



Fermion — The Complete Logical Structure within Neomoderne Science

List of Abbreviations

• NW — Neomoderne Science: a logical–foundational scientific system • MS — Modern Science: empirical–axiomatic science • BSD particle — Spherical Subatomic Particle • AD — Atomic Domain • ZM — Visible Matter Domain • OM — Invisible Matter Domain • M — Matter • A — Antimatter • L — Charge Type (H = integer, G = fractional) • S — Spin (G = fractional → fermion) • l — Charge pool • p — Polarity • g — Generation • Xx/Yy structure — Counterpole structure • R1–R7 — NW rules

Abstract

This manuscript presents a fully deterministic classification of fermions within the framework of Neomoderne Science (NW), a logical–foundational scientific system grounded in a single central natural law, informal logic, and Xx/Yy structures. In NW, fermions are modeled as BSD particles whose identity is uniquely determined by five orthogonal individual features: domain (ZM/OM), matter status, charge pool, charge polarity, and generation. Using the NW ruleset—particularly the even counterpole rule, the orthogonality principle, and the determinism rule—the manuscript demonstrates that these five features generate exactly 24 logically distinct fermion types: 12 leptons and 12 quarks. The classification is derived without empirical axioms and follows solely from the internal logical structure of NW. The result is a closed, noise-free and axiom-independent framework that reveals fermions as manifestations of an underlying logical order rather than empirically postulated entities. This work positions NW as a coherent alternative foundation for subatomic structure, unifying logic, ontology and particle classification within a single rule-based system.

Keywords

Neomoderne Science; Logical Foundations of Physics; Fermion Classification; Counterpole Logic; BSD Particles; Deterministic Ontology; Feature Vector Representation; Domain Logic (ZM/OM).

1. Introduction

Neomoderne Science (NW) is a logical–foundational scientific system in which natural structures are derived from a single central natural law, informal logic, and Xx/Yy counterpole structures (Carnap 1934; Quine 1951; Putnam 1962). The formal basis of NW is developed in detail in internal framework documents (Author withheld for review 2026a).

In contrast to Modern Science (MS), which operates empirically and axiomatically, NW is axiom-free, deterministic, and internally consistent (French & Ladyman 2003; Ladyman & Ross 2007).

2. Theoretical Framework of NW

2.1 The Central Natural Law

The central natural law states that every phenomenon is determined by a structure of counterpoles (Priest 2006; Author withheld for review 2026a).

2.2 The NW Rules

The NW rules (R1–R7) form the formal foundation of the system (Fitch 1952; Restall 2005). Their operational formulation within NW is presented in (Author withheld for review 2026c).

3. BSD Particles and Fermions

BSD particles are defined as concrete NW-objects described by orthogonal features. Their formal role within NW is elaborated in (Author withheld for review 2026b). The ontological interpretation parallels structural accounts in philosophy of physics (Esfeld 2004; Maudlin 2019).

4. The Five Individual Features

A fermion is fully determined by the feature vector $\langle d, m, l, p, g \rangle$. The feature-vector ontology is developed in (Author withheld for review 2026b) and aligns with structural realism (French & Ladyman 2003).

5. The Electron as Reference Fermion

The electron, represented by $\langle ZM, M, 1, -, 1 \rangle$, functions as the reference fermion. Its foundational role in NW's derivation of fermion structure is formalized in (Author withheld for review 2026c). This mirrors formal reconstructions of scientific theories (van Fraassen 1980).

6. Counterpole Logic

Counterpole logic determines how properties change under inversion (Fitch 1952). Its application to fermion polarity, matter–antimatter relations, and generational structure is developed in (Author withheld for review 2026a; 2026c).

7. The 24 Fermion Types

Combining the five orthogonal features yields exactly 24 fermion types: 12 leptons and 12 quarks. The complete derivation is presented in (Author withheld for review 2026b). This classification fits within broader ontological discussions in physics (Maudlin 2019).

8. Stability

Generational stability follows from NW's generational rule (Author withheld for review 2026c). This structure parallels formal analyses of theoretical architecture (van Fraassen 1980).

9. Domain Logic (ZM/OM)

Domain is a perspective feature: • within AD every fermion appears as ZM • outside AD every fermion appears as both ZM and OM

This perspective-dependence is consistent with relational ontologies (Esfeld 2004) and is formally defined in (Author withheld for review 2026a).

10. Conclusion

Fermions are logical manifestations of an underlying NW structure. The 24-type structure follows necessarily from the five orthogonal features and the NW rules (Ladyman & Ross 2007; Author withheld for review 2026b; 2026c).

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Author withheld for review (2026a)

Neomoderne Science: Central Natural Law and Counterpole Structures

NW Working Paper Series

Abstract

This working paper presents the foundational principles of Neomoderne Science (NW), focusing on the Central Natural Law and the Xx/Yy counterpole structure that underlies all natural phenomena. The document formalizes the logical basis of counterpoles, the coexistence of True and False, and the structural rules that govern inversion, preservation, and manifestation. These principles form the conceptual core from which all NW classifications—including fermions—are derived.

1. The Central Natural Law

Central Natural Law (CNL): *Every natural phenomenon is determined by a structure of counterpoles. True and False are both valid and coexist within a single logical system.*

This principle asserts:

1. **Dual manifestation:** Every entity expresses itself through a pair of opposing but co-valid poles.
2. **Non-exclusivity of truth values:** True and False are not mutually exclusive; they are structural positions.
3. **Structural determinism:** The configuration of counterpoles determines the identity and behavior of natural entities.

2. Counterpole Structures (Xx/Yy)

A counterpole structure consists of:

- **Xx:** the primary pole
- **Yy:** the complementary pole

Both poles are:

- co-valid
- co-present
- structurally necessary

2.1 Even and Odd Counterpoles

- **Even number of counterpoles** → **preservation**
- **Odd number of counterpoles** → **inversion**

This rule governs:

- polarity
- matter/antimatter relations
- stability
- domain appearance

3. Truth and Non-Truth

NW rejects binary truth exclusivity. Instead:

- Truth = structural position Xx
- Non-Truth = structural position Yy

Both are required for a complete description of any natural entity.

4. Manifestation in Physical Systems

The Central Natural Law applies universally:

- subatomic particles
- macroscopic systems
- conceptual structures

In fermion classification, counterpole structures determine:

- polarity
- matter status
- generational behavior
- domain appearance

5. Conclusion

This document establishes the logical foundation of NW. All subsequent NW modules—including feature-vector ontology and fermion classification—derive from the Central Natural Law and counterpole structures.



Author withheld for review (2026b)

Feature-Vector Ontology and the Logical Classification of Subatomic Particles

NW Technical Report

Abstract

This technical report develops the feature-vector ontology of Neomoderne Science (NW) and demonstrates how five orthogonal features generate exactly 24 fermion types. The report formalizes the feature space, orthogonality relations, and the deterministic mapping from feature combinations to particle identity.

1. Feature-Vector Ontology

A particle is defined by the ordered feature vector:

$$\langle d, m, l, p, g \rangle$$

where:

- **d** = domain (ZM, OM)
- **m** = matter status (M, A)
- **l** = charge pool (1, 0, 1/3, 2/3)
- **p** = polarity (−, +, (+&−), (+or−))
- **g** = generation (1, 2, 3)

2. Orthogonality Principle

Orthogonality (R4) states:

- No feature determines any other feature.
- All features vary independently.
- The feature space is complete and non-redundant.

This ensures:

- no hidden variables
- no empirical axioms
- no model-dependent assumptions

3. Deterministic Classification

The NW ruleset determines:

- polarity from (m, l)
- stability from g
- domain appearance from d

Thus:

- **12 leptons**
- **12 quarks**
- **no additional fermions possible**

4. The Electron as Reference Vector

The electron:

$$\langle ZM, M, 1, -, 1 \rangle$$

serves as the logical anchor. All other fermions arise from systematic counterpole transformations of this vector.

5. The 24 Fermion Types

The feature space yields:

- 4 charge pools
- 2 matter statuses
- 3 generations

But polarity is not free: it is determined by the counterpole logic applied to (m, l).

Thus:

$$4 \times 2 \times 3 = 24$$

Each corresponds to a unique fermion.

6. Conclusion

This report formalizes the feature-vector ontology and demonstrates that NW yields a closed, deterministic fermion classification without empirical axioms.



Author withheld for review (2026c)

Determinism, Orthogonality, and Generational Structure in Neomoderne Science

NW Formal Methods Document

Abstract

This formal methods document presents the deterministic rules governing particle identity in Neomoderne Science (NW). It focuses on the determinism rule, orthogonality constraints, and the generational structure that determines stability and transformation behavior.

1. Determinism Rule (R5)

The determinism rule states:

Given a complete feature vector, the identity of a particle is uniquely determined.

Consequences:

- no probabilistic behavior at the ontological level
- no free parameters
- no empirical fitting
- no hidden degrees of freedom

2. Orthogonality (R4)

Orthogonality ensures:

- independence of features
- completeness of the feature space
- absence of redundancy

This rule is essential for:

- the 24-type fermion structure
- the uniqueness of each particle
- the logical closure of NW

3. Generational Rule (R6)

Generations determine stability:

- **$g = 1 \rightarrow \text{stable}$**
- **$g = 2, 3 \rightarrow \text{unstable}$**
- **$A \text{ of } g = 1 \rightarrow \text{unstable}$**

This follows from:

- counterpole inversion
- polarity constraints
- structural asymmetry between matter and antimatter

4. Formal Derivation of Stability

Stability is derived from:

1. polarity inversion under odd counterpoles
2. matter/antimatter asymmetry
3. generational hierarchy

Thus:

- only first-generation matter is stable
- all antimatter of generation 1 is unstable
- higher generations decay deterministically

5. Domain as Perspective (R7)

Domain (ZM/OM) is not intrinsic:

- inside AD $\rightarrow$ ZM
- outside AD $\rightarrow$ ZM + OM

This is a perspectival effect, not a physical transformation.

6. Conclusion

This document formalizes the deterministic, orthogonal, and generational structure of NW. Together with the Central Natural Law and the feature-vector ontology, it completes the logical foundation for fermion classification.