A Classification Theorem for Physical Constants
Admissibility-Fixed, Quotient-Dependent, Effective, Transport-Defined, and Presentation-Dependent Roles

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Abstract

Physical constants are often treated as a single kind of explanatory object: fixed numerical entries in physical equations whose alternative values may be varied, scanned, weighted, selected, or explained. This paper shows that this treatment is structurally too coarse. Building on the fixed-domain result that standing-bearing constants are not freely variable same-domain parameters, the paper proves a role-exhaustion theorem for constant-like quantities under standing-preserving admissibility constraints. Every admissibility-bearing contribution made by a constant-like quantity in a fixed physical domain decomposes into one of five primitive role classes: admissibility-fixed, quotient-dependent, effective, transport-defined, or presentation-dependent. These classes are not a discretionary taxonomy. They are induced by the available loci of admissible physical use: domain eligibility, quotient-level invariant content, envelope-bounded validity, lawful transport, and representation.

The theorem is not a numerical derivation of the constants and does not prohibit renormalization-group running, empirical parameter fitting, effective field theory, controlled parameter scans, or beyond-Standard-Model construction. Its target is role confusion. Dimensionless constants, gauge couplings, mass ratios, symmetry structures, gauge structure, Yukawa entries, CKM and PMNS parameters, unit conventions, and scheme-dependent coordinates do not belong to one homogeneous parameter space merely because they can be written as symbols or numbers. Their admissibility roles differ. Treating an anchor as an effective knob, an effective coefficient as a primitive invariant, a transport coordinate as an independent scalar, or a presentation convention as tensor load produces a false homogeneous-parameter ontology and can support familiar fine-tuning, anthropic, and multiverse misclassifications. The result further distinguishes formal constant-family notation from inherited standing-bearing parameter-space authority and from explicitly gated target-domain comparison. Before a constant may be varied, selected, scanned, or explained, its admissibility role and its comparison domain must be fixed.

Orientation. The companion Fixity result established that standing-bearing constants are not freely variable same-domain parameters. The present paper asks the next question: what kinds of things are called physical constants? The answer is not one kind: it is a five-role classification constrained by admissibility, standing, quotient identity, envelope dependence, transport, and presentation discipline.

Contents

1 Introduction

Physical constants enter physics in many different ways. Some appear as dimensionful conversion factors. Some are measured dimensionless ratios. Some are couplings whose numerical values depend on scale and renormalization scheme. Some are boundary or matching inputs. Some encode transport between bases, as in mixing matrices. Some are not numbers at all but structural fixtures: gauge group, symmetry class, representation content, dimensionality, or law-form. Yet they are often discussed under the single heading "constants," as if the category were homogeneous.

This homogeneity assumption obscures the comparison structure required for physical interpretation. A unit convention is not an invariant physical load. A running coupling at a scale is not a timeless scalar primitive. A quotient-dependent ratio is not a raw coordinate. A mixing angle is not merely a number independent of the basis relation it coordinates. A gauge group is not a dial inside the same theory. Once these distinctions are erased, it becomes easy to draw a large parameter space, place all apparent constants inside it, and ask why our world occupies one point rather than another. The space then appears to support probability, typicality, anthropic selection, landscape scanning, or free modal variation. Such a space is not automatically an admissible physical object.

The companion study, *The Standing Fixity of Physical Constants*, argued that a standing-bearing constant is not a freely variable same-domain parameter unless the admissible identity conditions that make it a physical constant are preserved. The present paper extends that result. It does not ask whether constants are fixed. It asks what role a constant-like quantity occupies before any variation, explanation, or selection claim is made.

The central claim is:

> In a fixed admissibility-bearing physical domain, the admissibility-bearing contribution of any constant-like quantity decomposes into five and only five primitive role loci: admissibility-fixed, quotient-dependent, effective, transport-defined, and presentation-dependent. Any apparent sixth role is either a composite notation, a hidden scope change, an unspecified selector, or an instance of one of the five loci.

This is a classification theorem rather than a dynamics. It does not compute the fine-structure constant, the electron-proton mass ratio, CKM angles, PMNS angles, Yukawa eigenvalues, the Higgs vacuum expectation value, or the QCD scale. It says what type of admissibility role each such quantity can have in a fixed comparison domain. The distinction matters because role type determines what counts as variation, what counts as redescription, what counts as empirical input, and what counts as explanation.

1.1 Why a classification theorem is needed

The word "constant" conflates at least seven phenomena.

(1) **Conversion and unit discipline:** dimensionful constants such as c, $\hbar$, and k_B may function as unit conversions in one presentation while also pointing toward deeper structure when their invariant role is isolated.

(2) **Structural anchors:** Lorentzian causal structure, gauge group, symmetry class, representation compatibility, and admissible law-form may be fixed preconditions of the domain rather than variable entries inside it.

(3) **Quotient-level invariant relations:** dimensionless ratios and observable combinations may survive unit changes and coordinate changes only after the relevant quotient has been fixed.

(4) **Effective coefficients:** low-energy constants, Wilson coefficients, running couplings, and phenomenological parameters are meaningful inside envelopes and matching conditions.

(5) **Transport data:** CKM and PMNS parameters, phases, RG trajectories, and basis-change residues encode lawful relations between presentations or regimes.

(6) **Boundary inputs:** numerical values may be irreducible empirical or envelope data rather than internally forced structure.

(7) **Presentation-dependent skin:** labels, chart coordinates, normalization conventions, scheme variables, and regulator artifacts organize calculations without independently carrying physical standing.

A disciplined theory of constants does not treat these as one kind of object. The relevant question is not whether a symbol appears in an equation as a fixed number. The relevant question is what standing-preserving work the symbol performs. If changing it changes the admissibility of the domain, it is not a free parameter. If changing it changes only a chart, it is not a physical variation. If it runs under licensed scale transport, it is not a counterexample to fixity. If it is an empirical boundary input, its presence is not a competing structural role. If it encodes a basis-reconstruction relation, its value is inseparable from the transport problem that gives it meaning.

1.2 Method

The paper uses four structural components from the AASC corpus, but the argument is operational rather than framework-proprietary.

(M1) **Fixed-domain admissibility:** a physical comparison must preserve witness compatibility, lawful transport, standing-preserving redescription, invariant object identification, and envelope continuity.

(M2) **Anchor/Tensor/Skin decomposition:** admissibility-bearing description separates into anchor preconditions, tensor invariant content, and representational skin.

(M3) **Standard-Model role classification:** particle-physics structures require role typing, quotient normal form, transport closure, witness ledgers, and boundary-only envelope inputs.

(M4) **AMetric and null-regime closure:** before admissibility is fixed, no canonical selector, ranking, metric, representative, or measure is available; total vacuity does not govern a non-degenerate admissibility-bearing domain.

The present classification does not require adoption of AASC as a complete foundational program; it requires only the minimal operational assumption that physical quantities admit stable identification across admissible observational and theoretical transport.

Although the vocabulary is drawn from AASC, the pressure is familiar. A measured quantity must be re-identifiable across contexts. A coupling value must be attached to a scale and scheme. A dimensionless ratio must say which quotient relation makes it physical. A symmetry must say whether it is a representation convention or a domain-defining structure. These are ordinary conditions for physically meaningful parameter use rather than optional philosophical additions.

2 Scope and Non-Claims

The theorem is narrow by design. It is a classification theorem for roles, not a derivation theorem for numerical values.

2.1 Licensed claims

The paper claims:

(L1) Constant-like quantities in a fixed physical domain must be role-typed before being varied, selected, or explained.

(L2) The admissibility-bearing role contributions of such quantities are exhausted by five classes: admissibility-fixed, quotient-dependent, effective, transport-defined, and presentation-dependent.

(L3) Quantities may have composite notational profiles. A symbol may carry more than one role across contexts, but after decomposition each role-component belongs to one of the five classes.

(L4) Many apparent fine-tuning or free-parameter puzzles arise from substituting one role for another: treating skin as tensor, effective coefficients as anchors, transport data as independent scalars, or boundary inputs as internally derivable constants.

(L5) The theorem constrains the interpretive status of parameter spaces. It does not block practical scans, model exploration, or empirical fitting.

(L6) Formal constant-family multiplicity does not inherit standing-bearing authority by notation alone. If a family is used for physical comparison, it must either be controlled inside a fixed domain or be retyped as an explicitly gated target domain with its own witnesses, transport, and quotient discipline.

2.2 Excluded readings

The paper does not claim:

(N1) that the numerical values of all constants are derived;

(N2) that constants are metaphysically necessary across all possible worlds;

(N3) that all theories must share the same constants;

(N4) that RG running is unreal or inadmissible;

(N5) that EFT parameters lack physical standing;

(N6) that Bayesian or phenomenological parameter scans are useless;

(N7) that multiverse models are ruled out;

(N8) that the Standard Model is the final physical theory;

(N9) that empirical calibration can be eliminated;

(N10) that controlled parameter scans inside explicitly governed target domains are inadmissible.

The target is not exploration but explanation. A controlled scan may show sensitivity; a model family may show conditional dependence; an EFT may organize low-energy data; a UV proposal may relocate parameters. These tools remain admissible when the target domain, role profile, transport relation, and witness ledger are explicit. The classification theorem asks what role those quantities have in the admissible domain under discussion.

2.3 Fixed admissibility domains

Definition 2.1 (Fixed admissibility domain)**.** *A* fixed admissibility domain *is a comparison-relative structure*

$$\mathsf{D} = (\mathcal{T}, \mathcal{A}, \mathcal{W}, \mathcal{R}, \mathcal{Q}, \mathcal{E}),$$

where $\mathcal{T}$ is the operative theory or theory-family, $\mathcal{A}$ is the admissibility envelope, $\mathcal{W}$ is the witness ledger by which quantities are empirically identified, $\mathcal{R}$ is the lawful redescription and transport structure, $\mathcal{Q}$ is the standing quotient identifying equivalent presentations, and $\mathcal{E}$ records boundary, calibration, cutoff, and envelope data. The domain is fixed for a proposed comparison only when witness compatibility, lawful transport, standing-preserving redescription, invariant object identification, and envelope continuity are preserved.

Definition 2.2 (Constant-like quantity)**.** *A* constant-like quantity *in a domain D is any symbol, numerical value, structural fixture, coefficient, ratio, phase, group datum, normalization, or boundary entry that is treated as stable enough to support repeated physical reference inside D.*

This definition deliberately includes more than ordinary constants. It includes quantities that are eventually classified as presentation-dependent, effective parameters, transport coordinates, or domain anchors. The purpose is to prevent premature purification of the target. A classification theorem must first admit the ambiguous objects that actual physics practice calls constants, parameters, structures, couplings, scales, and coefficients.

Definition 2.3 (Standing-bearing invariant)**.** *A role-component of a constant-like quantity is* standing-bearing *when it is required for stable empirical identification and lawful transport across admissible observational, theoretical, or representational contexts. A merely formally preserved object is not thereby standing-bearing; it must participate in the witness and transport structure of D.*

Remark 2.4 (Not a semantic stipulation)**.** *The present argument does not infer fixity from stipulative semantic restriction. It identifies conditions already presupposed by ordinary physical practice whenever parameters are treated as stably identifiable across observational, theoretical, and representational transport. If no such transport exists, the object may still be a formal symbol, but it does not yet function as a physical constant for the domain.*

2.4 Parameter families, inheritance, and target-domain retyping

Later transport and ensemble results sharpen the comparison discipline required by the classification theorem. The relevant addition is not a sixth role. It is a distinction between three ways in which a family of constant-like quantities may be presented.

Definition 2.5 (Formal constant-family multiplicity)**.** *A* formal constant-family *is a collection*

$$\mathcal{F} = \{C_i\}_{i \in I}$$

of constant-like entries, candidate values, models, vacua, EFT parameter assignments, sectors, or presentations written under a common notation before a single admissibility-bearing comparison structure has been supplied. Formal multiplicity is allowed, but it is not standing-bearing by default.

Definition 2.6 (Inherited standing-bearing family multiplicity)**.** *A formal family is treated as* inherited standing-bearing multiplicity *when its members are assumed to be comparable, selectable, measurable, typical, observer-relevant, or physically variable merely because they are listed or indexed, without independently supplied target-domain gating, witness compatibility, quotient identity, transport, and envelope discipline.*

Definition 2.7 (Explicitly gated target-domain family)**.** *An* explicitly gated target-domain family *is a family equipped with its own domain*

$$\mathsf{D}_{\mathcal{F}} = (\mathcal{T}_{\mathcal{F}}, \mathcal{A}_{\mathcal{F}}, \mathcal{W}_{\mathcal{F}}, \mathcal{R}_{\mathcal{F}}, \mathcal{Q}_{\mathcal{F}}, \mathcal{E}_{\mathcal{F}}),$$

including membership rules, witness ledgers, transport and compatibility conditions, quotient relations, boundary data, and any measure or selector used for probabilistic claims. In that case the family is not inherited multiplicity; it is a newly typed comparison domain, and the role-classification theorem applies inside $\mathsf{D}_{\mathcal{F}}$.

Definition 2.8 (Constant-continuation locus)**.** *A* constant-continuation locus *for a constant-like quantity C is the admissibility-bearing identity locus by which C is treated as the same role-bearing quantity across lawful redescription, scale transport, basis reconstruction, matching, or explicitly gated family comparison. It preserves the role profile, witness attachment, quotient behavior, envelope status, and fail-closed comparison conditions needed for C to remain the same constant-like target rather than an unrelated coordinate assignment. Operationally, a constant-continuation locus is what preserves the admissibility-bearing identity by which a constant remains the same standing-bearing structural role across lawful redescription and transport.*

Proposition 2.9 (Target-domain retyping rule)**.** *If a comparison among constant-like assignments requires new ensemble membership, witness predicates, transport rules, quotient structure, envelope boundaries, or selectors, then the comparison is not inherited same-domain role authority. It is either a newly typed target domain with its own admissibility conditions, or it is unsupported as a standing-bearing comparison.*

Proof. Inherited role authority would require the original domain to carry the comparison structure already. If the comparison needs new witnesses, transport, quotients, envelope conditions, or selectors, then those structures are not inherited from the original list. When they are explicitly supplied, the comparison is evaluated in the new target domain they define. When they are not supplied, the family remains formal notation or heuristic exploration without standing-bearing authority over the original role profile. □

Corollary 2.10 (Controlled-scan preservation)**.** *Controlled parameter scans, EFT explorations, numerical surveys, and model-family comparisons remain admissible when they are performed inside explicitly governed target domains. Effective parameter families defined inside explicitly governed transport-preserving regimes remain admissible modeling tools. The classification theorem constrains only the promotion of such scans into homogeneous standing-bearing explanations without independent role, witness, quotient, transport, and envelope structure.*

Proof. A governed scan supplies the comparison conditions required by Proposition 2.9. Its results may be conditionally informative inside that target domain. What the theorem rejects is not scanning, but the inference from formal multiplicity to inherited physical standing. □

3 Anchor, Tensor, and Skin Role Discipline

The classification theorem rests on a fixed-domain decomposition of admissible description. The decomposition separates what fixes a domain, what carries invariant physical load, and what merely presents that load.

Definition 3.1 (Anchor, tensor, skin)**.** *For a fixed admissibility domain* D*:*

(i) An anchor *is an admissibility-defining precondition: a condition without which the domain does not have the object-class, witness ledger, quotient, or transport structure under discussion.*

(ii) A tensor *is quotient-level invariant content: the standing-bearing load that survives admissible redescription and supports stable physical identification.*

(iii) Skin *is representational surplus: units, coordinates, labels, gauges, charts, schemes, normalizations, or syntax that organize presentation without independent admissibility-bearing authority.*

The names are not meant to replace standard physics terminology. They state the role question that standard terminology often leaves implicit. Gauge choice, for example, is skin relative to gauge-invariant observables, while gauge structure can be anchor relative to a particle-physics comparison domain. A value of a coupling at a scale may be effective and transport-defined; its raw coordinate value is not the same object as the invariant physical relations extracted from the trajectory.

The ATS distinction formalizes operational separations already implicit in ordinary physical practice: admissibility conditions, invariant physical structure, and representational coordinatization. It is not an imposed metaphysical hierarchy. It names the difference between specifying the conditions under which a domain is available, extracting invariant physical load from equivalent descriptions, and choosing a representation in which calculations can be performed. The terminology is useful because these tasks are routinely conflated when all constant-like symbols are placed into a single parameter list.

3.1 Role hierarchy

The hierarchy can be represented schematically:

Anchor
admissibility conditions, object-class, law-form
gauge/symmetry skeleton, identity persistence

$\Downarrow$ permits

Tensor
invariant physical load, quotient-level observables
conserved relations, standing-bearing ratios

$\Downarrow$ admits presentation as

Skin
coordinates, units, gauge choices
renormalization schemes, chart labels, notation

The arrows are not generative in the ontological sense. They record dependence of admissible use. Skin can present tensor load only when the anchor conditions are already fixed. Tensor load can be recognized only through the quotient that identifies equivalent presentations. Treating anchors as skin-level coordinates changes the admissibility domain.

Lemma 3.2 (ATS exhaustion)**.** *On a fixed admissibility domain, any admissibility-bearing effect of a descriptive element is one of three types: anchor change, tensor-load change, or skin variation. If it has no such effect, it is inert relative to the admissibility question.*

Proof. A descriptive element can affect admissible use by changing the conditions under which the domain is available, changing the quotient-level content preserved across admissible redescription, or changing only how that content is represented. These are respectively anchor, tensor, and skin effects. A fourth same-domain effect would have to change admissible use while changing neither precondition, invariant load, nor presentation. There is no remaining locus in the fixed-domain structure for such an effect. If the fourth effect is introduced by adding a new witness, scope, primitive, or selector, the domain has changed; if not, the effect is only a renamed instance of one of the three roles. □

Corollary 3.3 (No cross-role substitution)**.** *A constant-like quantity is not interpreted stably by transferring the authority of one role to another. Skin does not determine tensor load. Effective envelope coefficients are not unbounded anchors. Transport-defined coordinates are not independent scalar primitives. Anchor changes are not same-domain parameter variation.*

Proof. Each substitution changes the admissibility locus of the object under discussion. The substituted authority either has no standing-bearing effect, changes only presentation, or changes the domain itself. It therefore does not preserve the role carrier required for same-domain comparison. □

4 The Five-Role Taxonomy

The three ATS roles are the deep decomposition. Physical constants, however, appear in a more refined set of physics-facing roles. The five-role taxonomy below is the practical classification induced by ATS together with envelope and transport discipline.

Definition 4.1 (Admissibility-role classes)**.** *Let C be a constant-like quantity in a fixed admissibility domain D. Its admissibility-bearing role-components fall into the following classes:*

A **Admissibility-fixed.**
A role-component that fixes the domain's object-class, witness eligibility, law-form, symmetry skeleton, or admissibility envelope. Varying it is domain change, not same-domain parameter variation.

Q **Quotient-dependent.**
A role-component that is standing-bearing only after a quotient relation has identified equivalent presentations. Its value is not raw coordinate data but invariant content relative to the quotient.

E **Effective.** *A role-component whose validity is bounded by scale, regime, cutoff, matching condition, or EFT envelope. It is physical inside the envelope and not primitive outside it.*

T **Transport-defined.**
A role-component whose identity is carried by lawful transition between presentations, bases, scales, or regimes. Its standing lies in preserved transport behavior.

P **Presentation-dependent.**
A role-component that organizes representation without independent standing-bearing authority: units, charts, gauges, schemes, normalizations, labels, regulator coordinates, or notation. The term marks dependence on a choice of presentation; it is not a judgment that the associated calculational structure is dispensable.

The classes do not imply that every printed symbol has one role in every sentence. The same symbol may carry a composite profile. For example, c may be a unit conversion in a relativistic unit system, a marker of Lorentzian causal structure in a structural discussion, and a measured conversion factor in a metrological context. These are not contradictions. They are different role-components attached to one symbol in different fixed domains.

Definition 4.2 (Role profile)**.** *The* role profile *of C in D, written $\mathsf{Prof}_{\mathsf{D}}(C)$, is the finite decomposition of the admissibility-bearing uses of C into components of the five classes in Definition 4.1. A role profile is resolved when each component has a fixed authority locus: domain, quotient, envelope, transport, or presentation.*

Definition 4.3 (Presentation-dependent quantity)**.** *A constant-like quantity, or a component of such a quantity, is* presentation-dependent *in D iff admissible redescription can change its numerical or symbolic presentation while preserving every standing-bearing witness relation, quotient-invariant content, envelope-valid prediction, and lawful transport relation in D. If changing the item changes empirical identification, quotient content, envelope validity, or transport behavior, then the item is not purely presentation-dependent, even if some coordinate presentation of it is conventional.*

Lemma 4.4 (Presentation-dependence is invariant-preserving representation)**.** *Presentation-dependent variation is representational variation, not a denial of physical relevance. A presentation-dependent component may be indispensable for calculation while still lacking independent standing-bearing authority.*

Proof. By Definition 4.3, a presentation-dependent component is exactly the part that can change under admissible redescription while preserving witness, quotient, envelope, and transport structure. It may be necessary to write equations, choose a gauge, normalize fields, set units, or regulate an intermediate calculation. Necessity for calculation or representation does not make it independent tensor load. □

4.1 Primary examples

Table 1: Initial role assignments for common constant-like targets.

Target	**Typical primary role**	**Reason**
Gauge group and representation skeleton	A / anchor	Changes object-class, admissible charge ledger, witness compatibility, and transport structure if varied.
Symmetry structure	A or tensor	May define the admissibility domain itself or provide invariant constraints inside it.
Dimensionful unit constants	P with possible anchor residue	Numerical value depends on units; invariant role may reflect deeper causal, quantum, or thermodynamic structure.
Fine-structure constant α	Q, E, T depending on scale context	Dimensionless quotient-bearing relation; measured/effective at a scale; transported under RG.
Gauge couplings g_i	E / T plus skin coordinates	Raw values are scheme and scale attached; physical role is extracted through witness and RG transport.
Mass ratios	Q / boundary-envelope	Dimensionless standing-bearing relations relative to a fixed particle identity ledger; often empirical inputs.
Yukawa eigenvalues	boundary-envelope / Q	Admissible entries in the admissible parameter interior, not generally derived by the fixed-domain theorem alone.
Higgs vacuum expectation value	A / E depending on target	Sets electroweak mass-generation structure inside Standard-Model role structure, but its numerical representation is scale/scheme/envelope dependent.
QCD scale Λ_{QCD}	E / T	Arises through RG and dimensional transmutation; not a raw primitive scalar.
CKM parameters	T / Q	Encode transport between weak-interaction and mass bases, with observable quotient residues.
PMNS parameters	T / Q	Encode flavor-to-mass transport and oscillation witness reconstruction.
CP phases	T tensor residue	Physical only through basis-invariant transport effects and witness residues.
Renormalization scheme labels	P	Organize calculation; no independent standing-bearing authority without invariant extraction.
Regulator cutoffs	P or E	Presentation artifact when removed or matched; effective boundary when part of a finite envelope.

Target	Typical primary role	Reason
Formal parameter scan	formal multiplicity, not a role by itself	Legitimate as notation or modeling tool; becomes physical comparison only in an explicitly gated target domain.
Replicated identical sectors	redundancy / finite envelope input	Standing-indistinguishable duplication is eliminable; surviving finite multiplicity requires non-degenerate distinguishing structure or envelope certification.

4.2 Role diagnostics

The following diagnostics fix the comparison target.

(D1) If changing the item changes what counts as the same object, the same witness, or the same theory-domain, the item has an admissibility-fixed component.

(D2) If changing the item changes invariant content only after quotienting equivalent presentations, the item has a quotient-dependent component.

(D3) If changing the item is meaningful only relative to a scale, cutoff, matching regime, or operational envelope, the item has an effective component.

(D4) If changing the item is meaningful only through a lawful map between bases, schemes, scales, or regimes, the item has a transport-defined component.

(D5) If changing the item changes only notation, labels, units, coordinates, gauge, or scheme presentation while the witness ledger is preserved, the item has a presentation-dependent component.

These diagnostics are not independent tests of numerical truth. They are tests of admissibility role.

4.3 Role-classification flow

The diagnostic sequence can be summarized as a fixed-domain decision flow. The flow is not a discovery algorithm for numerical values; it is a guard against assigning a physical interpretation before the role carrier has been identified.

Role classification flow

F1. If the proposed variation alters admissibility conditions, object-class, or witness eligibility, the component is admissibility-fixed (A).

F2. If standing arises through quotient identity after equivalent presentations are identified, the component is quotient-dependent (Q).

F3. If validity is bounded by scale, cutoff, matching, regime, or EFT envelope, the component is effective (E).

F4. If standing is carried by lawful reconstruction between bases, schemes, scales, or regimes, the component is transport-defined (T).

F5. If representation changes while the preceding structures are preserved, the component is presentation-dependent (P).

The sequence is applied relative to a fixed admissibility domain; a symbol with multiple admissibility-bearing uses receives a composite role profile. If comparison crosses domains, the family must be retyped as an explicitly gated target-domain comparison.

4.4 Classification architecture

The later transport and ensemble results can be summarized in one classification architecture. The point is to prevent a common overreading: the theorem does not deny formal families or controlled scans. It denies inherited standing-bearing authority from multiplicity alone. The architecture below is therefore diagnostic rather than prohibitive: it shows which role must be fixed before variation, scanning, or explanation can be treated as standing-bearing.

Constant-role classification architecture

A1. Start with a constant-like symbol or family.

A2. Fix its role profile: anchor, quotient, effective, transport, presentation.

A3. Preserve the continuation locus under redescription, scale, basis, or envelope comparison.

A4. Retype cross-domain family comparison as an explicitly gated target domain.

A5. Only then ask about variation, scan, selection, or explanation.

4.5 Orthogonality of the five classes

The five classes are related, but they are not interchangeable. Their orthogonality is functional rather than numerical: each class answers a different admissibility question.

Table 2: Functional separation of the five role classes.

Class	**Admissibility question answered**	**Boundary with neighboring classes**
A admissibility-fixed	What must be held fixed for the domain, object-class, witness ledger, or law-form to be the one under comparison?	Not an effective knob inside the same domain; changing it changes the comparison target.
Q quotient-dependent	What invariant content remains after equivalent presentations have been identified?	Not mere presentation variation: the quotient removes skin, but the surviving relation can carry tensor load.
E effective	Within which scale, regime, cutoff, approximation, or matching envelope is the quantity licensed?	Not primitive outside the envelope; not arbitrary while inside it.
T transport-defined	Which lawful map carries identity across bases, schemes, scales, or regimes?	Not reducible to a scalar coordinate; the standing is in reconstruction behavior.
P presentation-dependent	Which representational choices can vary while all standing-bearing witness and transport structure is preserved?	Not a denial of physical relevance; only the presentation is non-authoritative.

Thus quotient-dependence, effectiveness, and transport-definition do not collapse into one another. A quotient-dependent value gains standing from an equivalence relation. An effective value gains standing from a bounded operational envelope. A transport-defined value gains standing from a lawful map connecting presentations or regimes. A single symbol may display several of these components, but the components answer different questions and are not interchangeable.

4.6 Quotient and transport distinction

The distinction between quotient-dependent and transport-defined roles is especially important. Quotient-dependent quantities derive standing from equivalence-class identification: they state what remains invariant after admissibly different presentations are identified as the same physical content. Transport-defined quantities derive standing from lawful transformation: they state how identity, phase, scale, basis, or regime information is reconstructed across admissible presentations. Quotient structure concerns invariant identity; transport structure concerns admissible reconstruction. The same physical example may involve both, but the admissibility work is different.

4.7 Role-class examples

The following table gives a role-by-role guide. It is not a list of final numerical classifications; it is a diagnostic map for avoiding role compression.

Table 3: Examples by primitive role class.

Role	Representative targets	Role rationale	Role error
A	Gauge skeleton, Lorentzian causal structure, admissible symmetry class, representation compatibility	These determine the comparison domain, witness ledger, and lawful object-class before parameter variation is available.	Treating a domain-defining structure as a dial inside the same theory.
Q	Mass ratios, basis-invariant Yukawa data, dimensionless observable combinations, fixed-point invariants	Their standing is the relation that survives quotienting of equivalent presentations, not a raw coordinate entry.	Treating quotient-level relations as raw values before the quotient and witness ledger are fixed.
E	Wilson coefficients, low-energy constants, running couplings at a specified scale, cutoff-dependent coefficients	Their physical authority is bounded by scale, matching, approximation, and operational envelope.	Treating an envelope-bound coefficient as an unrestricted primitive constant.
T	RG trajectories, CKM and PMNS mixing data, basis-reconstruction matrices, matching maps, phase residues	Their standing is carried by lawful reconstruction between admissible presentations or regimes.	Treating transport coordinates as independent scalar facts detached from the map that gives them standing.
P	Unit choices, gauge choices, chart coordinates, renormalization scheme labels, normalizations, removable regulator artifacts	These are indispensable representational devices whose variation preserves witness, quotient, envelope, and transport structure.	Treating representational freedom as invariant tensor load, or dismissing tensor load because one coordinate presentation is conventional.
Target-domain family	Controlled scans, BSM families, landscape-style parameterized models	These are admissible only when the family supplies its own gate, witnesses, transport, quotient, and role profiles.	Treating the written family as already standing-bearing merely because it is indexed.

5 Main Classification Theorem

The main theorem follows from fixed-domain admissibility, ATS exhaustion, and envelope/transport discipline.

Theorem 5.1 (Role exhaustion theorem)**.** *Let* D *be a fixed admissibility domain and let* C *be a* *constant-like quantity admitted into physical use in* D*. The admissibility-bearing contribution of* C *admits a finite role profile whose primitive components are exhausted by*

$$\{\mathsf{A}, \mathsf{Q}, \mathsf{E}, \mathsf{T}, \mathsf{P}\}.$$

No sixth primitive same-domain role exists. Any proposed additional role either decomposes into the five classes, changes the fixed domain, imports additional selector or measure structure, or has no standing-bearing authority.

Any purported sixth role must either modify admissibility conditions, quotient identity, envelope scope, lawful transport structure, or representational presentation. Since these possibilities are jointly exhaustive under standing-preserving physical identification, no independent sixth role remains.

Proof. Let r be a primitive admissibility-bearing role-component of C in D. Since r is admissibility-bearing, changing or removing it must affect at least one condition by which C is physically usable: domain eligibility, invariant content, envelope validity, lawful transport, or presentation.

If r affects domain eligibility–the object-class, witness ledger, law-form, symmetry skeleton, admissibility envelope, or identity conditions of the comparison–then r is admissibility-fixed, class A. It is not a same-domain variable, because the same-domain comparison has lost one of its defining conditions.

If r does not fix the domain but affects what remains invariant after equivalent presentations are identified, then the role is quotient-dependent, class Q. Its standing is not the raw coordinate but the relation that survives quotienting.

If r does not derive its authority from quotient identification alone but is licensed only within a scale, cutoff, approximation, matching relation, or operational regime, then it is effective, class E. Its standing is real within the envelope and not primitive outside it.

If r does not primarily fix an envelope but carries identity through a lawful map between bases, schemes, scales, or regimes, then it is transport-defined, class T. Its standing lies in reconstruction or continuation behavior, not in an isolated scalar value.

If varying r changes only notation, units, labels, gauges, charts, schemes, normalizations, or regulator presentation while preserving all witness, quotient, envelope, and transport structure, then by Definition 4.3 and Lemma 4.4 it is presentation-dependent, class P.

These alternatives exhaust the available loci of admissible physical use in D: domain, quotient, envelope, transport, and presentation. A sixth primitive role would have to change admissible use while changing none of these loci. If it changes a new witness, primitive, measure, scope, or selector, D has been enlarged or replaced. If it changes no such structure, it is either a composite notation already decomposable into the five classes or an inert label. Therefore the five classes are exhaustive. $\square$

Corollary 5.2 (Non-ad-hocness of the taxonomy)**.** *The five-role classification is forced by the fixed-domain carrier of physical use, not chosen as a convenient list of interpretive labels.*

Proof. Each class corresponds to one and only one admissibility locus: domain, quotient, envelope, transport, or presentation. Removing any locus leaves ordinary physical practice unable to distinguish a domain change, invariant-content change, envelope restriction, lawful continuation, or representational redescription. Adding another primitive locus changes the carrier itself. The classification is therefore an exhaustion of admissibility functions rather than a relabeling of familiar quantities. $\square$

Corollary 5.3 (No homogeneous constant space)**.** *A same-domain parameter space obtained by placing all constant-like quantities in* D *into a single homogeneous coordinate list while ignoring role type is not licensed by admissibility alone.*

Proof. A homogeneous list suppresses the distinction between anchor change, quotient variation, envelope-bounded coefficient, transport coordinate, and presentation-dependent representation. By Theorem 5.1, these are different admissibility loci. A single coordinate space can be introduced only after additional structure specifies how these roles are compared, weighted, transported, and interpreted. If that structure is supplied, the result is an explicitly gated target-domain family in the sense of Definition 2.7. Without that structure, the list is notation rather than a standing-preserving parameter space. ☐

Corollary 5.4 (Role-before-explanation principle)**.** *Before a constant-like quantity can be varied, selected, fine-tuned, anthropically conditioned, or explained, its role profile* $\mathsf{Prof}_{\mathsf{D}}(C)$ *must be fixed.*

Proof. Variation and explanation are role-sensitive. Varying an anchor is domain change; varying skin is redescription; varying an effective coefficient requires envelope discipline; varying a transport-defined quantity requires transport laws; varying a quotient-dependent invariant requires the quotient and witness ledger. Therefore the role profile is prior to any admissible explanatory operation. ☐

Proposition 5.5 (Boundary-input non-derivation)**.** *If a numerical value is required by a fixed admissibility domain but is not fixed by its anchor, quotient, envelope, or transport structure, then within that domain it is a boundary or envelope input rather than an internally derived constant.*

Proof. Theorem 5.1 exhausts the admissibility-bearing roles. If the value is required but not fixed by any internal standing-preserving role, the remaining admissible source is boundary/envelope entry. Internalizing it without additional witness or transport would import a selector not present in the fixed domain. ☐

6 Family-Level Role Discipline

The five-role theorem classifies role-components. Family-level comparisons add one further obligation: the role being varied must remain identifiable across the family. The same symbol occurring at different points of a scan does not by itself guarantee that the same admissibility role is being transported.

Proposition 6.1 (Constant-role continuation criterion)**.** *A variation of a constant-like quantity counts as variation of the same standing-bearing role only if a constant-continuation locus is preserved through the variation. If the locus is absent, the proposal is a formal family, a presentation change, a new target-domain comparison, or an inadmissible standing transfer.*

Proof. By Definition 2.8, the continuation locus is the structure by which the role-carrier remains the same through redescription, transport, matching, or family comparison. If the locus is preserved, the five-role taxonomy applies to the variation. If it is not preserved, there is no fixed target for the claim that one constant has varied. The remaining possibilities are formal notation, a harmless presentation change, a retyped target domain with its own gate, or an unlicensed transfer of standing from one domain to another. ☐

Proposition 6.2 (Continuous constant-family discipline)**.** *A continuous constant-family component admitted into standing-preserving comparison is either presentation-trivial, quotient-stabilized under* *transport, or a transport-neutral envelope input. If closed admissible transport induces standing-distinguishable holonomy that is not quotient-stabilized, the component is not an admissible same-domain continuous role.*

Proof. A continuous coordinate that changes only by admissible redescription is presentation-dependent. A coordinate whose transport effects survive only through a discrete or invariant quotient is quotient-dependent or transport-defined after quotient stabilization. A continuous value unaffected by transport and not eliminable is an envelope input. If closed transport changes standing-bearing content without quotient closure, the same role returns with distinguishable standing after a loop, violating transport closure for the fixed comparison domain. □

Proposition 6.3 (Multiplicity discipline for replicated sectors)**.** *Replicated constant-like sectors are admissible only when the multiplicity is non-redundant, finite or otherwise explicitly certified, and transport-compatible. Standing-indistinguishable duplication is eliminable; unbounded inherited replication does not become a physical parameter merely by being indexed.*

Proof. If replicated sectors are exchangeable by admissible redescription and introduce no standing-distinguishable structure, the replication is redundant. If labels distinguish the copies without witness or transport support, the labels are presentation-dependent or illicit selector load. A surviving multiplicity must therefore either be forced by non-degenerate role structure or be declared as an irreducible envelope input in an explicitly gated target domain. □

Corollary 6.4 (Classification before ensemble explanation)**.** *Fine-tuning, anthropic, landscape, or multiverse arguments over constants require more than a family of symbols. They require role profiles, continuation loci, target-domain typing, and comparison authority.*

Proof. Such arguments compare alternatives. Alternatives are standing-bearing only when the roles being compared persist under the comparison and the family has declared authority to relate them. Propositions 6.1–6.3 provide the required conditions. Without them, the family is formal notation or a newly needed target domain, not an inherited parameter space. □

7 Dimensionful and Dimensionless Constants

Dimensionlessness removes one source of arbitrariness, but not all sources of role ambiguity. This section records the discipline needed for dimensionful and dimensionless quantities.

7.1 Dimensionful constants

Dimensionful constants are not direct metaphysical explananda without unit discipline. The numerical value of c, $\hbar$, G, or k_B depends on units. This does not mean these symbols lack physical significance. It means their role profile must distinguish numerical skin from invariant load.

Proposition 7.1 (Unit-skin separation)**.** *For a dimensionful constant-like quantity C, a change of units that preserves the witness ledger and lawful transport changes only presentation skin. Any invariant physical content associated with C must be isolated as a dimensionless relation, a structural anchor, or a transport law.*

Proof. Unit transformation changes numerical representation. If all empirical predictions, quotient relations, and transport rules are preserved, the standing-bearing content is unchanged. Therefore the unit-dependent numerical value is skin. Whatever remains invariant under the transformation is not the raw dimensionful number but a relation, anchor, or transport structure. □

Examples illustrate the point. The numerical value of c can be set to 1 by units, but Lorentzian causal structure is not thereby erased. The numerical value of $\hbar$ can be normalized, but the distinction between classical and quantum commutation structure is not merely a unit convention. The role of G in a given domain may be effective, dimensional, or structural depending on whether the target is Newtonian phenomenology, relativistic gravitation, or a putative quantum-gravity regime. A classification theorem does not deny any of these roles; it prevents their conflation.

7.2 Dimensionless constants

Dimensionless constants are more subtle because their numerical values are not removable by ordinary unit changes. It is tempting to regard them as pure parameter facts. That temptation is premature. Dimensionlessness removes unit dependence, but it does not determine admissibility role.

Proposition 7.2 (Dimensionlessness is not primitive standing)**.** *A dimensionless number is not automatically a primitive standing-bearing constant. It becomes standing-bearing only when its quotient relation, witness ledger, admissibility envelope, and transport behavior are fixed.*

Proof. Dimensionlessness removes unit dependence, not role dependence. A dimensionless ratio may still depend on particle identity, regime, scale, scheme, basis, normalization, or boundary data. Without those conditions, the number lacks a fixed physical carrier. Therefore dimensionlessness is necessary for some invariant comparisons but insufficient for primitive standing. □

Table 4: Dimensionless quantities by role.

Quantity	**Primary role**	**Classification note**
Fine-structure constant at specified scale	Q/E/T	Dimensionless, but tied to observable quotient structure and RG transport.
Electron-proton mass ratio	Q plus boundary input	Standing-bearing after particle identity ledger is fixed; numerical value generally empirical.
Yukawa eigenvalue ratios	Q / boundary-envelope	Basis-invariant only after diagonalization and quotient discipline.
CKM and PMNS angles	T/Q	Encode basis transport; not independent raw scalar facts.
CP-violating phases	T tensor residue	Physical through invariant phase residues and witness effects.
Group ranks and representation multiplicities	A or tensor	Structural role depends on whether they define the domain or occur inside it.
Critical exponents	E/Q	Universal within a class, but class-relative and envelope-bound.

The key error is the inference:

$$\text{dimensionless} \quad \Longrightarrow \quad \text{freely variable primitive scalar.}$$

The classification theorem blocks that inference. Dimensionless values can be invariant and important, but they still require role typing.

8 Gauge Structure, Symmetry Constants, and Admissibility-Fixed Roles

Gauge structure is a direct example of admissibility-fixed role. A gauge group, representation skeleton, charge ledger, and associated symmetry constraints are not ordinary knobs inside a fixed Standard-Model-like comparison domain. They participate in the identity conditions for the domain itself.

8.1 Gauge structure as anchor

Proposition 8.1 (Gauge skeleton anchor)**.** *Within a fixed particle-physics comparison domain, the gauge skeleton and representation compatibility conditions have an admissibility-fixed component. A change in this component changes the object-class, witness ledger, anomaly/cancellation conditions, charge ledger, or transport structure, and is therefore domain change unless an explicit cross-domain bridge is supplied.*

Proof. Gauge skeleton fixes which fields are compared, how charges are assigned, which interactions are admissible, what gauge redundancies count as skin, and what invariant observables can be formed. Changing the skeleton changes at least one of these features. By Definition 2.1, the domain is then no longer fixed. A theory with a different gauge group may be legitimate, but it is not a same-domain variation of a constant inside the original domain. □

This does not mean every gauge-related symbol is anchor. Gauge choices are skin. Gauge-invariant relations are tensor. Coupling values are effective/transport-defined. The gauge skeleton itself, however, is anchor relative to the domain it makes possible.

8.2 Symmetry constants

Symmetry-related quantities require the same discipline. Lie algebra structure constants, group dimensions, Casimirs, representation labels, and discrete signs may appear as constants, but their role depends on the carrier.

(S1) A choice of basis for a Lie algebra changes structure constants as coordinates; this is presentation skin if the algebraic object is preserved.

(S2) Group invariants such as rank, representation content, or Casimir eigenvalues may carry tensor load inside a fixed domain.

(S3) A different symmetry class or representation ledger may change the admissibility anchor of the domain.

(S4) Spontaneously broken symmetry data may have effective and boundary-envelope components, because the low-energy description inherits structure from a vacuum or phase.

The classification avoids a common ambiguity. Symmetry is not always a fixed anchor, and symmetry-related numbers are not always invariant tensor. The same family of symbols can carry different roles. The role profile supplies the correct comparison class.

9 Gauge Couplings and RG Transport

Gauge couplings are the central test case for any classification of constants. They are often called constants, yet their numerical values run with scale and depend on renormalization scheme. This is not a counterexample to role discipline; it is the reason role discipline is necessary.

9.1 Raw values, schemes, and transport

A raw coupling value such as $g_i(\mu)$ is incomplete without specifying the scale μ, scheme, matching conditions, and observable extraction procedure. Its role is not a primitive scalar invariant. Its role is effective and transport-defined.

Definition 9.1 (RG-transported coupling)**.** *An* RG*-transported coupling in a fixed domain is a scale- and scheme-attached coordinate together with a licensed flow law, matching ledger, and invariant witness extraction rule. Its physical use is the equivalence class of admissible presentations that preserve the same transported witness content.*

Proposition 9.2 (RG transport is not arbitrary reassignment)**.** *Renormalization-group evolution preserves standing when it is generated by lawful scale transport internal to a fixed admissibility envelope. Arbitrary reassignment of a coupling value, by contrast, is admissible only if accompanied by a new envelope, witness ledger, or transport rule; otherwise it is not a same-domain variation.*

Proof. RG evolution maps one scale-attached presentation to another according to a licensed flow relation. The transformed coordinate is accompanied by a rule that preserves observable extraction, comparison, and the constant-continuation locus of the coupling trajectory. Arbitrary reassignment supplies a new number without the flow relation. If the reassignment changes no witness, it is skin or redundancy. If it changes witnesses while preserving the same domain without transport, it fails to preserve the fixed-domain conditions. If it supplies new transport or matching data, the admissible domain has been enlarged, matched, or retyped. □

9.2 Classification of coupling roles

Gauge coupling parameters decompose as follows.

(G1) **Coordinate role:** the printed value of g_i in a scheme is presentation skin relative to invariant witness content.

(G2) **Effective role:** the value at a scale and within a regime is an effective coefficient.

(G3) **Transport role:** the running trajectory and matching relations are transport-defined.

(G4) **Quotient role:** scheme-independent observable combinations and fixed-point data can carry quotient-dependent tensor content.

(G5) **Boundary role:** initial or matching values may be empirical envelope inputs.

This decomposition avoids two errors. One error says: because couplings run, constants are not fixed in any standing sense. The other says: because a coupling appears in a Lagrangian, its numerical value is a primitive invariant. Both claims are too coarse. Couplings are not primitive fixed scalars, but neither are they unstructured free knobs. Their admissibility role is carried by envelope-bounded transport.

9.3 Fine-structure constant

The fine-structure constant illustrates the same point. A value of α is dimensionless, but it is not role-free. At low energy it is a measured quotient relation. At higher energies it is attached to a scale and scheme. Its value participates in scattering amplitudes, spectroscopy, and electromagnetic interaction strength through a witness ledger. It is transported under RG. It may be expressed through $e^2/(4\pi\epsilon_0\hbar c)$ in SI-like notation, but the dimensionful ingredients there include unit and normalization skin. The standing-bearing content is the quotient/effective/transport profile, not an untyped raw symbol.

The classification is therefore:

$$\mathsf{Prof}_{\mathsf{D}}(\alpha) = \{\mathsf{Q}, \mathsf{E}, \mathsf{T}\} \quad \text{with presentation data as needed.}$$

This is why α is a better target for classification than for immediate derivation. The first task is not to compute its value. The first task is to state what kind of physical object its value is in the domain under discussion.

10 Mass Ratios, Yukawas, and Boundary Inputs

Masses and Yukawa parameters are frequent sources of fine-tuning and free-parameter claims. The classification theorem gives a disciplined way to handle them without pretending to derive their observed values.

10.1 Masses and mass ratios

A mass value is dimensionful and therefore unit-sensitive. A mass ratio is dimensionless and may be standing-bearing, but only after the relevant particle identities and measurement ledger are fixed.

Proposition 10.1 (Mass-ratio quotient dependence)**.** *A mass ratio is quotient-dependent relative to a fixed particle-identity ledger. If the identities, regime, or extraction procedure change, the ratio is not the same standing-bearing object unless a transport rule supplies continuity.*

Proof. A ratio such as m_e/m_p presupposes stable identification of electron and proton states, mass extraction procedures, and admissible comparison of the resulting quantities. These are quotient and witness conditions. Without them the number is not attached to a fixed physical object. With them the ratio carries standing-bearing content, typically as an empirical boundary or envelope input rather than an internally derived value. □

Mass ratios are therefore not merely presentation-dependent. They carry quotient-level content. But they are not automatically admissibility-fixed anchors. Their role depends on whether changing them changes the identity ledger, alters effective phenomenology inside the same domain, or explores a controlled target-domain family with declared boundary data, transport, and witness conditions.

10.2 Yukawa entries

Yukawa parameters are especially important because they generate much of the observed fermion mass hierarchy in the Standard Model after electroweak symmetry breaking. The classification result is correspondingly limited: it identifies their admissibility role without claiming to derive their measured numerical values.

Within Standard-Model role structure, Yukawa matrices and their invariant decompositions have several roles:

(Y1) The existence of Yukawa-type coupling structure belongs to the admissible parameter interior once the representation ledger and electroweak structure are fixed.

(Y2) The raw matrix entries are basis-dependent skin until quotient normal form is specified.

(Y3) Eigenvalues and invariant combinations are quotient-dependent quantities.

(Y4) Their measured values are generally boundary or envelope inputs inside the fixed-domain theorem.

(Y5) Their evolution under scale changes is effective/transport-defined.

Proposition 10.2 (No same-interior Yukawa value fixation)**.** *The classification theorem assigns admissibility roles to Yukawa structures but does not, by itself, fix the observed numerical eigenvalues. Treating those values as internally derived without additional witness, anchor, or transport structure is a scope extension.*

Proof. The role profile explains how Yukawa data may enter the domain: as basis-sensitive matrices, quotient-level eigenvalues or invariant combinations, effective running quantities, and boundary inputs. None of these roles supplies a numerical selector unless further structure is introduced. Therefore the values are classified, not derived, by the theorem. □

10.3 Higgs vev and QCD scale

The Higgs vacuum expectation value and the QCD scale show why a single symbol can carry more than one role.

The Higgs vacuum expectation value participates in the electroweak mass-generation structure, so it can function as an anchor/effective component relative to Standard-Model role structure. But its numerical representation is scheme-sensitive and empirically calibrated. A discussion of its fine-tuning must therefore specify whether the target is the electroweak structure, the measured low-energy input, the RG behavior, or a UV matching problem.

The QCD scale is not simply inserted as a primitive number. It is tied to RG transport and dimensional transmutation. Its standing lies in effective/transport-defined structure and in the witness ledger of strong-interaction phenomenology. Treating it as a raw arbitrary scalar misses the classification.

11 Mixing Parameters as Transport-Defined Constants

CKM and PMNS parameters are among the strongest examples of transport-defined constants. They are numerical only after bases, quotient conventions, and observable residues are fixed.

Proposition 11.1 (Reconstruction transport)**.** *A parameter whose standing is carried exclusively by lawful reconstruction between admissible bases, schemes, regimes, or observational contexts is transport-defined rather than primitively free. Its physical target is the reconstruction structure modulo admissible quotienting, not the raw coordinate used to display that structure.*

Proof. If the parameter has no independent witness outside the reconstruction map, then changing the coordinate without the map changes only presentation, while changing the map changes the physical transport relation. The admissibility-bearing object is therefore the lawful reconstruction relation and its quotient-invariant residues. A primitive scalar interpretation would detach the number from the only structure that gives it standing. □

11.1 CKM matrix

The CKM matrix relates weak-interaction and mass bases in the quark sector. Its angles and phase are not independent scalar decorations. They instantiate Proposition 11.1: their role is to encode the transport relation between two standing presentations.

Proposition 11.2 (CKM transport role)**.** *In a fixed Standard-Model-like domain, CKM parameters are transport-defined with quotient-dependent invariant residues. Their physical standing lies in basis-reconstruction behavior and observable weak-interaction effects, not in raw matrix coordinates independent of basis discipline.*

Proof. A CKM matrix changes under quark-field phase conventions and basis choices. Physical content is extracted through invariant combinations and observable transition amplitudes. The object that survives admissible redescription is therefore the transport relation modulo the quotient, with CP-type residues as tensor content. Raw coordinates are skin until the quotient and basis conventions are fixed. □

11.2 PMNS matrix and neutrino oscillation

The PMNS matrix has the same general role, again as an instance of Proposition 11.1, with an especially clear witness ledger: neutrino oscillation. Flavor identity at production and detection is related to mass-basis propagation by lawful transport. The standing object is not a present-only flavor label. It is the transport-compatible reconstruction between production, propagation, and detection contexts.

Proposition 11.3 (PMNS transport role)**.** *PMNS parameters are transport-defined quantities whose standing is fixed by flavor-to-mass reconstruction and oscillation witness compatibility. Their role is not reducible to independent scalar values detached from the transport problem.*

Proof. Oscillation phenomenology requires production flavor, mass-basis propagation, phase accumulation, and detection flavor to be part of one lawful comparison structure. The PMNS parameters coordinate that structure. Changing them without preserving the witness ledger changes the oscillation content; changing only representation conventions is skin. Thus the admissibility-bearing component is transport-defined and quotient-dependent. □

11.3 CP phases as tensor residues

CP phases are not physical merely because a phase appears in a matrix. Many phases can be removed by redefinition. The physical residue is the portion that survives quotienting and appears in invariant witness effects. Thus CP-type phases are transport-defined tensor residues. Their role is neither purely presentation-dependent nor primitively scalar.

12 Effective Constants and Envelope Discipline

Effective constants are not second-class physics. They are disciplined physics. Their validity is bounded by the envelope that makes them meaningful.

Definition 12.1 (Effective constant)**.** *An* effective constant *is a constant-like quantity whose standing is licensed only within a specified operational regime, scale range, cutoff, approximation, matching condition, or EFT envelope.*

Proposition 12.2 (Envelope authority)**.** *An effective constant is not an unrestricted primitive unless a UV or cross-envelope transport structure is supplied, or the domain is changed.*

Proof. The effective coefficient is individuated by the envelope. Removing the envelope removes part of the witness and transport conditions that make the coefficient physical. If a UV completion or matching rule is supplied, the object becomes part of a larger domain with new transport. If no such rule is supplied, the promotion is unsupported scope extension. □

This proposition is compatible with ordinary EFT practice. An EFT may use coefficients without pretending they are primitive. It may fit them, run them, match them, and use them predictively inside the envelope. The classification theorem objects only when the coefficient is treated as if it possessed standing outside the conditions that define it.

12.1 Low-energy constants and Wilson coefficients

Low-energy constants and Wilson coefficients usually have role profiles of the form

$$\mathsf{Prof}_{\mathsf{D}}(C) = \{\mathsf{E}, \mathsf{T}, \mathsf{Q}\} \quad \text{plus boundary data and presentation-sensitive representation.}$$

They are effective because their validity is envelope-bound; transport-defined because matching and running relate descriptions; quotient-dependent because physical content is extracted from invariant combinations and observables; and presentation-sensitive because basis and normalization choices affect raw coordinates.

The classification helps prevent two opposite mistakes: dismissing effective constants as mere artifacts, and treating them as unrestricted primitive constants. They are physically real within their domain because they carry admissible witness load there. They are not primitive outside that domain unless additional structure provides continuation.

13 AMetric Boundary and the No-Selector Result

The AMetric boundary records a modest but important limitation: a pre-admissible parameter proposal does not acquire metric, measure, ranking, selector, or typicality authority by notation alone.

Definition 13.1 (Pre-admissible parameter proposal)**.** *A* pre-admissible parameter proposal *is a formal collection of possible values, coordinates, assignments, sectors, or family indices presented before the admissibility envelope, witness ledger, quotient relation, role-continuation locus, and transport rules that would make those entries physically comparable have been fixed.*

Proposition 13.2 (No default selector)**.** *A pre-admissible parameter proposal has no canonical standing-preserving selector, metric, measure, typicality order, or privileged representative derivable from the bare proposal alone. Such structure must be supplied by an admissible domain or declared as additional model structure.*

Proof. Before admissibility is fixed, the proposal side does not by itself supply the standing structure needed to privilege labels, distances, rankings, or representatives. Any nontrivial measure or selector must either be imported from post-admissible structure, declared as new model structure, or treated as heuristic. It is not inferred from the bare existence of coordinates. □

Corollary 13.3 (Fine-tuning measure discipline)**.** *Fine-tuning claims over constant-like quantities require role profiles, continuation loci, target-domain typing, and measure authority. A probability over anchors, quotient invariants, effective coefficients, transport data, presentation coordinates, or replicated sectors is not canonically licensed until the ensemble, quotient, witness ledger, transport, and measure are supplied.*

Proof. By Theorem 5.1, the coordinate list contains role-heterogeneous objects. By Proposition 13.2, no canonical measure follows from the pre-admissible list alone. A fine-tuning claim can be made only after role typing and measure structure are added. □

This conclusion is deliberately limited. It does not say that all parameter scans are unusable. It says they do not automatically possess canonical explanatory authority over standing-bearing constants. A scan may be useful, but its measure and comparison class must be part of the model rather than assumed by notation.

14 Null-Regime Closure and Non-Vacuous Role Structure

The forced-existence and null-regime materials are relevant only in a narrow way. The present paper does not claim that constants force existence. It claims that non-degenerate physical reference is not governed by total vacuity, arbitrary selection, or skin-only marking while retaining standing.

Proposition 14.1 (No vacuous constant-role regime)**.** *A fixed admissibility-bearing physical domain does not preserve standing-bearing physical reference by replacing its constant-role structure with total vacuity.*

Proof. Standing-bearing physical reference requires at least some non-vacuous anchor, quotient, envelope, transport, or presentation structure. If all such role structure is removed, no witness-compatible identification or lawful transport remains. If skin remains without anchor or tensor, it has no independent authority. If an arbitrary selector is added to choose values, the domain is no longer vacuous and the selector must itself be role-typed. □

Corollary 14.2 (No lower arbitrary constant generator)**.** *A rule that chooses constants from below the admissibility boundary is not a same-domain explanation unless it supplies admissible role structure. Otherwise it is either a non-canonical model assumption, an imported selector, or a change of domain.*

This closure is useful because it blocks a tempting reply: that constants might be neither fixed nor role-classified, but simply arbitrary defaults. Arbitrary defaults still require a selector. The selector must either be part of the admissible domain, in which case it is classified, or external to it, in which case it does not govern same-domain standing.

15 Error Taxonomy

The classification theorem is most useful when it identifies specific errors. The following are recurrent misclassifications.

Table 5: Common role errors in discussions of constants.

Error	Correction
Treating presentation skin as tensor load	Unit values, scheme coordinates, basis labels, and gauge choices do not independently carry standing-bearing authority when witness, quotient, envelope, and transport structure are preserved.
Treating effective constants as primitive anchors	EFT coefficients and running couplings are physical inside envelopes; unrestricted promotion requires new transport or domain extension.
Treating quotient-dependent values as free raw parameters	Dimensionless ratios and invariant combinations become physical only after the quotient and witness ledger are fixed.
Treating transport-defined parameters as independent scalar values	Mixing angles, phases, and RG coordinates carry standing through lawful transport relations.
Treating admissibility-fixed structure as a same-domain knob	Gauge skeleton, symmetry class, and object-class-defining structure change the domain when varied.
Treating boundary inputs as internally derived	A value may be necessary for model use without being fixed by the fixed-domain theorem.
Treating AMetric proposal spaces as physical ensembles	A coordinate list lacks canonical metric, measure, selector, or typicality until additional admissible structure is supplied.
Treating role composites as contradictions	One symbol may have multiple role-components across contexts; classification decomposes rather than denies this.
Treating formal families as standing-bearing parameter spaces	A range, scan, indexed model family, or landscape list is formal until a target domain supplies witnesses, transport, quotient structure, role profiles, and any measure authority.
Treating replicated sectors as free multiplicity	Standing-indistinguishable duplication is eliminable; surviving multiplicity requires non-degenerate distinguishing structure or envelope certification.

15.1 Fine-tuning as role compression

Many fine-tuning arguments begin by compressing role-heterogeneous quantities into a single vector of constants. The vector may include dimensionful conversions, dimensionless ratios, gauge couplings, cosmological parameters, Yukawas, replicated sectors, and structural assumptions. It is then assigned ranges and probabilities. The classification theorem does not preclude such exercises. It says the compression step is not physically neutral. Each coordinate must be role-typed. Each range must be attached to a comparison class. Each probability must be attached to measure authority. Each variation must specify whether it is skin, envelope change, transport, domain change, quotient-level variation, or target-domain retyping.

When this is done, some fine-tuning questions remain meaningful but narrower. They become conditional questions inside declared ensembles, not direct explanations of standing-bearing constants from a pre-given parameter space.

15.2 Anthropic and multiverse selection

Anthropic reasoning is admissible as conditional reasoning after an ensemble has been fixed. It is not by itself an admissibility generator. A statement such as "observers see constants compatible with observers" requires a domain in which observers, constants, and cross-domain comparisons are already referable. If varying a constant changes the standing conditions for those referents, the anthropic conditional does not supply the missing transport.

Similarly, a multiverse model may define an ensemble of vacua, EFTs, or domains. The classification theorem asks whether the ensemble is same-standing, cross-standing, or an explicitly gated target domain. In a same-standing ensemble, free variation of anchors is blocked. In a cross-standing ensemble, a measure, witness ledger, transport relation, and observer or record predicate must be supplied to compare distinct domains. If the model supplies those structures, the comparison is retyped into the target domain that supplies them. The authority is then supplied by that model, not by the mere notation of alternative constants.

16 Objection Matrix

Table 6: Concise responses to expected objections.

Objection	**Response**
You do not derive the constants.	Correct. The paper classifies admissibility roles. Numerical derivation requires additional witness, anchor, transport, or boundary structure.
Physics uses parameter scans.	The paper does not restrict exploratory scans. Controlled scans remain admissible inside explicitly governed target domains. The paper constrains their interpretation as canonical explanations of standing-bearing constants without role and comparison authority.
Couplings run.	Running is classified as lawful RG transport and effective envelope behavior, not arbitrary same-domain reassignment.
Different EFTs have different constants.	Yes. Their coefficients are envelope-relative and may be related by matching. Cross-envelope comparison requires transport structure.
Dimensionless constants are real.	Yes, but dimensionlessness is not primitive standing. Quotient, witness, envelope, and transport conditions still matter.
This is only semantics.	The distinctions track empirical re-identification, lawful transport, and observable invariance. They are operational conditions for using constants physically, and Theorem 5.1 exhausts the admissibility loci rather than merely naming preferences.

Objection	Response
Multiverse models define ensembles.	They may. The theorem requires the ensemble to supply its own measure, comparison class, witness ledger, transport rules, and role profiles; once supplied, the ensemble is a target domain rather than inherited standing-bearing multiplicity.
The theorem blocks BSM physics.	It does not. BSM proposals are domain extensions or new occupants; they require declared anchors, witnesses, and transport relations.
Gauge choices vary freely.	Gauge choices are presentation skin: they vary while preserving witness and quotient structure. Gauge structure is a different role and may be anchor-level.
Mixing angles are just measured numbers.	They are measured through transport between bases and observable transitions; raw coordinates depend on basis conventions.
The five classes overlap.	Symbols may have composite profiles, but primitive role-components are separated by function: domain, quotient, envelope, transport, or presentation.
You are banning parameter families.	No. Formal families and controlled target-domain families remain available. The theorem denies only inherited standing-bearing parameter-space authority from notation alone.
Why add continuation loci?	They specify what persists as the same role-carrier through redescription, transport, matching, or family comparison. Without such a locus, the proposal has no fixed target for same-role variation.

17 Conclusion

The category "physical constant" is not structurally homogeneous. Some constant-like quantities define the admissibility of a domain. Some carry quotient-level invariant content. Some are physical only inside effective envelopes. Some encode lawful transport between presentations, bases, scales, or regimes. Some are presentation-dependent components. A single numerical list does not erase these distinctions without losing the conditions that make the entries physically referable.

The classification theorem therefore reframes the problem of constants. Before asking why a constant has a value, whether that value is fine-tuned, whether variation across branches or vacua is admissible, or whether it can be anthropically selected, one must ask what role the constant-like quantity plays. Is it an anchor, a quotient invariant, an effective coefficient, a transport coordinate, a boundary input, or a presentation convention? If the question ranges over a family, one must also ask what continuation locus and target-domain structure preserve the role being varied. Only after this profile is fixed does variation have a determinate target.

This result does not end the physics of constants; it clarifies the comparison target. It leaves room for empirical measurement, EFT, RG flow, controlled scans, BSM construction, landscape models, and conditional selection arguments. It also shows that constant-like symbols do not automatically belong to a pre-given homogeneous parameter space. The first step is classification: the admissibility role of a constant-like quantity is prior to its variation, selection, and explanation, and family-level comparison requires its own admitted target-domain structure.

A Expanded Role Table

Table 7: Expanded classification guide.

Quantity	**Role profile**	**Admissibility interpretation**	**Typical status**
c numerical value	P	Unit conversion under unit changes; invariant causal role appears elsewhere.	Presentation
Lorentzian causal structure	A / tensor	Defines admissible causal comparison and relativistic object-class.	Anchor
$\hbar$ numerical value	P	Unit-sensitive conversion between action units and quantum normalization.	Presentation
Quantum commutation structure	A / tensor	Domain-defining quantum structure, not a unit value.	Anchor/tensor
G in Newtonian regime	E / boundary	Phenomenological gravitational coupling in a bounded regime.	Effective input
Gauge group	A	Defines charge ledger, gauge redundancy, and invariant observables.	Anchor
Gauge choice	P	Redescription with no independent observable authority.	Presentation
Gauge coupling coordinate	E/T/P	Scale/scheme-attached running coordinate.	Effective transport
Fixed point data	Q/T	Invariant trajectory or universality information.	Tensor
Mass ratio	Q / boundary	Standing-bearing after particle identity and extraction ledger are fixed.	Quotient input
Yukawa matrix entry	P/Q	Basis-sensitive until quotient normal form is specified.	Composite
Yukawa eigenvalue	Q / boundary	Invariant relation, generally empirical inside fixed SM domain.	Boundary input
CKM/PMNS coordinate	T/P	Basis-transport coordinate with quotient residues.	Transport
CP invariant	T/Q	Phase residue surviving basis redefinition and appearing in witnesses.	Tensor residue
Cutoff Λ	P/E	Regulator when removed; envelope boundary when physical/matched.	Depends
Wilson coefficient	E/T	Envelope-bound coefficient with matching and running.	Effective

Quantity	Role profile	Admissibility interpretation	Typical status
Formal scan coordinate	formal / target-domain dependent	Useful for controlled exploration once witnesses, transport, quotient, and measure rules are declared.	Modeling tool
Replicated identical sector	redundancy or finite envelope input	Eliminable if standing-indistinguishable; admissible only with non-degenerate distinguishing structure or envelope certification.	Depends

B Corpus Dependency Map

The article is self-contained, but its architecture is informed by the following AASC and forced-existence corpus components.

(C1) **Anchor, Tensor, and Skin.** Supplies the fixed-domain role decomposition into anchor preconditions, quotient-level tensor content, and representational skin. This is the backbone of Sections 3–5.

(C2) **A Classification Theorem for Admissible Standard-Model Structures.** Supplies the Standard-Model role structure vocabulary: witness ledger, quotient normal form, transport completeness, boundary-only envelope inputs, and non-competition with BSM/UV programs. This informs Sections 8, 10, and 11.

(C3) **Gauge-Coupling Parameters and Forced Uniqueness.** Supplies the distinction between raw coupling coordinates, scheme/scale dependence, RG transport, and invariant witness extraction. This informs Section 9.

(C4) **The Structure of Admissibility and Standing-Admissibility Identity Closure.** Supply the fixed-domain standing, admissible redescription, and no-repair discipline used in Definitions 2.1 and 2.3.

(C5) **The AMetric Boundary.** Supplies the no-default metric, measure, selector, representative, or typicality discipline used in Section 13.

(C6) **The Structural Inadmissibility of the Null Regime and Constraint-Bundle Forcing.** Supply the narrow closure claim that non-degenerate standing is not governed by total vacuity or arbitrary lower selection. This informs Section 14.

(C7) **The Standing Fixity of Physical Constants.** Supplies the companion fixed-domain result: standing-bearing constants are not freely variable same-domain parameters. The present article is the classification sequel.

(C8) **Renormalization as Standing-Preserving Scale Transport and Why Some Parameters Run and Others Cannot.** Supply the transport and parameter-mobility discipline used in Section 2.4: role-continuation loci, controlled target-domain scans, and the distinction between lawful running and arbitrary reassignment.

(C9) **Transport-Closure Locus for Continuous Parameters and Generation Multiplicity Minimality.** Supply the continuous-family and replication discipline used in Propositions 6.2 and 6.3: transport holonomy must close or quotient, and standing-indistinguishable duplication is eliminable.

(C10) **Ensemble Embedding Collapse and the Anthropic Collapse Theorem.** Supply the distinction between formal multiplicity, inherited standing-bearing multiplicity, and explicitly gated target-domain comparison used in Definitions 2.5–2.7.

C Claim Index

Table 8: Main claims and locations.

Claim	**Location**
Constants require role typing before explanation.	Corollary 5.4
Five classes exhaust admissibility-bearing constant roles.	Theorem 5.1
A homogeneous parameter space is not automatic.	Corollary 5.3
Dimensionless does not imply primitive standing.	Proposition 7.2
Gauge skeleton is anchor-level in fixed particle-physics domains.	Proposition 8.1
RG flow is licensed transport, not arbitrary reassignment.	Proposition 9.2
Yukawa values are classified, not derived.	Proposition 10.2
CKM and PMNS parameters are transport-defined.	Propositions 11.2 and 11.3
Pre-admissible parameter spaces have no default selector.	Proposition 13.2
Null/vacuous constant-role regimes do not preserve standing.	Proposition 14.1
Constant-family comparison requires a preserved role-continuation locus or target-domain retyping.	Proposition 6.1 and Definition 2.7

Claim	Location
Controlled parameter scans remain admissible when target-domain structure is explicit.	Corollary 2.10
Continuous parameter families require transport closure or quotienting.	Proposition 6.2
Standing-indistinguishable replicated sectors are eliminable unless non-degenerate or certified.	Proposition 6.3

References

[1] A. J. Maley, *The Standing Fixity of Physical Constants: Admissibility Constraints on Fine-Tuning, Anthropic Selection, and Multiverse Variation*, manuscript, 2026.

[2] A. J. Maley, *Anchor, Tensor, and Skin: A Fixed-Domain Decomposition Theorem for Admissible Description*, manuscript, 2026.

[3] A. J. Maley, *A Classification Theorem for Admissible Standard-Model Structures: Uniqueness Under Standing-Preserving and Transport Constraints*, manuscript, 2026.

[4] A. J. Maley, *Gauge-Coupling Parameters and Forced Uniqueness*, manuscript, 2026.

[5] A. J. Maley, *The Structure of Admissibility: Ametricity, Bivalence, and the Unique Admissible Interior*, manuscript, 2026.

[6] A. J. Maley, *The AMetric Boundary as a Unique Regime-Invariant Constraint on Admissibility-Bearing Construction*, manuscript, 2026.

[7] A. J. Maley, *The Structural Inadmissibility of the Null Regime: A Fixed-Domain Closure Theorem under AASC*, manuscript, 2026.

[8] A. J. Maley, *Renormalization as Standing-Preserving Scale Transport*, manuscript, 2026.

[9] A. J. Maley, *Why Some Parameters Run and Others Cannot: Effective Drift, Standing Collapse, and Scale Transport under Admissibility Constraints*, manuscript, 2026.

[10] A. J. Maley, *Transport-Closure Locus for Continuous Parameters*, manuscript, 2026.

[11] A. J. Maley, *Generation Multiplicity Minimality and Non-Degeneracy*, manuscript, 2026.

[12] A. J. Maley, *The Anthropic Collapse Theorem*, manuscript, 2026.

[13] A. J. Maley, *Ensemble Embedding Collapse under Standing-Preserving Admissibility*, manuscript, 2026.

[14] K. G. Wilson and J. Kogut, "The renormalization group and the epsilon expansion," *Physics Reports* **12**, 75–199, 1974.

[15] S. Weinberg, *The Quantum Theory of Fields*, Vols. I–III, Cambridge University Press, 1995–2000.

[16] M. E. Peskin and D. V. Schroeder, *An Introduction to Quantum Field Theory*, Westview Press, 1995.

[17] H. Georgi, "Effective field theory," *Annual Review of Nuclear and Particle Science* **43**, 209–252, 1993.

[18] H. Everett, "Relative state formulation of quantum mechanics," *Reviews of Modern Physics* **29**, 454–462, 1957.

[19] B. Carter, "Large number coincidences and the anthropic principle in cosmology," in M. S. Longair (ed.), *Confrontation of Cosmological Theories with Observational Data*, Reidel, 1974.

[20] S. Weinberg, "Anthropic bound on the cosmological constant," *Physical Review Letters* **59**, 2607–2610, 1987.

[21] L. Susskind, *The Cosmic Landscape: String Theory and the Illusion of Intelligent Design*, Little, Brown, 2005.