qquad \mathrm{rson} = {F_q}^2, \qquad A_u\,\mathrm{curl} = {F_q}^2\,{\lambda_C}^2.$$

The nucleus and electron geometries may deform compatibly while their localizations remain persistent. Stable atomic structure is therefore the coexistence of multiple invariant geometries within one higher-order compatibility organization.

7.4 Chemical and Molecular Organization

The established quantitative descriptions of molecular structure include electronic states, molecular orbitals, rotational and vibrational spectra, and symmetry-constrained bonding [Atkins and Friedman(2011)]. The compatibility-pathway construction proposed here must recover these measured molecular organizations and their spectroscopic consequences.

Chemical structure arises when stable atomic neighborhoods admit common compatibility pathways. If Γ_{A_i} denotes a stable atomic geometry, then a molecule is represented by

$$\Gamma_M = \Gamma_{A_1} \cup_{\mathcal{N}_M} \Gamma_{A_2} \cup \cdots \cup \Gamma_{A_k},$$

where $\mathcal{N}_M$ is the molecular compatibility neighborhood.

The participating atoms retain their persistent identities. Chemical bonding is the measurable consequence of shared compatibility between their electron-shell geometries.

Thus,

$$\boxed{\text{Stable Atoms} \longrightarrow \text{Shared Compatibility Pathways} \longrightarrow \text{Persistent Molecular Geometry.}}$$

Chemical reactions are transitions between molecular compatibility organizations,

$$\Gamma_{M_1} \longrightarrow \Gamma_{M_2},$$

rather than changes to the underlying invariant Aether geometry. The atomic constituents persist while their shared pathways reorganize.

7.5 Crystal and Condensed-Matter Geometry

Periodic lattices, space-group symmetry, defects, phonon modes, elastic response, and electronic structure constitute the established experimental and mathematical description of crystalline matter [Kittel(2005), Graef and McHenry(2012)]. The compatibility construction introduced here is intended to provide a common geometric origin for those measured forms of material organization.

Crystal structure is a periodic macroscopic extension of atomic and molecular compatibility. Let

$$\Gamma_C = \bigcup_{i=1}^{N} \Gamma_{A_i}$$

denote a crystal whose constituent atoms participate in a common compatibility neighborhood $\mathcal{N}_C$.

For a periodic crystal, this union must additionally reproduce a translation lattice, motif, and space-group organization compatible with the experimentally determined crystal structure [Graef and McHenry(2012)].

Persistent crystal geometry satisfies

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_C) = \Gamma_C, \qquad \forall n \geq 1.$$

The repeating lattice is a stable periodic realization of the same compatibility principles governing its constituent atoms. Individual atoms may be displaced, and local neighborhoods may deform, while the crystal remains stable provided the larger periodic organization is preserved.

The constructive sequence is

$$\begin{array}{|l|}\hline \text{Stable Atomic Geometry} \longrightarrow \text{Molecular Compatibility} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Periodic Compatibility} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Crystal and Condensed Matter.} \\ \hline \end{array}$$

Elastic deformation, thermal vibration, lattice defects, and structural transitions are compatible variations or reorganizations within this periodic framework. They do not require a new physical principle.

7.6 Macroscopic Matter

Macroscopic matter is the collective organization of many persistent geometries,

$$\Gamma_M = \bigcup_{i=1}^{N} \Gamma_i,$$

where each Γ_i remains individually persistent while participating in larger compatibility neighborhoods.

The stability of the whole does not replace the stability of its constituents. It extends their organization across multiple nested scales. Mechanical stress, compression, vibration, rotation, thermal expansion, and elastic deformation are therefore compatible geometric adjustments within the macroscopic neighborhood.

Macroscopic stability requires geometric compatibility rather than geometric rigidity. Its constructive dependence is

$$\begin{array}{|l|}\hline \text{Invariant Aether Geometry} \longrightarrow \text{Persistent Localized Geometries} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Composite Compatibility} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Atomic and Molecular Organization} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Macroscopic Stable Matter.} \\ \hline \end{array}$$

As the quantity and density of organized visible matter increase, the surrounding compatibility geometry becomes increasingly structured. The resulting gradients extend the constructive hierarchy toward large-scale gravitational organization.

7.7 Hierarchy of Persistent Matter

The complete hierarchy of stable matter follows continuously from the ontology and geometry established by the Aether Physics Model:

Singularity $\longrightarrow$ Primordial Bifurcation
$\longrightarrow$ Gforce, Dark Matter, and Charge Sectors
$\longrightarrow$ Invariant Aether Unit
$\longrightarrow$ Organization of Visible Matter
$\longrightarrow$ Persistent Compatibility
$\longrightarrow$ Electron and Proton
$\longrightarrow$ Neutron and Stable Nuclei
$\longrightarrow$ Stable Atoms
$\longrightarrow$ Molecules
$\longrightarrow$ Crystalline and Condensed Matter
$\longrightarrow$ Macroscopic Matter.

Creation belongs to the Singularity bifurcation. The Aether Unit does not create matter; Gforce acting upon magnetic charge constructs the Aether Unit, which captures dark matter and organizes it as visible matter. Persistent compatibility then preserves that visible matter in stable localized and composite geometries.

Every level of the hierarchy inherits the same quantum area, invariant $16\pi^2$ closure, unified force structure, and compatibility conditions. No level replaces the structures beneath it, and no additional fundamental organizing principle is required.

Stable matter is therefore the observable manifestation of persistent compatibility extending continuously from localized particle geometry to macroscopic material organization.

8 Stable Space

8.1 Persistent Space

Stable matter does not create space, nor does space emerge from matter. The primacy and discrete invariant structure of space are inherited from the monograph and the dedicated space-primacy treatment [Thomson III(2026a), Thomson III(2026c)]. Persistent space precedes stable matter and provides the invariant geometric foundation within which visible matter becomes localized.

The constructive dependence is

Invariant Aether Geometry $\longrightarrow$ Persistent Space
$\longrightarrow$ Organization of Visible Matter
$\longrightarrow$ Persistent Compatibility
$\longrightarrow$ Stable Matter.

Persistent space is neither an empty container nor a passive background. It is the extended realization of the invariant Aether geometry through which compatible localization becomes possible.

Before stable matter is formed, the Aether Unit already establishes

$$F_q\,\lambda_C = c, \qquad \text{volm} = {\lambda_C}^3, \qquad \text{rson} = {F_q}^2, \qquad A_u\,\text{curl} = {F_q}^2\,{\lambda_C}^2.$$

Electrons, protons, neutrons, nuclei, atoms, molecules, crystals, and macroscopic bodies therefore do not generate space. They form localized and progressively richer compatible organizations within persistent space.

Stable matter may modify the local organization of space, but it does not establish its existence. Persistent space remains the primary extended realization of the Aether Unit, while stable matter is a secondary localized realization within it.

8.2 Complementary Global and Localized Geometry

Persistent space and stable matter are complementary realizations of one invariant Aether geometry.

Persistent space is the global compatibility organization.

Stable matter consists of localized compatible realizations within that organization.

Accordingly,

$$\boxed{\text{Persistent Space} \supset \text{Stable Matter}.}$$

Every localized particle or material body remains embedded within the same extended spatial geometry. The distinction between space and matter is therefore not a distinction between separate substances, but between global and localized realization.

The constructive relation is

$$\boxed{\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Persistent Space}\\ &\longrightarrow \text{Persistent Localization}\\ &\longrightarrow \text{Stable Matter}.\end{aligned}}$$

Persistent space admits localization. Stable matter realizes that localization. As the quantity and density of stable matter increase, the surrounding compatibility organization becomes increasingly structured, while remaining continuous with the same persistent spatial geometry.

This extension produces the hierarchy

$$\boxed{\begin{aligned}\text{Persistent Space} &\longrightarrow \text{Stable Matter}\\ &\longrightarrow \text{Compatibility Organization}\\ &\longrightarrow \text{Compatibility Gradients}.\end{aligned}}$$

8.3 Spatial Compatibility

Spatial compatibility precedes material compatibility. The invariant Aether geometry is already continuously compatible before visible matter becomes localized.

Thus,

$$\boxed{\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Spatial Compatibility}\\ &\longrightarrow \text{Persistent Space}\\ &\longrightarrow \text{Stable Matter.}\end{aligned}}$$

Localized matter does not establish an independent compatibility law. Every particle, atom, molecule, crystal, and macroscopic body inherits the same spatial compatibility.

Localized compatibility neighborhoods are therefore not separated by empty regions. They are organized localizations within one contiguous compatible spatial organization.

The scale of realization changes, but the governing principle does not:

$$\boxed{\begin{aligned}\text{Persistent Space} &\longrightarrow \text{Localized Compatibility}\\ &\longrightarrow \text{Nested Compatibility}\\ &\longrightarrow \text{Compatibility Gradients.}\end{aligned}}$$

Quantum, atomic, molecular, crystalline, macroscopic, and astronomical compatibility are successive organizations of the same persistent spatial geometry.

8.4 Localized and Extended Persistence

The invariant Aether geometry admits two complementary forms of persistence:

$$\boxed{\begin{aligned}&\text{Localized Persistence} \longrightarrow \text{Stable Matter,}\\ &\text{Extended Persistence} \longrightarrow \text{Persistent Space.}\end{aligned}}$$

Localized persistence characterizes visible matter retained within stable compatibility neighborhoods. Extended persistence characterizes the contiguous extension of compatibility throughout discrete space.

These are not separate principles. They are simultaneous realizations of one invariant geometry:

$$\boxed{\text{Invariant Aether Geometry} \longrightarrow \begin{cases}\text{Persistent Space,}\\ \text{Stable Matter.}\end{cases}}$$

Persistent space supplies the extended compatibility organization; stable matter supplies localized realization and measurement. Neither is complete without the other.

As stable matter becomes more highly organized, its surrounding spatial compatibility also becomes more structured. Conversely, the extended organization of persistent space permits increasingly rich localized matter configurations.

8.5 Astronomical Organization

Astronomical structures are the largest compatible organizations considered in the present framework. They introduce no new geometry or compatibility law. They arise from progressively larger congregations of stable matter within the same discrete Aether structure.

The constructive hierarchy is

$$\begin{aligned}\text{Discrete Aether Geometry} &\longrightarrow \text{Persistent Space}\\ &\longrightarrow \text{Stable Matter}\\ &\longrightarrow \text{Macroscopic Organization}\\ &\longrightarrow \text{Astronomical Organization.}\end{aligned}$$

The fundamental invariants remain unchanged across this hierarchy:

$$16\pi^2 = 16\pi^2, \qquad \text{volm} = {\lambda_C}^3, \qquad \text{rson} = {F_q}^2, \qquad A_u\,\text{curl} = {F_q}^2\,{\lambda_C}^2.$$

Astronomical bodies differ from isolated particles or atoms not by different physical laws, but by the number and density of Aether Units participating in the common compatibility organization.

Persistent space remains discrete.

Discrete spaces and lattice-based geometries are well-defined mathematical structures, and differential-geometric concepts can be formulated on discrete complexes [Bobenko and Suris(2008)]. The identification of physical space with the specific discrete Aether geometry proposed here is a result of the present framework rather than a conclusion of those mathematical references.

Neighboring Aether Units preserve contiguous compatibility while remaining individually invariant. Large-scale organization extends through these adjacent units, producing compatibility structures of increasing extent and concentration.

The quantitative treatment of compatibility density, gradients, post-Newtonian observables, directional interferometry, and matter–Aether coupling is developed separately in [Thomson III(2025c), Thomson III(2025d), Thomson III(2025o), Thomson III(2025p)]. The present paper establishes only the stable geometric foundation upon which those large-scale formulations depend.

8.6 Space as the Persistent Complement of Matter

Stable space is the extended compatible geometry required for stable matter to exist. Stable matter is the localized compatible geometry through which stable space becomes measurable.

Their relation completes the constructive hierarchy:

Invariant Aether Unit $\longrightarrow$ Primitive Geometry
$\longrightarrow$ Compatibility
$\longrightarrow$ Persistent Space
$\longrightarrow$ Persistent Localized Geometry
$\longrightarrow$ Stable Particles
$\longrightarrow$ Stable Matter
$\longrightarrow$ Compatibility Organization
$\longrightarrow$ Observable Universe.

The monograph established the invariant mathematical grammar of the Aether Unit. The present construction applies that grammar to persistent space, localized particles, stable matter, and higher-order physical organization.

Space provides the extended compatibility structure.

Matter provides localized persistent realization.

Together they constitute the observable geometry of the physical Universe.

9 Invariant Measurement Algebra

9.1 Invariant Measurement Algebra

The Quantum Measurement Units provide the natural measurement algebra of the invariant Aether geometry. Their axiomatic structure, calibration chains, QMU–SI translation, conventional-unit conversions, and operational metrology are developed in [Thomson III(2025t), Thomson III(2025v), Thomson III(2025u), Thomson III(2025z), Thomson III(2025a)]. The QMU relations introduce no additional physical principle; they quantify the persistent compatible structures developed throughout this paper.

The fundamental relations are

$$F_q \, \lambda_C = \lambda_C F_q = c,$$

$$\mathrm{volm} = {\lambda_C}^3,$$

$$\mathrm{rson} = {F_q}^2,$$

together with the invariant closure

$$A_u \, \mathrm{curl} = {F_q}^2 \, {\lambda_C}^2.$$

The constructive order is

$$\boxed{\begin{aligned}\text{Invariant Geometry} &\longrightarrow \text{Persistent Compatibility}\\ &\longrightarrow \text{Persistent Realization}\\ &\longrightarrow \text{QMU Quantification}\\ &\longrightarrow \text{Observable Measurement.}\end{aligned}}$$

Geometry therefore determines measurement. Observable quantities are measurement projections of persistent compatible geometry rather than independent physical primitives.

Theorem 4 (Measurement Invariance)

Every persistent realization possesses a unique invariant QMU measurement signature.

Proof. Every QMU quantity is constructed exclusively from the primitive invariants

$$m_e,\ \lambda_C,\ F_q,\ e^2,\ e^2_{emax},$$

together with the inherited closure relations.

Persistent compatibility preserves those primitive invariants under repeated exposure.

Therefore every derived QMU quantity is likewise preserved.

Hence repeated measurements produce identical invariant measurement relations.

□

9.2 Species-Normalized Particle Quantification

Electrons, protons, and neutrons are quantified through species-normalized forms of the same invariant algebra.

For the electron sector,

$$\text{angm} = m_\text{e}{\lambda_C}^2 F_q = h,$$

$$\text{mflx} = \frac{\text{angm}}{{e_\text{emax}}^2},$$

and

$$e^2 = 8\pi\alpha_e\, {e_\text{emax}}^2.$$

For the proton sector,

$$angm_p = \mp{\lambda_C}^2 F_q = h_p,$$

$$mflx_p = \frac{angm_p}{{e_{\mathrm{pmax}}}^2},$$

and

$$e^2 = 8\pi\alpha_p\, {e_{\mathrm{pmax}}}^2.$$

For the neutron sector,

$$angm_n = m_n {\lambda_C}^2 F_q = h_n,$$

$$mflx_n = \frac{angm_n}{{e_{\mathrm{nmax}}}^2},$$

and

$$e^2 = 8\pi\alpha_n\, {e_{\mathrm{nmax}}}^2.$$

The particle sectors therefore differ by normalization rather than by measurement law. Each expresses the same relations among mass, circulation, magnetic charge, electrostatic charge, angular momentum, and magnetic flux through its characteristic geometry.

Accordingly,

$$\boxed{\text{One Invariant Measurement Algebra} \longrightarrow \begin{cases} \text{Electron Sector,} \\ \text{Proton Sector,} \\ \text{Neutron Sector.} \end{cases}}$$

9.3 Quantification of Composite Matter

Atoms and stable matter introduce no new measurement system. Their observable properties arise from the compatible organization of previously quantified particle geometries.

Let

$$\Gamma_A = \Gamma_N \cup_{\mathcal{N}_A} \Gamma_{e1} \cup \Gamma_{e2} \cup \cdots \cup \Gamma_{en}$$

denote a stable atom. Its persistence requires

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_A) = \Gamma_A, \qquad \forall n \geq 1.$$

Atomic mass follows from the visible matter organized within the composite geometry. Atomic angular momentum follows from the compatible circulation of its constituent particle geometries.

Electrostatic and magnetic properties follow from the organization of the nuclear and electron-shell sectors.

The same principle applies to any stable realization Γ_S,

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_S) = \Gamma_S, \qquad \forall n \geq 1.$$

Thus,

$$\begin{aligned} \text{Persistent Particle Geometry} &\longrightarrow \text{Composite Compatibility} \\ &\longrightarrow \text{Atomic and Material Organization} \\ &\longrightarrow \text{Observable Quantification.} \end{aligned}$$

Particle, atomic, molecular, crystalline, macroscopic, and astronomical quantification are therefore nested realizations of one QMU algebra,

$$\begin{aligned} \text{Particle Quantification} &\subset \text{Atomic Quantification} \\ &\subset \text{Molecular Quantification} \\ &\subset \text{Macroscopic Quantification} \\ &\subset \text{Astronomical Quantification.} \end{aligned}$$

The scale and complexity of the realization change, but the underlying measurement relations remain invariant.

9.4 Correlations with Physical Constants

The QMU relations establish proposed geometric correlations among experimentally measured physical constants. Numerical evaluations in the present work use the 2022 CODATA recommended values [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga]. The QMU interpretation of those constants is developed within the present framework; the measured values themselves are taken from the external metrological adjustment.

For comparison with conventional metrology, numerical reference values should be taken from the current CODATA recommended constants, while QMU translations and benchmark identities are taken from the QMU reference ledgers [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga, Thomson III(2025z), Thomson III(2025a), Thomson III(2026d)].

Photon propagation is

$$F_q \, \lambda_C = F_q \lambda_C = c.$$

The fundamental quantum volume and chronogeometric resonance are

$$\text{volm} = {\lambda_C}^3,$$

and

$$\text{rson} = {F_q}^2.$$

The electron angular-momentum geometry is

$$\text{angm} = m_\text{e}{\lambda_C}^2 F_q = h,$$

so Planck's constant quantifies the complete persistent angular-momentum geometry of the electron.

The corresponding magnetic-flux relation is

$$\text{mflx} = \frac{\text{angm}}{{e_\text{emax}}^2},$$

while the species-normalized fine-structure identities are

$$e^2 = 8\pi\alpha_e \, {e_\text{emax}}^2,$$

$$e^2 = 8\pi\alpha_p \, {e_\text{pmax}}^2,$$

and

$$e^2 = 8\pi\alpha_n \, {e_\text{nmax}}^2.$$

These relations identify the fine-structure constants as quantitative measures of the relation between electrostatic and magnetic charge organization within each species sector.

The common closure

$$A_u \, \text{curl} = {F_q}^2 \, {\lambda_C}^2$$

links these measurable quantities to the same invariant Aether geometry. The physical constants are therefore correlated expressions of one constructive framework rather than unrelated empirical parameters.

9.5 Closure of the Measurement Hierarchy

The QMU framework closes the measurement hierarchy by quantifying every persistent realization through one invariant algebra:

Invariant Aether Geometry $\longrightarrow$ Persistent Space
$\longrightarrow$ Persistent Compatibility
$\longrightarrow$ Stable Matter
$\longrightarrow$ QMU Quantification
$\longrightarrow$ Observable Measurement.

Table 1: Representative exact closures and externally testable correlations.

Relation	**Status**	**References**
$\lambda_C F_q = c$	Exact QMU closure	[Thomson III(2025z)] [Thomson III(2025a)]
$m_e \lambda_C{}^2 F_q = h$	Exact electron-sector closure	[Thomson III(2025z)] [Thomson III(2026d)]
$e^2 = 8\pi\alpha_e e_{\text{emax}}{}^2$	Species-normalized charge closure	[Thomson III(2025ac)]
$A_u \,\text{curl} = F_q{}^2 \,\lambda_C{}^2$	Invariant Aether closure	[Thomson III(2026a)] [Thomson III(2025u)]
Particle mass ratios	Derived geometric correlation	[Thomson III(2025s)]
Hydrogenic spectral scaling	Independent observational test	[Thomson III(2025x)] [Thomson III(2025y)]

Species normalization changes characteristic magnitudes but not the measurement algebra. Hierarchical organization changes geometric complexity but not the measurement algebra.

The complete relation is therefore

$$\begin{aligned}\text{One Invariant Geometry} &\Longrightarrow \text{One Compatibility Framework}\\ &\Longrightarrow \text{One Measurement Algebra}\\ &\Longrightarrow \text{Every Observable Realization.}\end{aligned}$$

The Quantum Measurement Units are consequently not merely a conventional system of units. They are the quantitative expression of the invariant Aether geometry and provide a unified algebra for persistent space, stable particles, composite matter, and every higher compatible organization.

The constructive program therefore reaches

$$\begin{aligned}&\text{Geometric Closure,}\\ &\text{Ontological Closure,}\\ &\text{Measurement Closure.}\end{aligned}$$

The observable Universe is thereby represented as a hierarchy of persistent compatible geometries governed by one invariant Aether structure and quantified through one invariant measurement algebra.

10 Observable Consequences

10.1 Experimental Predictions

The invariant Aether geometry and its persistent compatibility relations lead to several experimentally testable consequences. These predictions follow from the constructive framework developed in this paper rather than from phenomenological adjustment.

Persistent Particle Geometry The electron, proton, and neutron are predicted to be persistent localized angular-momentum geometries rather than point-like material objects. Their measured properties should therefore remain mutually consistent with the corresponding invariant angular-momentum relations across observable physical processes.

Species-Normalized Measurement The electron, proton, and neutron are quantified through species-normalized forms of one invariant measurement algebra. Their observable properties should therefore preserve common dimensionless relations despite differing characteristic scales.

Compatibility-Based Stability Stable matter is predicted to exist only within persistent compatibility organizations. Observable structural changes should therefore correspond to transitions between compatible realizations rather than changes in the underlying invariant Aether geometry.

Hierarchical Compatibility The same compatibility principles governing stable particles are predicted to extend without modification to nuclei, atoms, molecules, crystalline matter, macroscopic bodies, and astronomical structures. No independent organizing law is required at higher scales.

Discrete Persistent Space Persistent space is predicted to consist of discrete invariant Aether Units whose contiguous compatibility produces extended spatial organization. Observable spatial structure should therefore remain consistent with an underlying discrete geometry across physical scales.

Compatibility Density and Gradients Increasing quantities of organized visible matter are predicted to produce compatibility organizations of greater extent, while increasing matter density is predicted to produce greater compatibility concentration. The resulting gradients provide the geometric basis for large-scale gravitational organization.

Unified Measurement Algebra Every observable quantity is predicted to remain expressible through the same invariant QMU algebra. Physical constants should therefore exhibit systematic correlations arising from the common geometry of the Aether Unit rather than independent physical origins.

The experimental sequence is summarized by

$$\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Persistent Compatibility}\\ &\longrightarrow \text{Stable Matter}\\ &\longrightarrow \text{Observable Measurement}\\ &\longrightarrow \text{Experimental Verification.}\end{aligned}$$

The present work establishes the geometric basis of these predictions. Existing QADI studies provide calibration chains, benchmark suites, laboratory protocols, particle and material tests, and astronomical applications against which the framework may be evaluated [Thomson III(2025v), Thomson III(2025w), Thomson III(2025q), Thomson III(2025m), Thomson III(2025c)].

10.2 Stable Matter Measurements

Measurements of stable matter quantify persistent compatible realizations of the invariant Aether geometry through the Quantum Measurement Unit algebra. They do not measure independent physical substances detached from that geometry.

The constructive relation is

$$\begin{array}{|l|}\hline \text{Invariant Aether Geometry} \longrightarrow \text{Persistent Compatibility} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Stable Matter} \\ \qquad\qquad\qquad\qquad\quad \longrightarrow \text{Observable Measurement.} \\ \hline \end{array}$$

Mass, angular momentum, electrostatic organization, magnetic organization, spatial localization, and all derived QMU quantities are therefore complementary measurements of persistent geometric organization.

For the electron,

$$\text{angm} = m_{\text{e}} {\lambda_C}^2 F_q = h,$$

$$\text{mflx} = \frac{\text{angm}}{{e_{\text{emax}}}^2},$$

and

$$e^2 = 8\pi\alpha_e \, {e_{\text{emax}}}^2,$$

with analogous species-normalized relations for the proton and neutron.

Experimental measurements should consequently preserve invariant relationships among the physical constants across different systems and scales. The strongest tests compare these relations throughout particles, atoms, materials, and astronomical structures rather than treating each domain independently.

Theorem 5 (Hierarchical Closure)

No higher compatible organization introduces a new primitive geometric law.

Proof. Every constructive stage is defined recursively by

$$\mathcal{X}_{n+1} = F_n(\mathcal{X}_n),$$

where

$$F_n$$

acts only upon previously established structures.

Therefore no stage introduces new primitive geometric objects.

Each realization inherits the invariant relations already established for the Aether Unit.

Thus the hierarchy remains constructively closed.

□

10.3 Atomic and Material Measurements

A stable atom is a persistent compatible organization,

$$\Gamma_A = \Gamma_N \cup_{\mathcal{N}_A} \Gamma_{e1} \cup \Gamma_{e2} \cup \cdots \cup \Gamma_{en},$$

satisfying

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_A) = \Gamma_A, \qquad \forall n \geq 1.$$

Atomic measurements quantify the organization of the nucleus and electron geometries within this common compatibility neighborhood. Atomic mass, angular momentum, magnetic organization, shell structure, and transition frequencies are therefore projections of one persistent atomic realization.

The atom inherits

$$F_q\,\lambda_C = c, \qquad \mathrm{volm} = {\lambda_C}^3, \qquad \mathrm{rson} = {F_q}^2, \qquad A_u\,\mathrm{curl} = {F_q}^2\,{\lambda_C}^2,$$

and introduces no new measurement algebra.

A material realization is similarly represented by

$$\Gamma_M = \bigcup_{i=1}^{N} \Gamma_{A_i},$$

with persistence condition

$$(\mathcal{C} \circ \mathcal{E})^n(\Gamma_M) = \Gamma_M, \qquad \forall n \geq 1.$$

The macroscopic quantities considered here—including density, elasticity, thermal expansion, conductivity, dielectric response, magnetic response, and optical behavior—are conventionally measured and organized within solid-state and condensed-matter physics [Kittel(2005), Ashcroft and Mermin(1976)]. The present framework proposes that these observables are collective projections of nested compatibility geometry.

The measurement hierarchy is

$$\boxed{\begin{aligned}\text{Persistent Particle Geometry} &\longrightarrow \text{Atomic Compatibility}\\ &\longrightarrow \text{Material Compatibility}\\ &\longrightarrow \text{Observable Measurement.}\end{aligned}}$$

10.4 Astronomical Measurements

Astronomical systems extend the same measurement hierarchy to larger compatible organizations. Let

$$\Gamma_{\text{astro}} = \bigcup_{i=1}^{N} \Gamma_{M_i}$$

denote an astronomical realization composed of persistent material geometries. Its persistence requires

$$(\mathcal{C} \circ \mathcal{E})^{n}(\Gamma_{\text{astro}}) = \Gamma_{\text{astro}}, \qquad \forall n \geq 1.$$

Astronomical mass, density, extent, angular momentum, magnetic organization, rotational behavior, and compatibility gradients quantify the organization of stable matter within the same invariant Aether geometry.

The constructive hierarchy becomes

$$\boxed{\begin{aligned}\text{Persistent Particle Geometry} &\longrightarrow \text{Atomic Organization}\\ &\longrightarrow \text{Material Organization}\\ &\longrightarrow \text{Astronomical Organization}\\ &\longrightarrow \text{Astronomical Measurement.}\end{aligned}}$$

Planets, stars, galaxies, and larger systems therefore differ from particles and atoms by scale and organization rather than by a different measurement law.

10.5 Criteria for Experimental Verification

The empirical inputs used for particle masses, charges, magnetic moments, fundamental constants, and atomic transition quantities should be taken from independently maintained reference sources such as CODATA, the Particle Data Group, and the NIST Atomic Spectra Database [Mohr et al.(2025)Mohr, Newell, Taylor, and Tiesinga, Particle Data Group et al.(2026)Particle Data Group, Takahashi, et al., Kramida et al.(2024)Kramida, Ralchenko, Reader, and NIST ASD Team].

The framework is experimentally tested by determining whether independent measurements preserve the invariant relations derived from the common Aether geometry.

The principal criteria are

1. preservation of invariant geometric relations across independent experimental domains;
2. successful quantification of stable matter through the QMU measurement algebra;
3. preservation of species-normalized relations for electrons, protons, and neutrons;
4. extension of the same compatibility principles from particle to atomic, material, and astronomical organization;
5. successful prediction of previously unrecognized measurable relationships.

For each proposed invariant relation, the comparison should report the measured value, its stated uncertainty, the QMU-derived value, the absolute residual,

$$\Delta x = x_{\mathrm{QMU}} - x_{\mathrm{obs}},$$

the relative residual,

$$\delta_x = \frac{x_{\mathrm{QMU}} - x_{\mathrm{obs}}}{x_{\mathrm{obs}}},$$

and, where the measurement uncertainty σ_x is known, the normalized residual,

$$z_x = \frac{x_{\mathrm{QMU}} - x_{\mathrm{obs}}}{\sigma_x}.$$

Operational procedures for reference realizations, calibration chains, benchmark identities, and proposed falsification tests are presented in [Thomson III(2025v), Thomson III(2025w), Thomson III(2025u), Thomson III(2025q)].

The verification sequence is

$$\begin{aligned} \text{Invariant Geometry} &\longrightarrow \text{Compatibility Relations} \\ &\longrightarrow \text{Observable Predictions} \\ &\longrightarrow \text{Experimental Verification.} \end{aligned}$$

The strongest confirmation occurs when measurements obtained by different methods and at different scales preserve the same invariant relationships. Persistent disagreement would require revision of the constructive framework.

10.6 Future Experimental Program

The experimental program should emphasize precision measurements of stable particles, nuclei, atoms, materials, and astronomical systems.

Its principal stages are:

1. refine the QMU algebra through comparison with established precision measurements;
2. test species-normalized electron, proton, and neutron relations;
3. identify common compatibility relations across atomic, chemical, crystalline, and condensed-matter systems;

4. investigate compatibility organization and gradients at macroscopic and astronomical scales;
5. derive and experimentally test previously unknown invariant relationships.

The progression is

$$\begin{aligned}\text{Invariant Geometry} &\longrightarrow \text{Invariant Measurement Algebra}\\ &\longrightarrow \text{Experimental Verification}\\ &\longrightarrow \text{Predictive Measurement}\\ &\longrightarrow \text{Constructive Discovery.}\end{aligned}$$

Stable matter provides the most reproducible domain for this program because its persistent compatibility permits repeated measurement of the same underlying geometric relations.

10.7 Closing Observation

The constructive framework unifies geometry, ontology, and measurement:

$$\begin{aligned}\text{Invariant Aether Geometry} &\longrightarrow \text{Persistent Space}\\ &\longrightarrow \text{Persistent Compatibility}\\ &\longrightarrow \text{Organization of Visible Matter}\\ &\longrightarrow \text{Stable Matter}\\ &\longrightarrow \text{Observable Measurement.}\end{aligned}$$

Geometry establishes the invariant structure.

Ontology establishes the dependency hierarchy.

Measurement provides the quantitative realization of that structure.

The framework therefore reaches three complementary closures:

$$\begin{aligned}&\text{Geometric Closure,}\\ &\text{Ontological Closure,}\\ &\text{Metrological Closure.}\end{aligned}$$

Electrons, protons, neutrons, nuclei, atoms, materials, and astronomical structures are progressively richer compatible realizations of one invariant Aether geometry quantified through one QMU measurement algebra.

The remaining task is therefore not to introduce additional fundamental principles, but to derive and test the measurable consequences of the invariant framework established here.

Theorem 6 (Persistence Implies Repeatable Measurement)

Every persistent realization possesses a repeatable measurement signature.

Proof. If

$$\mathcal{T}^n(X) = X$$

for every positive integer n,

then every exposure reproduces the same compatible geometry.

Because measurement is defined as the observable projection of the persistent geometry, each measurement records the same invariant relations.

Therefore repeated measurements necessarily produce a repeatable measurement signature.

□

11 Conclusion

11.1 Constructive Hierarchy of Stable Matter

This work extends the invariant mathematical framework established in *The Geometry of Compatibility* into a constructive theory of stable physical existence. Beginning with the inherited Aether Unit, the paper develops persistent compatibility as the geometric criterion by which invariant geometry becomes stable matter.

The resulting dependency hierarchy is

Invariant Aether Geometry $\longrightarrow$ Persistent Space
$\longrightarrow$ Organization of Visible Matter
$\longrightarrow$ Persistent Compatibility
$\longrightarrow$ Stable Matter.

Within this framework, electrons and protons are identified as the first persistent localized geometries, the neutron as the first stable composite compatibility neighborhood, and nuclei, atoms, molecules, materials, and astronomical structures as progressively richer organizations of the same invariant geometry. No additional geometric or organizational principle is introduced at any stage.

The observable diversity of matter therefore arises from differences in compatible organization rather than from different systems of physics.

11.2 Geometric, Ontological, and Metrological Closure

The constructive hierarchy developed throughout this paper reaches three complementary forms of closure.

Geometrically, every persistent realization inherits one invariant Aether geometry.

Ontologically, every realization follows one dependency hierarchy from persistent space to stable matter.

Metrologically, every realization is quantified through one invariant Quantum Measurement Unit algebra.

Accordingly,

$$\boxed{\begin{aligned}\text{One Invariant Geometry} &\Longrightarrow \text{One Compatibility Framework}\\ &\Longrightarrow \text{One Measurement Algebra}\\ &\Longrightarrow \text{Every Stable Realization.}\end{aligned}}$$

Stable matter is therefore interpreted not as an independent physical substance, but as the persistent realization of invariant geometry. Observable measurements are complementary projections of that geometry, and their mutual consistency reflects their common geometric origin.

11.3 Final Remarks

The central result of this investigation is that persistent compatibility provides the constructive principle through which stable physical existence is realized. Persistent space supplies the extended geometric foundation, the Aether Unit organizes visible matter within that foundation, and persistent compatibility preserves that organization as stable matter.

The Aether Physics Model therefore describes the observable Universe as a hierarchy of persistent compatible realizations arising from one invariant Aether geometry and quantified through one invariant Quantum Measurement Unit algebra.

The hierarchy developed in this work is complete:

$$\boxed{\text{Invariant Geometry} \Longrightarrow \text{Persistent Compatibility} \Longrightarrow \text{Stable Matter} \Longrightarrow \text{Observable Measurement.}}$$

The remaining task is not the introduction of additional fundamental principles, but the continued derivation and experimental verification of measurable relationships arising from this invariant geometric framework.

Stable matter is therefore not a primitive constituent of reality. It is the persistent realization of invariant geometry. The constructive hierarchy developed in this paper demonstrates that one invariant Aether geometry, one compatibility framework, and one Quantum Measurement Unit algebra are sufficient to describe persistent space, stable matter, and their observable organization across every experimentally accessible scale.

The constructive program developed here identifies persistent compatibility as the mathematical criterion by which invariant geometry becomes stable physical existence. Stable matter is therefore not postulated as a primitive constituent of Nature, but arises as the persistent organization of invariant Aether geometry preserved under repeated compatibility and quantified through one invariant measurement algebra.

A Inherited Mathematical Framework

The present paper is a direct mathematical continuation of *The Geometry of Compatibility*. The monograph establishes the invariant mathematical framework of the Aether Unit, while the present work develops the first constructive application of that framework to the persistence of visible matter and the emergence of stable physical existence.

Accordingly, the mathematical primitives established in the monograph are inherited without modification. The present work neither replaces nor redefines those foundations. Instead, it assumes their validity and extends them into the constructive description of stable electrons, protons, neutrons, atoms, materials, and persistent space.

To preserve mathematical consistency and maintain a one-to-one correspondence between terminology and meaning, the following concepts retain precisely the definitions established in *The Geometry of Compatibility*.

1. Invariant Aether Unit
2. Primitive Geometry
3. Topological Structure
4. Differential Geometry
5. Exposure
6. Compatibility
7. Compatibility Neighborhood
8. Canonical Structures
9. Geometric Memory
10. Measurement Algebra
11. Inverse Geometry
12. Dependency Hierarchy
13. Canonical Geometric Representatives
14. Observable Projection
15. Invariant Measurement

Throughout the present paper these concepts are employed exactly as defined in the monograph. No inherited definition is modified, generalized, or replaced unless an explicit statement to that effect is made within the body of this work.

The constructive development therefore begins not with new mathematical primitives, but with the invariant Aether geometry already established. The present paper addresses a different question.

The monograph establishes the invariant mathematical structure of the Aether Unit.

The present paper asks why that invariant structure admits persistent visible matter and why that visible matter remains stable.

Consequently, the dependency between the two works is constructive rather than parallel.

The mathematical framework established in the monograph becomes the foundation from which the present work derives progressively richer compatible realizations.

Accordingly,

$$\begin{aligned}\text{The Geometry of Compatibility} &\Longrightarrow \text{Invariant Aether Geometry}\\ &\Longrightarrow \text{Persistent Space}\\ &\Longrightarrow \text{Organization of Visible Matter}\\ &\Longrightarrow \text{Persistent Compatibility}\\ &\Longrightarrow \text{Stable Matter.}\end{aligned}$$

The monograph therefore establishes the invariant mathematical grammar of the Aether Unit.

The present paper inherits that grammar and develops its first constructive physical realization.

No new geometric primitives are introduced.

No new measurement algebra is introduced.

No new dependency hierarchy is introduced.

Rather, the existing invariant framework is extended to demonstrate how persistent space provides the geometric foundation for the organization of visible matter, how persistent compatibility preserves that organization, and how stable matter emerges as the observable manifestation of invariant geometry.

Readers seeking the complete mathematical definitions, proofs, dependency maps, variational constructions, and canonical geometric derivations of the inherited concepts should consult *The Geometry of Compatibility*, where those topics are developed in full.

B Dependency Map

Figure B summarizes the mathematical dependency hierarchy developed jointly by *The Geometry of Compatibility* and the present paper. The upper portion of the hierarchy consists entirely of inherited mathematical structures established in the monograph. The lower portion shows the constructive extension developed here, beginning with persistent geometry and proceeding through stable particles, stable matter, stable space, and experimentally observable quantities.

C QMU Tables

The Quantum Measurement Unit (QMU) system provides the invariant measurement algebra for the constructive hierarchy developed throughout this paper. The QMU quantities quantify persistent realizations of the invariant Aether geometry and provide the natural metrological language for persistent space, visible matter, stable matter, and their observable measurements.

The following tables summarize the principal QMU quantities and the constructive hierarchy developed in this work. Complete definitions, dimensional derivations, and unit constructions are presented in *The Geometry of Compatibility*, the QMU monograph, and the associated QADI publications.

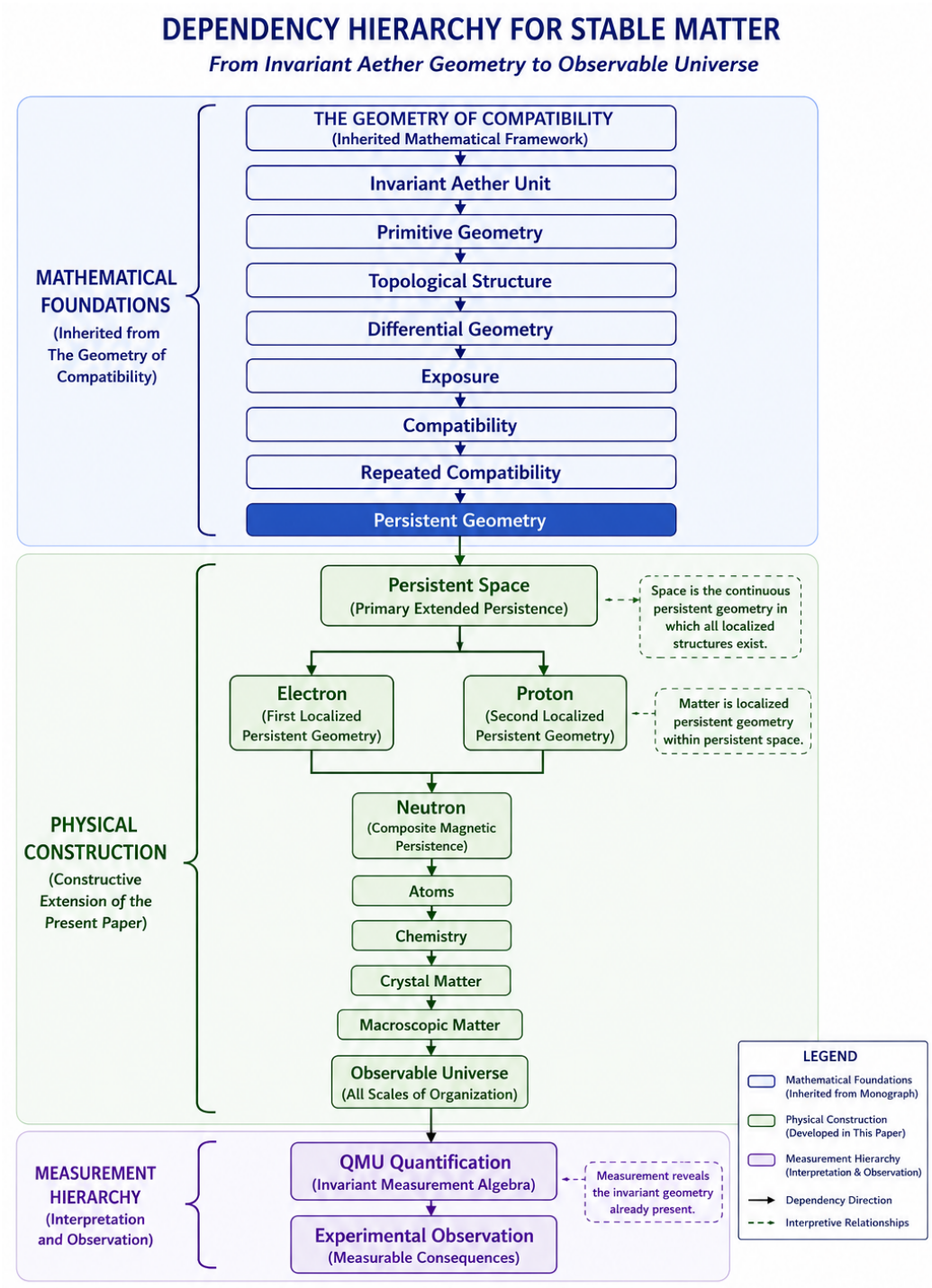

Figure A.1: Dependency hierarchy for the construction of stable matter from invariant Aether geometry.

The upper section (blue) is inherited entirely from *The Geometry of Compatibility*. The middle section (green) is the constructive development of the present paper, beginning with persistent space as primary extended geometry and proceeding to localized persistent matter. The lower section (purple) represents measurement and experimental observation, which reveal the invariant geometry already established.

C.1 Persistent Particle Geometry

Table 2: Principal QMU quantities associated with persistent localized geometry.

Quantity	Primary QMU	Geometric Interpretation
Mass	m_e	Visible matter organized within the Aether Unit
Length	λ_C	Invariant geometric scale
Frequency	F_q	Invariant chronogeometric frequency
Velocity	velc	Invariant propagation of Aether geometry
Angular Momentum	angm	Persistent localized geometry
Electrostatic Potential	potn	Electrostatic organization
Magnetic Flux	mflx	Magnetic organization
Circulation	curl	Invariant geometric circulation
Resonance	rson	Chronogeometric organization

C.2 Constructive Hierarchy

Table 3: Constructive hierarchy of persistent realizations.

Realization	Constructive Description
Persistent Space	Discrete realization of invariant Aether Units
Visible Matter	Matter organized within persistent space
Persistent Compatibility	Localization-preserving organization
Electron	Persistent localized angular-momentum geometry
Proton	Persistent localized angular-momentum geometry
Neutron	Shared compatibility realization of electron and proton
Stable Nucleus	Persistent nuclear organization
Stable Atom	Persistent atomic organization
Molecule	Persistent chemical organization
Crystal	Periodic compatible organization
Macroscopic Matter	Hierarchical organization of stable matter
Astronomical Structure	Large-scale organization of stable matter

C.3 Constructive Measurement Hierarchy

C.4 Fundamental Physical Constants

D Notation

The present paper inherits the notation established in *The Geometry of Compatibility*. The following table summarizes the principal symbols employed throughout this work. Symbols not listed here retain the definitions and notation established in the monograph.

Table 4: Constructive progression from invariant geometry to observable measurement.

Stage	Constructive Role
Invariant Geometry	Fundamental geometric structure
Persistent Space	Discrete geometric realization
Organization of Visible Matter	Visible matter organized within space
Persistent Compatibility	Localization-preserving organization
Stable Matter	Persistent localized realization
Geometric Projection	Observable realization of geometry
QMU Measurement Algebra	Invariant quantitative description
Observable Measurement	Experimental quantification

Table 5: Fundamental physical constants interpreted through invariant Aether geometry.

Constant	Constructive Interpretation	QMU Basis
Electron Mass	Visible matter organization	m_e
Compton Length	Invariant geometric length	λ_C
Quantum Frequency	Invariant chronogeometric frequency	F_q
Elementary Charge	Electrostatic organization	e^2
Maximum Magnetic Charge	Magnetic organization	${e_{\mathrm{emax}}}^2$
Speed of Light	Invariant propagation	$F_q\,\lambda_C$
Gravitational Constant	Large-scale organization of stable matter	G
Fine Structure Constant	Species-normalized electrostatic organization	$\alpha_e,\ \alpha_p,\ \alpha_n,\ \alpha_a$

D.1 Geometric Symbols

D.2 Stable Matter Hierarchy

D.3 Quantum Measurement Units

The Quantum Measurement Unit (QMU) notation follows the conventions established in the QMU monograph and associated QADI papers. Throughout this paper, QMU symbols denote invariant measurement units derived from the Aether Unit and are used without redefinition.

Complete dimensional derivations, unit identities, and conversion relations are given in the QMU reference publications and are therefore not reproduced here.

D.4 Notation Convention

Unless explicitly stated otherwise,

- symbols retain the meanings assigned in *The Geometry of Compatibility*;
- QMU symbols retain the meanings assigned in the QMU monograph;
- every geometric construction proceeds according to the dependency hierarchy established in the monograph;
- no notation introduced in the present paper supersedes previously established definitions.

Table 6: Principal mathematical notation.

Symbol	Description
λ_C	Compton (quantum) length
F_q	Quantum frequency
c	Photon propagation velocity
m_e	Electron mass
e^2	Elementary electrostatic charge squared
${e_{emax}}^2$	Maximum magnetic charge squared
G	Gravitational constant
α	Fine-structure constant

Table 7: Geometric notation inherited from the monograph.

Symbol	**Meaning**
$\mathcal{A}$	Invariant Aether Unit
$\mathcal{G}$	Invariant geometry
$\mathcal{E}$	Exposure operator
$\mathcal{C}$	Compatibility operator
$\mathcal{P}$	Persistent compatible geometry (used conceptually in this paper; formal operator reserved for future work).

Accordingly, this paper should be read as a constructive extension of the invariant mathematical framework rather than as an independent reformulation of its notation.

E Glossary

The following glossary summarizes the principal concepts developed or extended throughout the present work. Mathematical concepts inherited from *The Geometry of Compatibility* retain the definitions established there unless explicitly stated otherwise.

Aether Unit The invariant discrete geometric structure established in *The Geometry of Compatibility*. The Aether Unit provides the fundamental geometric organization from which persistent space, organized visible matter, persistent compatibility, and stable matter are constructively derived.

Atomic Compatibility The persistent organization that preserves the stable realization of an atomic nucleus together with its compatible electron-shell geometry.

Compatibility The invariant geometric condition determining whether two or more realizations may coexist while preserving the organization established by the Aether Unit.

Compatibility Neighborhood The local geometric organization surrounding a realization within which persistent compatibility is maintained.

Table 8: Hierarchy of persistent geometric structures.

Term	Meaning
Persistent Geometry	Compatibility preserved under repeated exposure
Persistent Space	Extended compatible geometry
Electron	First localized persistent geometry
Proton	Second localized persistent geometry
Neutron	Composite electron–proton geometry
Stable Matter	Hierarchy of persistent compatible structures
Observable Universe	Largest persistent compatible organization

Composite Geometry A persistent realization constructed from previously established persistent localized geometries while preserving compatible organization.

Constructive Hierarchy The ordered dependency through which progressively richer realizations are derived from the invariant Aether geometry.

Electron The first persistent localized angular-momentum geometry organized within the Aether Unit.

Exposure The inherited operation through which geometric realizations become available for compatibility and observable measurement.

Geometric Projection The observable manifestation of a persistent compatible realization. Measurements quantify geometric projections rather than invariant geometry directly.

Geometry of Compatibility The foundational monograph establishing the invariant Aether geometry, topology, differential geometry, compatibility, exposure, measurement algebra, inverse geometry, canonical structures, and dependency hierarchy upon which the present work is constructed.

Macroscopic Matter The hierarchical organization of stable matter extending beyond the atomic scale while preserving the same invariant compatibility principles.

Measurement Algebra The invariant Quantum Measurement Unit framework through which persistent geometric realizations become quantitatively observable.

Neutron The first persistent composite realization consisting of an electron and proton sharing one compatibility neighborhood.

Organization of Visible Matter The constructive process by which visible matter becomes geometrically organized within persistent space through the invariant Aether Unit.

Persistent Compatibility The repeated preservation of compatibility under successive exposure. Persistent compatibility localizes organized visible matter into stable realizations.

Persistent Existence The continued preservation of a compatible realization through persistent compatibility. Persistent existence is the constructive criterion for stable physical reality developed in this paper.

Persistent Localized Geometry A compatible realization whose localization is preserved by persistent compatibility.

Persistent Space The discrete realization of invariant Aether Units providing the geometric foundation within which visible matter is organized and localized.

Proton The second persistent localized angular-momentum geometry organized within the Aether Unit. It differs from the electron by species normalization and canonical geometry while preserving the same constructive framework.

QMU Quantum Measurement Units. The invariant measurement algebra naturally induced by the Aether geometry and used throughout the Quantum AetherDynamics framework.

Repeated Compatibility Successive preservation of compatibility under repeated exposure. A realization exhibiting repeated compatibility becomes persistently compatible.

Stable Matter Visible matter whose localization is preserved through persistent compatibility. Stable matter extends hierarchically from electrons and protons through neutrons, nuclei, atoms, molecules, crystalline matter, macroscopic matter, and astronomical structures.

Stable Particle A persistent localized realization possessing repeatable observable properties and remaining compatible under repeated exposure.

Visible Matter Dark matter organized within the Aether Unit through the interaction of the common Gforce and magnetic charge. Visible matter precedes stable matter and becomes stable only when its localization is preserved by persistent compatibility.

The terminology employed throughout this paper preserves the dependency hierarchy established by *The Geometry of Compatibility*.

Invariant geometry precedes persistent space.

Persistent space precedes the organization of visible matter.

The organization of visible matter precedes persistent compatibility.

Persistent compatibility precedes stable matter.

Stable matter precedes observable measurement.

Accordingly, every glossary entry reflects one stage of the constructive hierarchy developed throughout the Aether Physics Model. No term carries more than one technical meaning, and each definition preserves the one-to-one correspondence between mathematical structure, ontological interpretation, and quantitative measurement established throughout this work.

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