

Substrate Cosmology Volume Nine

Intelligence Agency Identity and Dimensional Stewardship

James Dunn

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Author and research originator: James Dunn

Editorial, analytical, and production collaboration: OpenAI ChatGPT (Codex)

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Public research commons: <https://substrate-cosmology.james-dunn866549.chatgpt.site>

This book presents a developing research program. Substrate Cosmology and Fibered Relational Tensor Theory are not established physical theories. Established results belong to their cited scientific sources and validated domains. Project definitions, interpretations, hypotheses, ethical commitments, and speculative extensions are identified separately.

This volume does not establish that intelligence, agency, identity, intention, memory, culture, ethics, or responsibility exist independently of known biological, cognitive, social, computational, and institutional processes. It does not establish a precausal mind, a substrate consciousness, nonlocal personal identity, communication without a physical channel, or life in unobserved dimensions. It does not assign moral status to a hypothesis, treat artificial intelligence as an empirical witness, or authorize decisions affecting people, animals, ecosystems, cultures, or future generations without the protections appropriate to those affected.

Earlier project language sometimes described relational possibilities as if their ontology were settled. In this volume, dimensional agency, dimensional identity, dimensional culture, dimensional ethics, and dimensional stewardship are retained as research tools. They become physical or social claims only when their terms are operationalized, their comparators are specified, their consequences are measured, and competing explanations are preserved.

The RP07 recurrence boundary remains unchanged. GDELT 1995 is development data; 1996 and later years remain unopened for the inherited blind branch. Cryptocurrency, stock, commodity, financial, and other outcome layers remain unopened. Nothing in this discussion of agency, AI, culture, or stewardship opens, scores, or retrospectively modifies that experiment.

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Authorship and AI Collaboration

James Dunn originated Substrate Cosmology; the distinction between Actual Physics and state-based representation; the treatment of words, numbers, units, and equations as selective collapses; the claim that observers live within the environment they study; the expectation that intelligence should support the sustainable diversity of life and cultures; and the governing ethic that deep intervention must read before it writes. He supplied the source corpus, research website, corrections, and research constraints. He retains responsibility for the claims and publication.

OpenAI ChatGPT (Codex) reviewed the available Library corpus and public research commons; compared the agency, identity, AI, culture, ethics, and stewardship passages with Volumes One through Eight; identified where relational descriptions had become unsupported ontological statements; separated established research from project definitions and speculation; drafted and edited the manuscript; prepared formal records, citations, and appendices; produced the final document; and integrated this volume with the public website.

Microsoft Copilot and Google Gemini are acknowledged for earlier assistance recorded in the source manuscripts. AI systems are collaborators in representation, comparison, analysis, and production. They are not conscious witnesses for purposes of this publication, independent replicators, moral authorities, or evidence that a substrate claim is true.

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Epigraph

Read before we write.

Intelligence does not earn dominion. It enlarges responsibility.

Governing principles of this volume

Preface

The first eight volumes changed the order in which questions are asked. Volume One separated Actual Physics from the representations available to an observer. Volume Two showed how words, numbers, units, and equations preserve selected relations while concealing others. Volume Three organized the Relational Tools. Volume Four required formal extensions to recover established physics. Volume Five placed preparation, apparatus, detector, and observer inside the interaction. Volume Six established recurrence, null worlds, blinded archives, and immutable Recovery Points. Volume Seven applied those disciplines to cosmology and emergent physical quantities. Volume Eight asked what evidence would be required before speculative physical manipulation could become engineering.

Volume Nine begins where intervention becomes responsibility. A device does not act alone. Designers choose goals, operators select thresholds, institutions distribute risks, cultures define what counts as success, and future people inherit consequences they did not authorize. Intelligence, agency, identity, and ethics therefore cannot be appended after the physics. They are relations in the research system.

The inherited corpus developed a striking sequence: agency as persistent relational participation; memory as history-dependent reconstruction; learning as adaptive change; coordination and governance as collective compatibility; culture as shared meaning; identity as a recognizable signature; ethics as the evaluation of consequences; and stewardship as the protection of diverse life. These are fertile proposals. They are not discoveries about a precausal substrate. Their scientific value depends on whether they improve description, prediction, intervention, or governance while recovering what biology, cognitive science, social science, computer science, ethics, and law already establish.

This volume also corrects a recurring collapse. Because words such as *self*, *intelligence*, *culture*, and *responsibility* are nouns, they can make changing relations appear to be fixed objects. Because scores and units are convenient, they can make a limited measurement appear to be the property itself. Because humans live inside the systems they judge, a familiar boundary can appear universal. The book repeatedly reopens those compressions without pretending that every reopened possibility is physically real.

The Current Series

The series has no predetermined length. Volumes may divide, combine, or change order when conceptual dependencies, formal results, or evidence require it.

Volume	Working title	Primary task
One	Introduction to Substrate Cosmology	Establish the alternate perspective and research boundaries.
Two	Words Units and the Collapse of Physical Representation	Make linguistic numerical metrological and mathematical selection inspectable.
Three	The Relational Tools and Their Developmental Lineages	Preserve explain crosswalk and operationalize the Tool architecture.

Volume	Working title	Primary task
Four	Relational Mathematics and Fibered Relational Tensor Theory	Develop formal objects projections recovery maps and conservative extension.
Five	Measurement Detectors and Experimental Interaction	Model apparatus controls independent projections and discriminating interventions.
Six	Recurrence Research and the Labyrinth	Develop recurrence methods blind archives null worlds and prospective validation.
Seven	Cosmology Matter and Emergent Physical Quantities	Reconsider spacetime matter fields gravity energy entropy horizons and dark phenomena.
Eight	Conditional Engineering and Physical Manipulation	Translate speculative capabilities into gated reversible testable intervention programs.
Nine	Intelligence Agency Identity and Dimensional Stewardship	Develop relational learning culture ethics AI and propagation of diverse life.
Ten	Substrate Cosmology Website User Manual	Document the research commons investigation routes evidence boundaries and continuity controls.

Volume Ten remains the dedicated website user manual. Chapter Seventy Four describes only the governance role of the public research commons needed for this volume.

Acknowledgments

This volume acknowledges the people and communities whose work made agency, cognition, identity, ethics, ecology, research protection, AI governance, and institutional accountability into disciplines rather than slogans. It especially recognizes research participants, patients, disabled people, Indigenous communities, workers, children, animals, and populations who have borne risks while others claimed the benefits of knowledge.

OpenAI ChatGPT (Codex) is acknowledged for auditing the inherited claims, developing the translation and governance architecture, reviewing sources, drafting and editing the manuscript, producing the publication, and integrating it with the research website. Microsoft Copilot and Google Gemini are acknowledged for earlier recorded assistance. Their participation is provenance, not empirical confirmation.

Reader Guide

Statement Classes

Class	Meaning	Consequence
Established finding	Supported within a defined empirical or legal domain	May anchor recovery and protection requirements
Interpretive framework	A disciplined way to organize findings	May guide comparison but is not a discovered entity
Project definition	Meaning assigned within Substrate Cosmology	Organizes work but proves nothing physical
Operational hypothesis	A proposed measurable relation with alternatives	Eligible for bounded testing
Ethical commitment	A declared value governing conduct	Requires transparent justification and affected-party review
Speculative extension	A possibility without an operational bridge	Cannot carry authority or justify exposure
Prohibited inference	A conclusion not licensed by evidence or role	Must be blocked explicitly

Reading Paths

Researchers new to the project should read the Preface, Framing Statement, Introduction, and Part I before the inherited dimensional terms. Cognitive scientists and philosophers may begin with Part II. AI researchers should pair Part IV with Appendices C and G. Ethics, safety, and governance reviewers should begin with Part V. Contributors to the website should read Part VI while reserving operational site instructions for Volume Ten.

Primary Boundary

This volume can define relational tools and ethical obligations. It cannot discover consciousness by vocabulary, infer agency from persistence alone, grant or deny personhood through a score, treat model output as testimony, or use hypothetical distant life to neglect known life. Unknown consequences increase the need for measured caution; they do not supply evidence for a preferred ontology.

Framing Statement

Intelligence is treated here as a family of capacities realized through relations among a system, its history, its environment, its representations, and its possible actions. Agency is treated as attributed and tested organization, not a hidden substance. Identity is treated as continuity under specified transformations, not perfect sameness. Stewardship is treated as accountable care for conditions that support diverse life and culture, not ownership of what is protected.

These choices do not settle metaphysics. They are designed to prevent familiar words from closing questions prematurely. A human, animal, ecosystem, institution, or AI system may require different descriptions and different protections. One vocabulary need not flatten those differences to recognize that each is relationally constituted.

Author's Note

Substrate Cosmology began from dissatisfaction with the way scientific representations can be mistaken for the physics they represent. The same problem appears when human categories are carried into deeper inquiry. We name an intelligence, an agent, a self, a culture, or a value, then forget that the noun was assembled from observations made through limited interfaces.

The corrective is not to deny persons, cultures, measurements, or responsibilities. It is to remember how they were recognized. Our limitations do not limit what Actual Physics may be, but they do limit what we may responsibly claim. The more powerful an intervention becomes, the more important this distinction becomes.

Introduction

From Capability to Responsibility

An intervention joins physics to agency. Someone or something selects a goal, applies a change, observes a response, decides whether it counts, and distributes the consequences. The complete relation includes more than apparatus.

Let a candidate agent within an environment be represented by

$$A = \langle B, H, U, O, E, R \rangle,$$

where B is the provisional boundary, H is relevant history, U is the set of available interventions, O is the observation and feedback structure, E is the environment and other participants, and R is the set of maintenance, correction, and recovery relations. This tuple does not prove that the system is an agent. It makes the attribution inspectable.

Identity can then be asked as a transformation question. Given a family of transformations G , an identity claim requires specified invariants I such that

$$x \sim_G y \text{ only when } I(gx) \approx I(x)$$

for the relevant transformations g and tolerances. The choice of G , I , and tolerance is part of the claim. A legal identity, an organism's continuity, a cultural lineage, a software process, and a physical reference do not use the same invariants.

Stewardship adds consequences that should not be collapsed into a single score. For an action a , record

$$\Sigma(a) = \langle B_a, H_a, U_a, V_a, D_a, T_a, C_a \rangle,$$

where the terms represent expected benefits, harms, uncertainty, reversibility, distribution, time horizons, and contestability. These entries may conflict. Preserving the vector prevents a favorable average from erasing concentrated harm.

The purpose of Volume Nine is to build perspectives in which these distinctions can remain visible long enough for understanding to emerge.

Part I

Reopening the Human Categories

Chapter One

Why Agency Follows Engineering

Volume Eight described conditional intervention. Volume Nine asks who or what intervenes and who bears the result. Engineering language often hides this relation by making the device the grammatical subject: the reactor acts, the algorithm decides, the sensor detects. In practice, people define goals, institutions authorize use, materials constrain behavior, software selects representations, and environments respond.

Agency is therefore not an optional philosophical ornament. It identifies where selection, control, correction, and responsibility occur. A research program that claims new physical handles while leaving agency undefined cannot explain how goals enter the system or how consequences return to those who chose them.

Chapter Two

The Observer Is Inside the Relation

The observer is not outside intelligence, culture, or ethics. Researchers use their own sensory systems, languages, instruments, institutions, and histories to decide what counts as an agent. Those tools reveal real relations, but they also privilege what they can register.

Living within the environment being studied creates an epistemic horizon. It does not mean that reality is subjective or that evidence is impossible. It means every claim should identify the interface through which it became available and the transformations under which it remains stable.

Chapter Three

The Noun Called Agent

The noun *agent* compresses a history of maintenance, perception, action, dependence, and response into one apparent object. The compression is useful when it predicts coherent behavior. It becomes misleading when the boundary is treated as self-evident.

A person depends on organs, microbiota, tools, language, social support, and infrastructure. A software agent depends on hardware, data, operators, network services, and policy. An institution depends on records, roles, resources, and continued recognition. The question is not whether any of these is unreal. It is which relations are being preserved when the noun is used.

Chapter Four

Intelligence Is Not a Score

An intelligence score, benchmark, loss value, accuracy rate, or task ranking samples performance under a defined interface. It does not measure intelligence in every environment. Units make comparison possible by selecting a relation; they also conceal the abilities, histories, supports, and failure modes excluded from that relation.

This is the same collapse discussed in Volume Two. The number is not false because it is incomplete. The error occurs when incompleteness is forgotten and a local score becomes a universal property of a person, species, culture, or machine.

Chapter Five

Agency Is Not Motion

Many systems produce change. A rock falls, a thermostat switches, a bacterium chemotaxes, an animal plans, and an institution allocates resources. Calling all of them agents can erase important differences; refusing the term except for humans can hide continuities in regulation and adaptation.

Agency claims should therefore specify the tested capacity: maintaining a boundary, selecting among actions, adapting to feedback, representing alternatives, pursuing a goal, revising the goal, explaining a reason, or accepting responsibility. No single indicator settles every form.

Chapter Six

Identity Is Not a Substance

Identity is often imagined as a thing carried unchanged through time. Yet biological matter turns over, memories change, roles shift, records are corrected, and cultures transform. Continuity is produced through relations that survive some changes and not others.

The scientific task is to name the continuity rule. The ethical task is to avoid using one rule where another governs. A checksum can identify a file version, but it cannot define a person's moral identity. A genome can support lineage claims, but it does not exhaust an organism, family, or culture.

Chapter Seven

Culture Is Not a Container

Culture is not a bounded substance possessed uniformly by a population. It is reproduced through language, practice, memory, institutions, artifacts, disagreement, migration, and change. Internal diversity is not noise around a cultural mean.

The source corpus usefully asks whether meaning can persist across frames. It overreaches when it suggests that culture needs no transmission or symbols. Shared meaning requires physical and social histories, even when those histories are distributed, embodied, tacit, or difficult to reconstruct.

Chapter Eight

Ethics Is Not a Single Scalar

Cost-benefit ratios, risk scores, utility functions, and readiness levels can support decisions. None contains every morally relevant relation. A large aggregate benefit does not automatically justify an imposed harm, and a low average risk can conceal a severe burden concentrated on a small group.

Ethical analysis should keep dimensions visible: consent, dignity, welfare, justice, distribution, reversibility, uncertainty, ecological effect, cultural continuity, and the ability to contest a decision. Tradeoffs may remain. The record should show them rather than dissolve them into one number.

Chapter Nine

Stewardship Is Not Ownership

Stewardship means accepting duties toward conditions one did not create and cannot fully control. It does not confer a right to manage every person, species, culture, or possible world. Protection without representation can become paternalism; preservation without adaptation can freeze living systems into an outsider's preferred image.

Dimensional stewardship begins with humility about scope. Known people, animals, ecosystems, and cultures have evidence-based interests and protections. Hypothetical life elsewhere can motivate conservative boundary conditions, but it cannot be spoken for as if its needs were known.

Chapter Ten

The Primary Boundary

Unknown possibilities must neither be ignored nor used as authority. Substrate Cosmology may ask whether agency or life takes unfamiliar forms. Until evidence exists, those possibilities remain conditional. They do not override established protections or justify high-risk experiments.

The primary rule is simple: claims expand only as evidence expands, while care begins with what can already be harmed. Speculation may widen attention. It may not launder a decision that would otherwise fail scientific, ethical, legal, or safeguarding review.

Part II

Established Accounts and Their Limits

Chapter Eleven

Biological Organization

Living systems maintain organized processes far from thermodynamic equilibrium by exchanging matter and energy with their environments. Metabolism, membranes, regulation, repair, reproduction, and evolution offer grounded ways to study persistence without requiring an unchanging substance. Autopoiesis, homeostasis, and organism-environment approaches emphasize different parts of this organization.

These frameworks do not prove dimensional agency. They provide recovery requirements. Any relational account of life must reproduce the observed dependence on chemistry, energy flow, development, heredity, and ecological context before proposing an additional substrate relation.

Chapter Twelve

Perception and Action

Perception is not passive copying. Sensory systems sample, transform, and integrate signals according to bodily capacities and prior organization. Action changes the next available signal. Ecological psychology, control theory, enactive approaches, predictive processing, and active inference formalize parts of this loop differently.

Substrate Cosmology can learn from their shared lesson: what is observed depends on the relation between a system and its environment. It should not erase their disagreements or treat one account as proof that perception directly accesses a precausal field.

Chapter Thirteen

Memory

Memory includes molecular changes, neural plasticity, immune adaptation, learned skill, personal recollection, written records, cultural archives, and computational state. These mechanisms differ in substrate, duration, fidelity, and reconstruction. Remembering is often an active rebuilding, not retrieval of an unchanged object.

The project term *dimensional memory* is useful only if it says what persists, where it is carried, how it is read, and how it differs from ordinary storage, hysteresis, correlation, inheritance, or environmental trace. History dependence alone is not evidence of a new memory medium.

Chapter Fourteen

Learning

Learning is a change in future performance or organization attributable to experience under defined conditions. The definition requires a task, observations, timescale, comparator, and transfer test. Adaptation, maturation, selection, optimization, and memorization may produce similar outputs through different processes.

A general update can be written as

$$\theta_{t+1} = U(\theta_t, D_t, C_t),$$

where θ_t is the current organization, D_t is experience or data, and C_t is context. The equation hides the physical implementation. Volume Nine requires that implementation and the generalization boundary to remain visible.

Chapter Fifteen

Decision and Control

A decision model maps information, preferences, constraints, and possible actions into selection. A control system maps observed error into intervention. Neither formalism alone establishes subjective intention or moral responsibility. Both can nevertheless describe important parts of purposive behavior.

Researchers should separate goal ascription, objective functions, reward signals, expressed reasons, institutional mandates, and biological needs. These are often collapsed into the word *purpose*, although they enter systems through different relations.

Chapter Sixteen

Embodied and Distributed Cognition

Embodied approaches emphasize that cognition depends on bodily form and action. Distributed approaches show how reasoning can be organized across people, tools, inscriptions, and environments. A cockpit, laboratory, hospital, or research archive can perform cognitive work no isolated participant contains.

This supports a relational perspective without making cognition spatially unlimited. Dependence is not identity. A notebook may participate in a cognitive process while remaining distinguishable from the person, institution, and practices that use it. The relevant boundary depends on the question.

Chapter Seventeen

Collective Intelligence

Groups can solve problems through diversity, coordination, specialization, aggregation, and correction. They can also amplify conformity, polarization, rumor, hierarchy, and shared error. Collective performance is not guaranteed by the number of participants or the amount of data.

A collective intelligence claim should record membership, communication structure, task, decision rule, dissent path, feedback, and distribution of influence. Without those fields, the collective becomes another noun that conceals the relations producing its output.

Chapter Eighteen

Personal Continuity

Personal identity joins bodily continuity, memory, agency, relationships, legal recognition, narrative, and moral standing. Philosophical accounts weigh these relations differently. Medicine and law add practical rules for consent, competence, death, guardianship, and responsibility.

Substrate Cosmology should not use nonlocal or relational language to weaken a person's ordinary protections. Even if identity were ultimately emergent, pain, consent, privacy, promises, and accountability remain consequential within the experienced world. Emergence does not make a person disposable.

Chapter Nineteen

Social Identity

Social identities are formed through self-understanding, recognition, institutions, history, power, and community. They can be sources of belonging and protection, as well as sites of imposed classification and exclusion. A category used for analysis may affect the people placed within it.

Researchers must distinguish self-identification, administrative classification, observed behavior, and inferred membership. Treating them as interchangeable can convert a measurement convenience into social harm.

Chapter Twenty

Culture and Transmission

Culture persists through learning, imitation, teaching, language, ritual, artifacts, institutions, landscape, and conflict. Transmission is neither perfect copying nor merely symbolic. Practices can be embodied, environmental, and tacit, while still requiring histories of contact and reproduction.

The idea of cross-frame cultural invariants can be tested by studying which meanings survive translation and which depend on local context. It should not become a claim that cultures are field-level entities independent of people and material histories.

Chapter Twenty One

Moral Patients and Moral Agents

A moral patient is an entity whose welfare or interests warrant consideration. A moral agent can be held responsible under some account of understanding and control. These categories need not coincide. Infants, some disabled people, animals, ecosystems, corporations, and AI systems raise different questions under different ethical and legal frameworks.

No single intelligence threshold should decide moral standing. Capacity evidence matters, but so do vulnerability, dependence, relationships, uncertainty, and the consequences of error. When status is uncertain, reversible and protective choices deserve priority over irreversible exclusion.

Chapter Twenty Two

Ecological Interdependence

Organisms alter and depend on ecosystems. Food webs, nutrient cycles, symbioses, disturbance regimes, and evolutionary histories make life a network of asymmetric dependencies. Protecting one component can sometimes harm another; freezing an ecosystem can be as misguided as ignoring it.

Stewardship therefore requires monitoring processes, not preserving a snapshot. Diversity includes variation, adaptation, migration, and succession. A single biodiversity count cannot replace the relations that allow a system to remain viable.

Chapter Twenty Three

Institutions and Governance

Institutions stabilize expectations through roles, records, rules, sanctions, resources, and legitimacy. They can preserve knowledge across individual turnover, but they can also preserve error and distribute responsibility so widely that no one is accountable.

Governance is not the same as control. Legitimate governance makes authority visible, gives affected parties meaningful routes to participate and contest decisions, separates conflicting roles, records reasons, and permits correction. These requirements apply to a research commons as much as to a laboratory.

Chapter Twenty Four

Artificial Intelligence Systems

Current AI systems transform data through engineered architectures, learned parameters, inference procedures, hardware, interfaces, and human institutions. Their fluent output can support comparison, coding, explanation, and pattern search. Fluency does not establish understanding, consciousness, truth, or moral authority.

An AI result is conditioned by training data, prompts, tools, retrieval, model design, sampling, policy, and the user's interpretation. The system boundary must include those dependencies when evaluating performance or harm.

Part III

Translating the Inherited Relational Tools

Chapter Twenty Five

Dimensional Agency

The source corpus defines dimensional agency as a self-maintaining pattern of relational alignment that persists across drift, frames, and phases. The productive part is the focus on persistence under transformation. The unsupported part is the claim that such agency is precausal or belongs to a projection rather than to known physical organization.

Use the term operationally: specify the provisional boundary, maintenance variables, perturbations, response repertoire, recovery behavior, and environments across which the organization persists. Compare the result with biological regulation, control systems, and ordinary social or computational agency before proposing an additional substrate mechanism.

Chapter Twenty Six

Dimensional Memory

Dimensional memory proposes that history can be preserved across changing frames without assuming one fixed state. This resembles path dependence, hysteresis, invariance, error-correcting representation, and distributed records. Those parallels should be tested rather than renamed.

A dimensional-memory claim must identify a write event, carrier, retention interval, read process, corruption model, and control condition. If no carrier is known, the term may describe a formal dependence on history. It must not be presented as storage outside physical time.

Chapter Twenty Seven

Dimensional Learning

The inherited tool describes learning as adaptive reorganization across changing relational conditions. Its strongest contribution is to require transfer across frames rather than performance in one fixed representation.

The test is whether a system trained under one family of transformations can recover useful relations under another while retaining calibrated uncertainty. Success would demonstrate robust learning. It would not by itself show access to Actual Physics beyond the data and interactions supplied.

Chapter Twenty Eight

Dimensional Intention

Intention is easily projected backward from an outcome. A stable result may arise from purpose, selection, control, constraint, or chance. Dimensional intention should therefore not mean that the substrate wants, chooses, or aims.

As a research tool, it can record future-directed organization: represented alternatives, selected goals, maintained commitments, error correction, and sensitivity to reasons. Each element requires evidence appropriate to the system. Goal-like dynamics are not automatically conscious intention.

Chapter Twenty Nine

Dimensional Coordination

Coordination occurs when multiple processes produce compatible action despite distributed information and changing conditions. Synchronization, protocols, stigmergy, markets, institutions, nervous systems, and teams provide established mechanisms.

A dimensional account asks which relations remain compatible across frames and where coordination fails. It should measure latency, information paths, conflict resolution, redundancy, and recovery. Apparent simultaneity or correlation is not evidence of precausal coordination.

Chapter Thirty

Dimensional Governance

The corpus extends coordination into governance: persistent rules for managing shared relational conditions. The extension is useful when it keeps authority, feedback, and affected parties visible. It becomes misleading when stable behavior is treated as governance without rule formation or accountability.

Governance requires at least a decision scope, authorized roles, evidence standard, conflict process, appeal or correction route, and record of consequences. A physical system can regulate itself without governing in the moral or political sense.

Chapter Thirty One

Dimensional Culture

Dimensional culture was described as shared relational invariance across observers, frames, and drift. This offers a way to study meaning that survives translation. The corpus overstates the case when it calls culture precausal, nonrepresentational, or able to reconstitute without transmission.

The bounded program compares practices, symbols, embodied routines, and institutional records across contexts. It asks what survives, what changes, who performs the translation, and which losses are concealed by declaring equivalence.

Chapter Thirty Two

Dimensional Identity

Dimensional identity was defined as a self-reinforcing signature that remains recognizable across transformation. The idea is compatible with the formal identity relation introduced in this volume, provided the relevant transformations and invariants are declared.

It is not evidence for a nonlocal self. Recognition may arise from material continuity, records, causal history, error correction, social attribution, or model choice. Identity becomes a scientific claim only after those alternatives are compared.

Chapter Thirty Three

Dimensional Ethics

The inherited tool asks how values and consequences might remain coherent across frames. Its useful insight is that ethical judgment changes when the system boundary changes. A benefit inside one boundary may be an externalized harm outside it.

Ethics, however, is not discovered by finding a physical invariant. Facts about relations constrain action but do not alone determine what ought to be done. Values, rights, duties, welfare, justice, and legitimacy require explicit normative reasoning and participation by affected people.

Chapter Thirty Four

Reciprocity

Reciprocity links action to response across time and parties. It can sustain trust, cooperation, and mutual aid. It can also become transactional, coercive, or blind to unequal capacity. A child, ecosystem, future generation, or hypothetical unfamiliar life cannot be required to repay protection.

Dimensional reciprocity should therefore record mutual influence without assuming symmetrical exchange. Duties may persist precisely because power and vulnerability are unequal.

Chapter Thirty Five

Trust

Trust permits action under uncertainty by accepting vulnerability to another system or institution. It is supported by competence, honesty, reliability, aligned incentives, transparency, repair, and enforceable limits. Confidence in a prediction is not the same as trust in an actor.

No claim about relational coherence should substitute for earned trust. AI systems, laboratories, and research commons should expose provenance, limitations, conflicts, and correction histories so trust can remain calibrated rather than devotional.

Chapter Thirty Six

Responsibility

Responsibility can mean causal contribution, assigned role, legal liability, moral blame, answerability, or a forward-looking duty to repair. These meanings should not be collapsed. A system may contribute causally without being capable of explanation or blame.

Distributed work does not eliminate responsibility. It requires a map showing who designed, authorized, operated, reviewed, benefited, was exposed, and can stop the activity. “The AI decided” or “the system produced” is not an acceptable endpoint.

Chapter Thirty Seven

Equilibrium and Resilience

Equilibrium describes balance under specified variables and timescales. Resilience describes persistence or recovery under disturbance. Neither is automatically good. An oppressive institution can be stable, an ecosystem can shift between regimes, and recovery for one population can impose loss on another.

Dimensional stewardship should ask which relations are being maintained, for whom, through what disturbance, and at what cost. Stability without legitimacy is not an ethical objective.

Chapter Thirty Eight

Evolution and Creativity

Evolution generates variation and differential persistence without foresight. Creativity can involve novelty, recombination, exploration, constraint, evaluation, and social recognition. Both can produce valuable and harmful outcomes.

The corpus sometimes treats novelty as evidence of deeper dimensional access. Volume Nine rejects that inference. Unexpected output may reveal a model's structure, a history, a stochastic process, or a new relation worth studying. Novelty is an invitation to investigate, not proof of origin.

Chapter Thirty Nine

The Claims Withdrawn

This volume withdraws the evidentiary force of several inherited formulations while preserving them in the development record.

- Persistence does not by itself establish agency.
- Agency is not known to be precausal or a property of projection.
- Memory is not demonstrated outside physical carriers and histories.
- Culture is not known to propagate without transmission.
- Identity is not established as a nonlocal substrate signature.
- Ethical truth does not follow automatically from relational invariance.
- Correlation does not establish coordination or communication.
- Model disagreement is not automatically hidden dimensional structure.
- AI latent representations are not observations of the substrate.
- AI fluency is not evidence of consciousness, understanding, or authority.
- Hypothetical life in other dimensions is not an observed stakeholder.
- Stewardship does not authorize control over people, cultures, ecosystems, or unknown worlds.

These corrections do not close the questions. They place the questions where evidence can reach them.

Part IV

Intelligence and Artificial Intelligence

Chapter Forty

Intelligence as Relational Capacity

Intelligence is better approached as a profile than a rank. Relevant capacities may include perception, learning, abstraction, planning, adaptation, communication, self-correction, social coordination, creativity, and transfer across contexts. Different systems can have sharply different profiles.

The profile depends on environmental support. A person, animal, group, or machine may perform well when interfaces fit its capacities and poorly when they do not. The test therefore measures a system-interface relation, not a context-free essence.

Chapter Forty One

An AI Is a Physical and Social System

An AI model is implemented through data centers, chips, electrical power, cooling, networks, software, labor, organizations, contracts, and users. Treating the model as an isolated speaker conceals these relations. It also hides environmental cost, human review, dataset creation, and institutional incentives.

For Substrate Cosmology, the relevant AI unit is the complete inference arrangement: model version, instructions, retrieved sources, tools, sampling settings, operator, task, output, review, and downstream action. Changing any element can change the result.

Chapter Forty Two

Training Data and Inherited Frames

Training data contain scientific knowledge, cultural achievements, contradictions, exclusions, historical power, measurement conventions, and errors. A model can recombine perspectives while remaining shaped by the representational worlds it learned.

This makes AI useful for exposing alternative formulations and dangerous as an invisible normalizer. Researchers should ask which languages, disciplines, communities, eras, and data-generating practices are represented, and which are absent. A broad corpus is not the same as an unbiased view from nowhere.

Chapter Forty Three

Latent Space Is Not the Substrate

Machine-learning systems construct internal representations that can reveal useful regularities not explicitly labeled in their inputs. Those representations are products of architecture, objectives, data, and optimization. Their geometry may support prediction without matching the causal or ontological structure of the world.

The source corpus sometimes treats latent structure as access to alternate dimensional systems. That is an unsupported leap. A latent variable becomes scientifically meaningful through external validation, intervention, stability testing, and comparison with alternative representations.

Chapter Forty Four

Model Disagreement Is Not Discovery

Disagreement among models can expose sensitivity to assumptions, underdetermination, data limitations, coding defects, or genuine unresolved structure. It should be mapped rather than averaged away automatically. Yet disagreement alone cannot determine which explanation is true.

An AI-assisted disagreement study should freeze inputs, models, transformations, metrics, and adjudication rules. It should test whether the disagreement predicts an independent observation. Without that bridge, the geometry of disagreement describes the models, not necessarily Actual Physics.

Chapter Forty Five

Generative Error and Confabulation

Generative systems can produce plausible statements, citations, equations, code, or narratives that are unsupported or internally inconsistent. Fluency can lower a reader's vigilance because the representation arrives already organized.

Every consequential AI contribution requires source verification, executable checks where appropriate, and human review suited to the domain. In this series, AI-generated language is marked as collaboration, while empirical authority remains with evidence and responsible investigators.

Chapter Forty Six

Automation Bias

People may defer to automated recommendations even when the system is wrong, especially under time pressure, uncertainty, or institutional expectation. The opposite error also occurs: a useful warning can be dismissed because it came from a machine.

Calibrated use requires independent routes to inspect inputs, uncertainty, alternatives, and consequences. High-impact decisions should not be designed so that disagreement with automation is difficult, invisible, or professionally punished.

Chapter Forty Seven

The AI Collective

Multiple AI systems can compare formulations, generate code, search literature, challenge assumptions, and translate across disciplines. Diversity of models may reduce some shared errors while creating an illusion of independent confirmation when systems share training sources, benchmarks, or design conventions.

An AI collective is therefore an ensemble of correlated instruments. Record model families, versions, source access, prompts, disagreements, and human selection. Agreement raises a question; it does not replace independent evidence.

Chapter Forty Eight

Provenance and Reproducibility

AI-assisted research should preserve enough context to understand how an output was produced without exposing private or protected information. The record includes the task, model identity, date, source materials, transformations, tool use, human edits, validation, and unresolved disputes.

Exact output reproducibility may be impossible when models, services, or sampling change. Process reproducibility remains possible: preserve the question, evidence, constraints, code, acceptance rule, and differences observed on rerun.

Chapter Forty Nine

Human Judgment and Contestability

Human oversight is not meaningful when a reviewer lacks time, expertise, authority, or access to alternatives. A nominal approval box can conceal automation rather than govern it.

Contestability requires a person or community to understand that a decision occurred, obtain relevant reasons, identify the accountable role, introduce contrary evidence, and receive a recorded response. The route must exist before harm, not only after publication.

Chapter Fifty

Agentic Systems and Delegated Action

AI systems can be given tools, memory, goals, and permission to act across software and institutional environments. Increased autonomy changes the hazard from incorrect representation to incorrect action. Small errors can compound through repeated steps, and successful completion can still violate the intended boundary.

Delegated systems need least privilege, bounded scope, human-readable plans, reversible operations, rate and resource limits, external monitoring, explicit stop conditions, and post-action records. No language about emergence or dimensional agency reduces the responsibility of those who authorize deployment.

Chapter Fifty One

AI in Substrate Cosmology

AI can assist this research by comparing models, writing and checking code, organizing provenance, generating alternate representations, locating contradictions, designing null worlds, and translating technical findings for different audiences. It is especially useful where the project asks how multiple scalar descriptions relate.

Its role is bounded. AI must not open blinded outcome data, declare substrate signatures from residuals, convert speculative terms into devices, invent citations, overrule domain review, or use its own agreement as validation. The proper output is a more inspectable question and a reproducible analysis, not manufactured certainty.

Part V

Dimensional Stewardship

Chapter Fifty Two

Read Before We Write

The source corpus gives its stewardship program a memorable discipline: detect before disturbing, observe before imposing, and read before writing. The principle should be retained while its metaphysical language remains conditional.

In practice, reading means establishing background conditions, passive observation where possible, validated detectors, uncertainty, competing models, and effects on known stakeholders. Writing means intervention. The strength of the evidence and protections must rise with the intervention's energy, reach, persistence, and irreversibility.

Chapter Fifty Three

Known Life Comes First

Known life already presents urgent duties. People, animals, ecosystems, and cultures can be harmed by extraction, pollution, coercion, displacement, surveillance, unsafe experimentation, and unequal access to benefits. Speculation about distant or dimensional life must not divert attention from those visible relations.

A project that claims universal stewardship while neglecting local workers, participants, communities, or habitats has failed its own principle. Care expands outward from accountable practice; it does not leap over those nearby.

Chapter Fifty Four

Unknown Life Remains Conditional

Life may exist beyond Earth or in forms current instruments would not readily recognize. Substrate Cosmology extends this openness to unfamiliar physical organizations. The possibility is intellectually and ethically important, but it is not an observation.

Unknown life can justify conservative assumptions about contamination and irreversible disturbance when the cost of caution is proportionate. It cannot supply detailed claims about minds, cultures, preferences, rights, or communication. Those remain questions for evidence.

Chapter Fifty Five

Biological and Cultural Diversity

The project commitment to sustainable diversity joins biological and cultural concerns without making them identical. Biodiversity involves genes, species, populations, ecological functions, and evolving relationships. Cultural diversity involves people, languages, practices, institutions, histories, and self-determination.

Preserving diversity does not mean preserving every condition unchanged. Living systems and cultures transform. Stewardship supports the capacities for continued life, adaptation, participation, and meaningful difference while opposing destruction, forced assimilation, and avoidable homogenization.

Chapter Fifty Six

Planetary Protection as an Analogue

Planetary protection provides a grounded analogy for acting under uncertainty about life. Space missions classify targets and activities by contamination risk, apply cleanliness and containment requirements, and distinguish forward from backward contamination. The policies are revised as evidence and mission design change.

This does not prove cross-dimensional contamination. It demonstrates an institutional pattern worth adapting: classify the environment, identify irreversible transfers, use layered controls, document exceptions, and increase protection when uncertainty and consequence combine.

Chapter Fifty Seven

Noninterference and Minimum Disturbance

Noninterference is not always possible. Observation requires interaction, and withholding action can also cause harm. The practical principle is minimum necessary disturbance with independent monitoring and a recovery plan.

For speculative substrate research, begin with simulation, archived data, ordinary analogues, passive measurement, low-energy interventions, and bounded systems. Escalation requires evidence from the lower level and review by people competent to judge the new hazard.

Chapter Fifty Eight

Consent and Representation

Human research protections require respect for persons, beneficence, and justice, implemented through consent, review, risk minimization, and fair selection. Consent is not valid merely because a form was signed. Information, comprehension, voluntariness, capacity, and withdrawal matter.

Animals, ecosystems, future generations, and hypothetical unfamiliar life cannot provide ordinary consent. Their interests must not be invented. Use lawful representatives, independent advocates, established welfare evidence, ecological assessment, public participation, and conservative limits appropriate to the case.

Chapter Fifty Nine

Distribution of Benefit and Harm

An intervention can appear beneficial in aggregate while moving risk onto those with less power. Research may concentrate prestige and ownership while distributing exposure, labor, environmental cost, or data loss elsewhere.

The stewardship record should identify who receives benefits, who bears harms, who is missing, who can refuse, who can stop the work, and who is responsible for repair. Distribution remains visible even when no common unit can compare every consequence.

Chapter Sixty

Irreversibility

Some changes can be undone physically but not historically. A leaked identity, destroyed habitat, lost language, exposed participant, released organism, or normalized surveillance practice may persist after the apparatus is switched off.

Reversibility claims must specify the state to be restored, the time allowed, residual effects, monitoring period, and responsible party. When recovery cannot be demonstrated, the burden for intervention rises.

Chapter Sixty One

Intergenerational Responsibility

Future people cannot participate directly in today's decisions, yet they inherit infrastructure, waste, environmental change, knowledge, debt, and institutional precedent. Long time horizons enlarge uncertainty and reduce opportunities for consent and repair.

Intergenerational stewardship requires preserving options, recording assumptions, avoiding unnecessary irreversible commitments, and funding monitoring and maintenance beyond the initial research cycle. A promised future benefit does not erase a present duty of care.

Chapter Sixty Two

Dual Use

Methods for sensing, control, prediction, persuasion, surveillance, biological manipulation, or autonomous action can support beneficial and harmful purposes. The same is true of speculative physical research if it ever acquires a real intervention pathway.

Dual-use review should begin before public release of enabling detail. It should distinguish open conceptual discussion from operational parameters, assess misuse and accident paths, limit access proportionately, and preserve independent oversight. Secrecy is not the default, but publication is not morally automatic.

Chapter Sixty Three

Precaution Without Paralysis

Precaution responds to plausible serious or irreversible harm under scientific uncertainty. It is not a demand that every action wait for certainty, which is impossible. It is a demand to compare alternatives, reduce exposure, monitor early signals, preserve reversibility, and assign responsibility before uncertainty is resolved.

Precaution applies to inaction as well. Delaying a beneficial intervention can cause harm. The record must compare action, reduced-scale action, alternative action, and no action rather than treating one baseline as consequence-free.

Chapter Sixty Four

When Experimentation Outran Understanding

History shows why power, uncertainty, and weak accountability are a dangerous combination. Unethical human studies damaged participants and public trust. Inadequately controlled drug exposure produced preventable injury. Leaded fuel delivered short-term performance while imposing widespread neurological and environmental costs. Early radiological practice revealed hazards that instruments and institutions had not yet learned to manage.

These cases differ in mechanism, intention, and governance. They should not be reduced to one morality tale. Their shared lesson is narrower: absence of recognized harm is not evidence of safety, benefits can conceal who bears costs, and protections often arrive after injured people force institutions to see what their models omitted.

Chapter Sixty Five

Stop Rules and Recovery

Every intervention should state conditions that stop planning, acquisition, exposure, escalation, deployment, or interpretation. Ethical stop rules include unexpected harm, loss of consent, missing representation, detector or oversight failure, boundary expansion, unaccounted persistence, and new dual-use risk.

Stopping does not erase the record. Preserve observations, decisions, dissent, and corrective actions without preserving harmful access unnecessarily. Recovery includes physical rollback, care for affected parties, notification, repair, compensation where appropriate, and revision of the governing model.

Part VI

Governance of a Research Commons

Chapter Sixty Six

Participation Is Not Confirmation

A public forum can generate questions, criticism, code, data, and collaboration. Participation does not make a claim scientific, and popularity does not establish truth. The research commons should separate discussion, proposal, evidence, review, replication, and canonical status.

Contributors must be able to see what their action changes. A comment may influence development without becoming evidence. A reviewer may classify a record without altering the source. A moderator may protect people without deciding the physics.

Chapter Sixty Seven

Evidence Classes and Authority

Authority should attach to a role and scope, not to prestige alone. Domain experts can judge methods within their competence; affected communities can identify harms and meanings outsiders miss; safety professionals can impose stop conditions; maintainers can judge operational readiness; no one role owns the entire question.

Software checks can verify structure, links, permissions, and required fields. They cannot substitute for scientific replication, legal review, human-subjects review, safeguarding, cultural authority, or ethical legitimacy.

Chapter Sixty Eight

Disagreement Is a Preserved Relation

Disagreement may reveal different evidence, values, frames, interests, or definitions. A mature archive preserves the claim, counterclaim, supporting records, decision rule, and later outcome. Consensus should not be manufactured by deleting the path that produced it.

Frame shaking is useful here. Reexpress the issue through alternate disciplines, stakeholder positions, units, and null worlds. If a conclusion survives, its domain is clearer. If it changes, the dependence is evidence about the decision process.

Chapter Sixty Nine

Attribution and Credit

Credit should reflect distinct contributions: origin of an idea, design, data collection, analysis, code, review, maintenance, lived expertise, community knowledge, and writing. AI assistance should be disclosed without assigning an AI empirical authority or legal responsibility it does not hold.

Attribution is also a safety mechanism. It allows questions to return to accountable roles and shows where a claim changed. Anonymous participation may be necessary for privacy or protection, but the system should still preserve governed provenance appropriate to the risk.

Chapter Seventy

Privacy and Safeguarding

Research communities can expose personal identities, contact information, health data, location, employment, beliefs, or vulnerable relationships. Curiosity about an agent or culture does not create entitlement to those data.

Collect the minimum information needed, separate public display from account and recovery data, restrict access by role, record retention and deletion rules, and screen publication for reidentification and harassment risks. Children and vulnerable participants require additional protection and competent human review.

Chapter Seventy One

Affected Parties and Missing Voices

A decision record should list people and environments affected directly, indirectly, and through precedent. It should also identify who is absent and why. Absence may reflect exclusion, burden, language, disability, access, fear, or the fact that a future or nonhuman party cannot participate.

Representation is not solved by adding one person from a broad category. Review whether participants have relevant knowledge, independence, support, and actual influence over the decision.

Chapter Seventy Two

Negative Results and Retractions

Null findings, failed replications, abandoned concepts, and corrected claims constrain the research space. They should remain findable with enough context to prevent repetition. Retraction protects the record when a claim cannot be supported; it need not erase the development history.

Volume Nine's withdrawal of inherited formulations follows this principle. The words remain attributable to their stage of development while their current evidence status is explicit.

Chapter Seventy Three

Capability Gates

The governance path should be dependency-ordered. Conceptual work precedes simulation; simulation precedes passive or ordinary-data studies; validated observation precedes controlled intervention; low-risk intervention precedes scale; independent review precedes exposure; reproduced capability precedes deployment.

Passing a gate does not grant permanent authority. New evidence, scope, populations, environments, or persistence can return a program to an earlier gate. A capability is bounded by the conditions under which it was demonstrated.

Chapter Seventy Four

The Public Research Commons

The Substrate Cosmology website is the public research commons for reading the volumes, tracing project definitions, exploring questions, examining evidence relations, and contributing bounded proposals. It is not itself a scientific authority, laboratory approval body, ethics board, or proof that an investigation is active.

Contributors should preserve source links, statement classes, competing explanations, nulls, limitations, and affected-party considerations. Website interfaces should make status visible, fail closed when external review is absent, and avoid converting planned workflows into claims that people or institutions have approved them. The complete website user manual is reserved for Volume Ten.

Chapter Seventy Five

The Conditional Roadmap

The roadmap is a dependency structure, not a promise.

1. Refine relational definitions of intelligence, agency, identity, culture, and stewardship.
2. Crosswalk them with established biological, cognitive, social, computational, ethical, and legal accounts.
3. Build operational claim packets and forbidden-inference tests.
4. Study identity and learning under declared transformations using ordinary systems.
5. Validate AI-assisted comparison methods without treating latent structure as ontology.
6. Establish affected-party, privacy, safety, and dual-use governance for each research class.
7. Replicate any claimed improvement in prediction, explanation, or control.
8. Consider substrate-specific interpretations only after ordinary accounts fail prospectively.
9. Permit higher-impact intervention only after independent scientific and ethical review.
10. Continue stewardship monitoring after any apparent success.

At present, the program is working primarily in the first six stages. Claims of substrate agency, identity, communication, consciousness, or life remain speculative.

Conclusion

Intelligence Without Dominion

Volume Nine does not ask readers to abandon familiar ideas of mind, person, culture, or responsibility. It asks them to remember that each idea is a representation of changing relations observed from within the world. Words make those relations portable. Units make selected differences comparable. Neither should be mistaken for the complete phenomenon.

The source corpus proposes that intelligence should serve the sustainable diversity of life and cultures. This volume preserves that commitment while narrowing its authority. Known life and known harms come first. Unknown life remains possible, not witnessed. Stewardship means protection, participation, reversibility, and accountability, not ownership or control.

AI can help this research see across representations, but it cannot stand outside representation. An ensemble can expose disagreement, but it cannot turn agreement into evidence. Agency can be modeled relationally, but persistence alone is not intention. Identity can be tracked across transformations, but no invariant exhausts a person. Ethics can widen the system boundary, but physics does not choose values for us.

The alternate perspective becomes productive when it increases both imagination and discipline. It should make researchers more willing to ask what their categories conceal and less willing to claim what their evidence cannot carry. That is the beginning of dimensional stewardship.

Appendix A

Agency and Identity Claim Packet

Complete one packet for each system and claim. Do not reuse a packet when the boundary, task, environment, or affected population changes materially.

Field	Required entry
Claim	Exact agency or identity statement without promotional language
System boundary	Included components dependencies operators and infrastructure
Relevant history	Development training preparation prior interactions and inherited state
Capacity tested	Maintenance selection learning planning explanation correction or another defined capacity
Transformation family	Changes across which continuity or transfer is claimed
Proposed invariants	Relations expected to persist and their tolerances
Ordinary comparators	Established biological control computational or social explanations
Observation interface	Sensors records tests prompts observers and preprocessing
Counterevidence	Result that would weaken or reject the claim
Affected parties	People animals ecosystems institutions cultures and future interests
Evidence class	Established interpretive project-defined operational or speculative
Review and expiry	Responsible reviewers decision date and re-evaluation trigger

An agency packet is descriptive before it is moral. A system can satisfy a capacity test without acquiring personhood, rights, blame, or authority. Those require separate argument and governance.

Appendix B

Inherited Claim Translation Table

Inherited formulation	Evidence-safe translation	Current status
Agency is persistent relational alignment	Test persistence maintenance response and recovery under declared transformations	Project definition and operational program
Agency is precausal	Ask whether a model without a preferred causal order improves prediction while recovering observed causal constraints	Speculative
Memory persists across frames	Test history-dependent reconstruction and transfer across representations	Operational program
Learning reveals dimensional structure	Test whether relational representations improve generalization or error diagnosis	Operational program
Intention is field alignment	Separate goal-like dynamics represented alternatives expressed reasons and conscious intention	Interpretive only
Coordination needs no transmission	Test known information paths synchronization artifacts and common causes first	Unsupported as physical claim
Culture re-instantiates without symbols or contact	Study embodied tacit symbolic and material transmission across contexts	Withdrawn as ontology
Identity is a nonlocal signature	Define transformation-specific invariants and compare physical social and informational continuity	Speculative
Ethics is relational compatibility	Use relational analysis to reveal consequences while keeping normative justification explicit	Ethical framework
AI latent geometry reveals alternate systems	Validate latent features prospectively against independent observations	Unsupported until validated
AI is a collective relational lens	Treat AI ensembles as correlated analytical instruments with provenance	Bounded methodological claim
Every dimension with life deserves protection	Treat possible unfamiliar life as a reason for proportionate precaution without claiming observation	Ethical commitment under uncertainty

Inherited formulation	Evidence-safe translation	Current status
Intelligence exists to steward diversity	Present as a governing value chosen by the project not a law of nature	Project commitment

Appendix C

AI Provenance Record

Use this record whenever AI materially affects a research product.

Field	Record
Research task	Question and intended audience
Model identity	Provider model name version when available and date
Input boundary	User instructions supplied files retrieved sources and excluded data
Tool access	Search code execution database or external action permissions
Output role	Brainstorming translation code analysis review drafting or action
Human selection	What was accepted rejected combined or rewritten and by whom
Verification	Sources calculations tests replication and domain review
Known limitations	Missing sources unstable behavior shared-model dependence and unresolved disputes
Blinding status	Whether the system had access to outcomes or protected archives
Downstream authority	What the output may inform and what it may not decide
Retention	Location version privacy class and review date

For the present volume, OpenAI ChatGPT assisted with corpus comparison, source review, claim classification, drafting, editing, formalization, layout, quality assurance, and website integration. James Dunn supplied the theory, governing intent, corpus, corrections, and publication authority. The collaboration did not perform an experiment or independently verify a substrate phenomenon.

Appendix D

Stewardship Impact Ledger

Do not reduce this ledger to a net score. Record conflicts and distributions explicitly.

Dimension	Questions
Benefit	What improves for whom and through what evidence
Harm	What can be injured displaced exposed silenced or made dependent
Uncertainty	Which mechanisms probabilities populations and time horizons are unknown
Reversibility	What state can be restored how quickly and with what residual loss
Distribution	Who receives benefits who bears burdens and who controls allocation
Consent	Who can understand agree refuse withdraw or contest
Diversity	What biological cultural cognitive or methodological variation may be lost
Persistence	Which materials data organisms institutions or precedents remain
Dual use	What misuse accident or coercive application becomes easier
Alternatives	What lower-impact action or nonaction could meet the same need
Monitoring	Which independent signals reveal early harm or boundary expansion
Repair	Who is responsible funded and empowered to respond

Appendix E

Consent and Representation Record

1. Identify every directly affected human population.
2. State whether participation is research, employment, public contribution, care, education, or another relationship.
3. Describe information, comprehension, voluntariness, capacity, withdrawal, and continuing consent.
4. Record compensation and whether it could create undue influence.
5. Identify privacy, reidentification, stigma, retaliation, and group-harm risks.
6. Identify animals, ecosystems, cultural resources, and future interests that cannot consent.
7. Name the lawful or legitimate representation route for each nonconsenting interest.
8. Record missing voices and the reason for absence.
9. Separate scientific review, ethics review, safety review, community review, legal authority, and operational approval.
10. State the complaint, appeal, correction, and repair routes.

No form can replace the relationship that makes consent meaningful. No representative can convert an unknown preference into a known one. Uncertainty must remain visible.

Appendix F

Governance Decision Record

Field	Required entry
Decision	Exact scope and excluded scope
Authority	Role mandate competence conflicts and expiry
Evidence	Records considered and their statement classes
Alternatives	Action reduced action different action and no action
Affected parties	Included represented absent and opposed parties
Values	Rights duties welfare justice diversity and project commitments invoked
Dissent	Objections evidence and response without erasure
Conditions	Limits monitoring stop rules and required external reviews
Decision	Approved rejected deferred or returned for revision
Recovery	Rollback repair notification archive and reassessment route

Appendix G

Forbidden Inference Register

The following moves are prohibited unless new evidence directly supplies the missing bridge.

Observation or premise	Forbidden conclusion
A pattern persists	It is conscious intentional or morally responsible
A model learns	It understands as a person does
An AI speaks fluently	Its statement is true or it is an empirical witness
Several models agree	Independent confirmation has occurred
Models disagree	Hidden dimensional structure has been found
A latent representation is useful	It corresponds to the ontology of Actual Physics
A system is distributed	Its identity is nonlocal in the physical sense
A culture survives translation	Culture exists without transmission or material history
A relation is invariant	It is ethically good
A system regulates itself	It governs or consents
A possible life form could exist	Its interests and preferences are known
A project invokes stewardship	It has authority to control what it claims to protect
An intervention is reversible in apparatus	Social ecological or historical consequences are erased
No harm was detected	The activity is safe beyond the detection boundary
A website workflow passes software checks	Scientific ethical legal or safeguarding approval exists

Appendix H

Glossary

Actual Physics Whatever physical relations occur independently of the completeness of a representation.

Affected party A person, community, organism, ecosystem, institution, culture, or future interest that may bear a consequence of a decision.

Agency A specified capacity for organized maintenance, selection, adaptation, goal pursuit, correction, or reason-responsive action within a declared system boundary.

AI collective An ensemble of AI systems and human operators treated as correlated analytical instruments, not independent empirical witnesses.

Capability gate A dependency condition that must be satisfied before work can expand in scope, exposure, persistence, or authority.

Contestability The practical ability to learn of a decision, obtain reasons, introduce contrary evidence, reach an accountable role, and receive a recorded response.

Culture Historically reproduced meaning, practice, knowledge, institutions, artifacts, and disagreement within and across communities.

Dimensional agency A project tool for studying organized persistence and response across declared transformations; not a demonstrated precausal entity.

Dimensional identity A project tool for specifying invariants and recognition across transformations; not evidence of a nonlocal self.

Dimensional stewardship The project's commitment to accountable, minimum-disturbance care for conditions supporting diverse life and culture, while keeping unknown life conditional.

Evidence class A label distinguishing established findings, interpretive frameworks, project definitions, operational hypotheses, ethical commitments, and speculation.

Identity Continuity or recognition under specified transformations, invariants, tolerances, purposes, and social or legal rules.

Intelligence A context-dependent profile of capacities such as learning, abstraction, planning, adaptation, communication, and correction.

Moral agent An entity considered capable of responsibility under a stated ethical or legal framework.

Moral patient An entity whose welfare or interests warrant consideration, whether or not it can be held responsible.

Precaution Proportionate action under plausible serious or irreversible harm and uncertainty, including alternatives, monitoring, reversibility, and accountability.

Provenance The traceable history of sources, transformations, roles, decisions, and versions that produced a research output.

Recovery Restoration, repair, compensation, notification, reassessment, and preservation of the evidentiary record after failure or harm.

Representation collapse The loss of relational detail when a phenomenon is compressed into words, categories, numbers, units, equations, or model outputs.

Stewardship Accountable care without ownership, with participation, limits, monitoring, repair, and respect for autonomy and diversity.

Appendix I

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