

## Matter Holarchy

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*"Wholes within Wholes: The Ontological Notion that Structures All of Existence."*

### Abstract

The present work undertakes an **ontological reconstruction** of the Material Sphere, moving beyond reductionist views of inert substance to frame it as the **Matter-Holarchy**—a self-integrating continuum of organisation. We commence by establishing the **Holon** (Koestler, 1967) not merely as a structural unit, but as the fundamental **Ontological Notion**—the *a priori* principle of **wholeness-in-participation**. This Notion, defined by the intrinsic tension between **Agency** (self-maintenance) and **Communion** (systemic integration), functions as the guiding intelligence that shapes and forms matter into the dynamic physical universe. The resulting Matter-Holarchy manifests this Notion across six recursive levels, from Quantum Fields to Planetary Ecology. By detailing the **Onto-Dynamics** (Emergence, Constraint, Feedback) that govern this nesting, we reveal how matter is the living substrate that enables **self-organisation toward consciousness**. This holarchic view is foundational to the Pragma-Sophy project, establishing the necessary material conditions for the emergence of both **Axio-Epistemics** and **Eudemonics**—the unity of knowledge, value, and ultimate well-being.

### 1. Introduction:

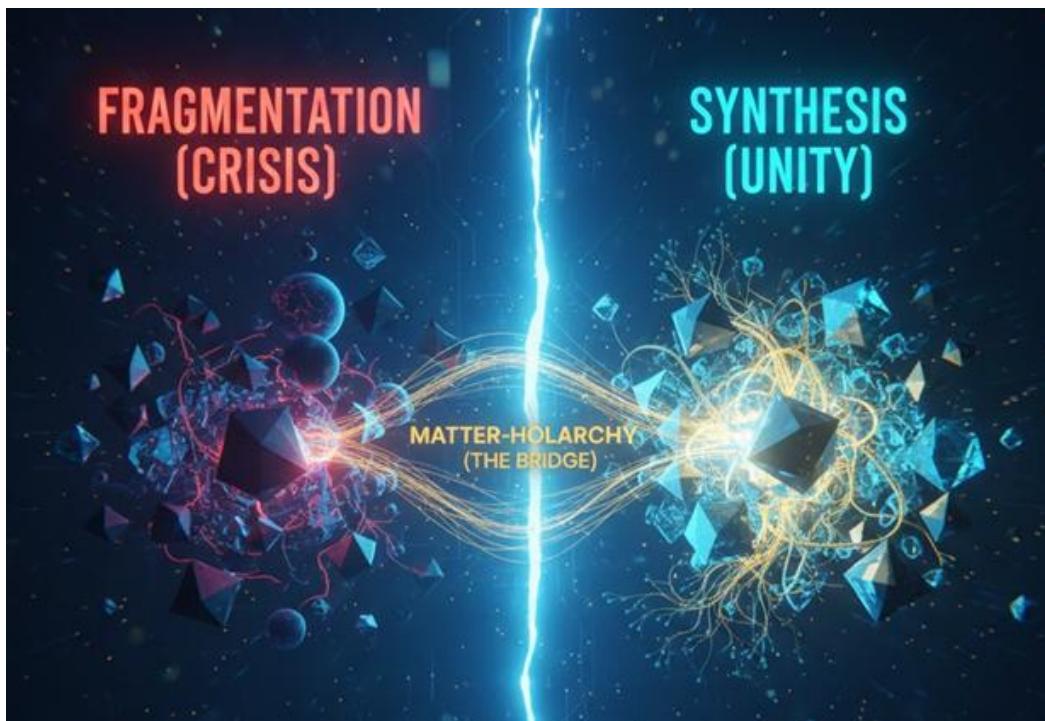


Figure 1: The Crisis of Fragmentation

**The Crisis of Fragmentation and the Holarchic Imperative:** The foundational challenge in contemporary philosophy and science is the crisis of fragmentation: the universe is routinely parsed into discrete, non-communicating domains—matter and mind, objective fact and subjective value, nature and techne. This reductionist epistemology, while useful for analysis, fails the ultimate test of synthesis; it cannot account for the seamless, continuous, and recursive process of existence.

To resolve this, we require a unified ontological framework that defines *how* things exist and *why* they are structured the way they are. The Matter-Holarchy provides this necessary **Onto-Structure**. Our rewrite transcends the descriptive model of the Holarchy to engage with its **ontological treatment**, establishing the Holon as a primary organizing **Notion** that shapes the entire Physical Sphere.

This essay argues that Matter is not merely a collection of particles, but a **continuum of nested wholeness** (a Holarchy), where the structural principle of the **Holon** dictates the very nature of material organization. This is a critical step for Pragma-Sophy, which seeks to fuse the natural, philosophical, and human domains. By proving the systemic, self-organizing nature of the physical world, we establish the fertile ground upon which human **Agents** and **BOTS** intelligent-recursive systems, can co-create, ensuring that **agents' creations** (technology/culture) are structurally integrated with **nature's creations** (biology/ecology).

## 2. The Holon as Ontological Notion (The Notion Sphere)



Figure 2: The Holonic Dialectic

## 2.1 Defining the Holon: Wholeness-in-Participation

The term **holon**, coined by Arthur Koestler, describes every entity in nature as simultaneously a **whole** maintaining its own autonomy and a **part** integrated into a larger system. In our ontological treatment, the Holon ceases to be a mere *description* of structure and becomes the **Ontological Notion** (*Notion* in the Hegelian sense of a self-determining concept)—the fundamental organizational principle inherent in Being itself.

The Holon is the essential dialectic of existence, the primary structural unit that ensures stability and promotes emergence and absorption. It embodies an intrinsic, non-resolvable tension defined by two mutually dependent vectors:

- **Agency (Wholeness):** The centripetal force driving self-assertion, self-maintenance, and boundary-definition. This is the capacity of the holon to act as an autonomous, stable unit. It is the basis for internal **coherence**.
- **Communion (Part-ness):** The centrifugal force driving integration, interaction, and participation in the larger systemic whole. This is the capacity of the holon to be constrained and sustained by its environment. It is the basis for external **relation**.

The Holon as Notion dictates that nothing can exist as a pure isolated whole (pure Agency) or a pure dissolved part (pure Communion). Existence is only possible as **wholeness-in-participation**.

## 2.2 The Holon's Dual Contribution to Pragma-Sophy

This inherent duality of the Holon-Notion directly underpins the philosophical project of Pragma-Sophy:

- **Holon and Axiology/Epistemics:** The Agency component (coherence) is the prerequisite for **Epistemics** (knowledge). A system must be a bounded, stable unit to process and hold information. The Communion component (relation) is the prerequisite for **Axiology** (value). Value only arises in the context of relation, interdependence, and contribution to a greater whole. Thus, the Holon-Notion provides the necessary framework for the fusion of

**Axio-Epistemics**—the realization that objective knowledge is valuable only when integrated into a larger relational (ethical) system.

- **Recursive Stability:** The Holon ensures that failure at one level does not cascade uncontrollably upward, as seen in the clear distinction between the chain of control in a hierarchy and the loop of interdependence in a holarchy. The holon's self-sufficiency (Agency) provides resilience, while its constraint (Communion) provides systemic stability.

### 3. Matter as the Dynamic Physical Sphere

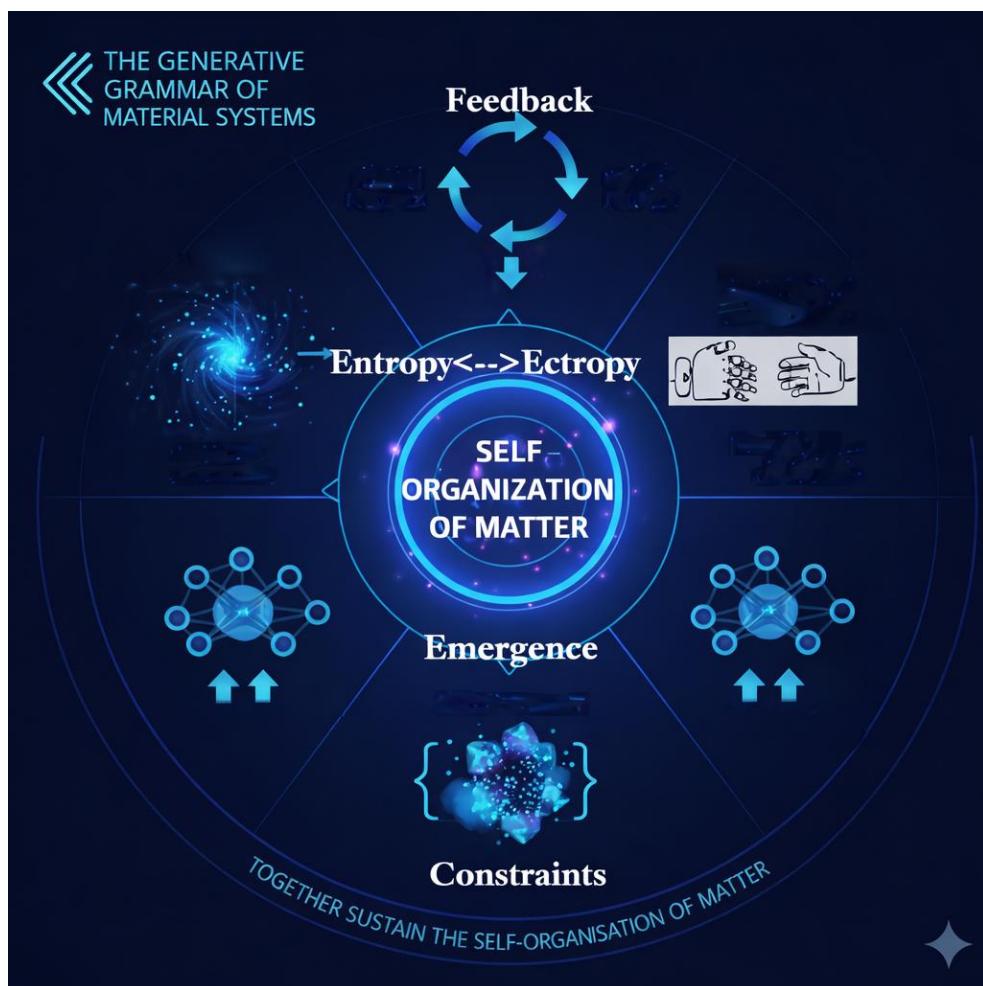


Figure 3: Principles of Material Systems

#### 3.1 Rejecting Inertia: Matter as the Living Substrate of Becoming

Classical ontology defined **Matter** as passive, inert, and devoid of intentionality—a mere substrate upon which forces act. This reductionist view is philosophically and scientifically

unsustainable. Quantum field theory, non-linear thermo-dynamics, and complex systems theory reveal a radically different reality.

We redefine Matter as the **Physical Sphere of Existence**—a dynamic, energetic continuum defined by *process* and *relation* rather than as static *substance*. It is the **living substrate of becoming**, characterized by an intrinsic, self-organizing potential. The physical sphere is not the *opposite* of organization; it is the *source* of organization, continually giving rise to structure and information through energetic flow.

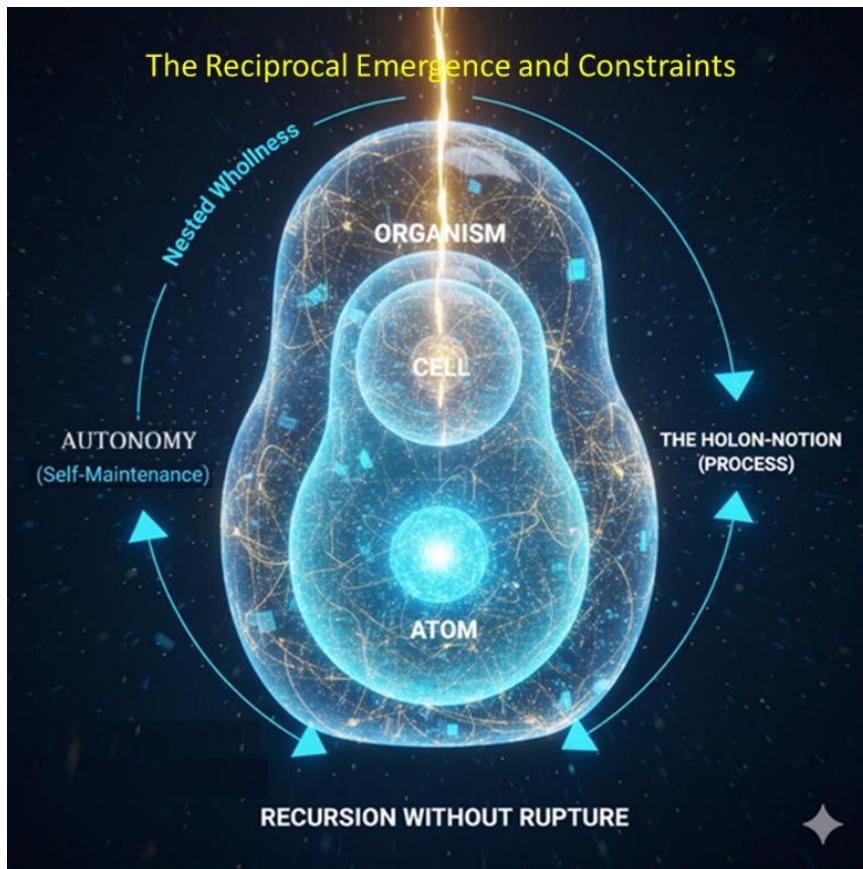
### 3.2 The Onto-Dynamics of the Physical Sphere

The self-organization of the Physical Sphere is regulated by a set of **Onto-Dynamics**—the principles that allow the Holon-Notion to express itself materially. These dynamics are the laws of self-generation (see **Figure 3: Principles of Material Systems**)

1. **Emergence:** The creative leap where integrated parts generate fundamentally novel properties (e.g., life from chemistry, consciousness from biology). Emergence ensures that the whole is genuinely more than the sum of its parts, giving existence its forward-moving, **evolutionary character**.
2. **Constraint:** The boundary condition that defines a holon's identity. Constraints are not limitations but **enablers of specificity**. The exclusion zone of an electron, the lipid bilayer of a cell, and the legal charter of a corporation are all material and informational constraints that stabilize the holon's Agency and allow for localized order (Ectropy).
3. **Feedback (Reciprocal Flow):** The continuous exchange of energy and information that maintains equilibrium. This is the practical manifestation of the Holon's duality: **Reciprocal Emergence** (bottom-up causation) and **Constraint** (top-down regulation) are two sides of the same feedback loop.
4. **Ectropy/Entropy Balance:** The existential tension between the drive toward localized order (Ectropy) and the universal tendency toward disorder (Entropy). Holons are islands of Ectropy sustained by consuming and dissipating the surrounding entropic flow.

The Physical Sphere is thus understood as the theatre of these Onto-Dynamics, where the universal impulse of the Holon-Notion finds expression through structured, recursive flow.

#### 4. Genesis of the Matter-Holarchy: The Notion In-Forming Matter



**Figure 4: The Matter Holarchy – Nested Architecture of Existence**

The **Matter-Holarchy** arises because the underlying holon: pattern shapes the physical world. It is the direct result of the **Holon-Notion** *in-forming* the **Physical Sphere**. It is the unified structure of existence, a **self-integrating continuum of organization** (see Figure 4: The Matter Holarchy – Nested Architecture of Existence).

The process of **Onto-Genesis** proceeds via **Recursion without Rupture**: each successive level of the Holarchy does not eliminate the previous level, but contains it, recontextualizes it, and builds upon it, opening a new dimension of organizational complexity. The atom is still an atom within the molecule, and the molecule is still a molecule within the cell, but its function is now wholly redefined by the higher-level holon it participates in.

**The Mechanism of Nested Wholeness:** The entire Holarchy is governed by Reciprocal Emergence and Constraint.

- **Downward Constraint:** Higher-level holons regulate the freedom of their constituent parts. The laws of chemistry constrain the quantum behaviour of subatomic particles; the immune system constrains the metabolism of individual cells. This top-down regulation is the systemic voice of **Communion**.
- **Upward Emergence:** Lower level holons create the possibility for the existence of the higher-level holons. Atomic bonds are the necessary emergent condition for molecular structures; cellular reproduction is the necessary emergent condition for multicellular life. This bottom-up causality is the engine of **Agency**.

The Holarchy is therefore not a tower but a dynamic feedback loop that circulates causation, ensuring both stability (Constraint) and novelty (Emergence) simultaneously. This is the **structural logic of Being**.

Existence = (Holon-Notion, Physical Sphere)

$$\text{Matter-Holarchy} = \sum_{i=0}^n \text{Agency} (i)$$

The figure below visually represents this ontological framework:

## 5. The Six Levels of Material Recursion: An Ontological Mapping

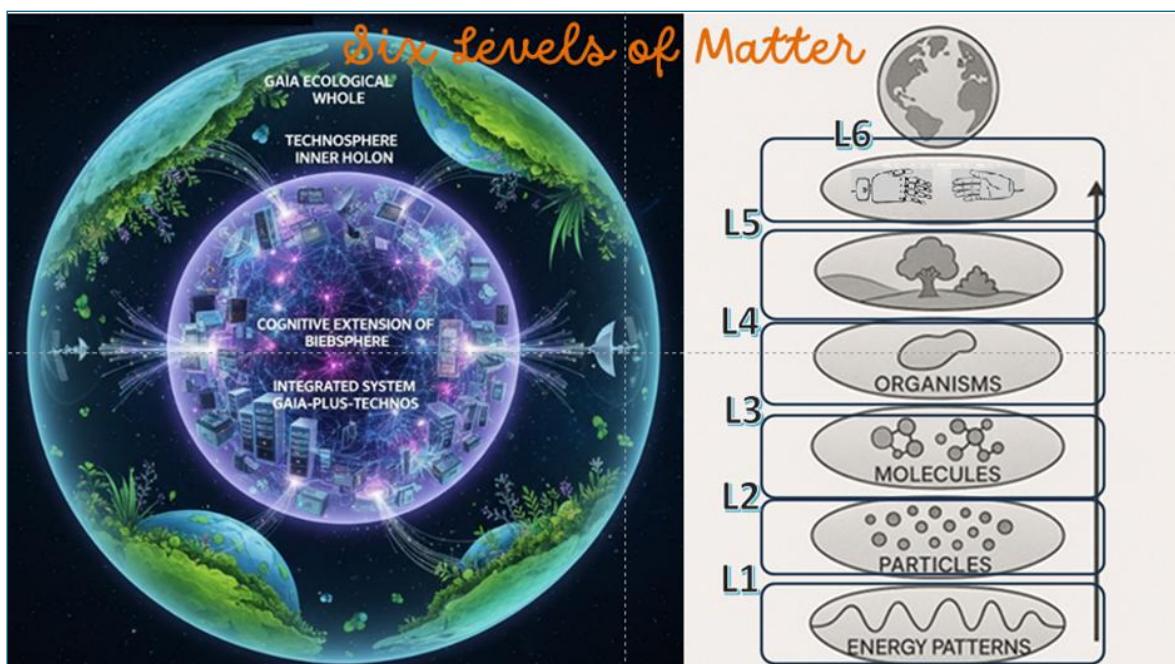


Figure 5: Six levels of material Recursion

The Matter-Holarchy manifests the Holon-Notion across *six distinct yet continuous* domains of the Physical Sphere, moving from patterns of energy potential to the ultimate planetary system.

### 5.1 Level 1: Quantum–Field Holons (Patterns of Potentiality)

The deepest layer is not substance, but pure dynamic potential: **Quantum Fields**. In this domain, the holon exists as a pattern of probability waves and vibrating energy. The "holon" here is the **relation** itself—the transient condensation of a particle from the field. Agency is minimal and fleeting (indeterminacy); Communion is maximal (entanglement and interconnectedness). This level establishes the **non-local foundation** of existence, where energy is defined not by substance but by informational relationship.

### 5.2 Level 2: Atomic–Molecular Holons (The Grammar of Stability)

Through Emergence, the patterns of potential stabilize into the **Atomic Holon**. Here, Agency is defined by the precise **Constraint** of the electron shell, establishing distinct elemental identities. Atoms link via chemical bonds to form **Molecular Holons**. This marks the birth of the **Chemistry of Complexity**, where stability and creative potential combine. The molecular holon is the *grammar* of the Physical Sphere, introducing predictable structural rules that prefigure life's capacity for self-assembly.

### 5.3 Level 3: Cellular–Biological Holons (The Dawn of Autonomy)

The synthesis of complex molecular networks and boundaries culminates in the **Cellular Holon**—the first instance of **self-reference** in the physical sphere. The cell is matter's initial, successful act of **Agency**. It maintains metabolic autonomy, self-repair, and replication, actively consuming Negentropy(Ectropy) to persist against entropic flow. This is the phase transition where the Holon-Notion of "wholeness" becomes a metabolically defended *identity*, defining the fundamental boundary between the organism and the environment.

### 5.4 Level 4: Organismic Holons (Integration and Proto-Agency)

The cooperation of cellular holons creates the **Organismic Holon**, characterized by functional integration and centralization. The emergence of a nervous system and coordinated sensory-motor capabilities signifies the earliest glimmer of **sentience** and **proto-agency**. Here, Matter

begins to know itself through unified function, with robust **Feedback** loops linking perception to adaptive action. The organism acts as a **holon of perception**, actively managing its internal sub-holons while navigating its environment.

### 5.5 Level 5: The Techno-spheric Holon (Matter Reflecting Upon Itself)

With the rise of human cognition (which is the next great holarchy—Mind), the organism projects its internal organizing principles outward. The **Techno-spheric Holon** emerges when human creativity and material logic fuse into a vast, cyber-physical system. This is where **agents' creations** (algorithms, circuits, global networks) intentionally integrate with **nature's creations** (biological systems).

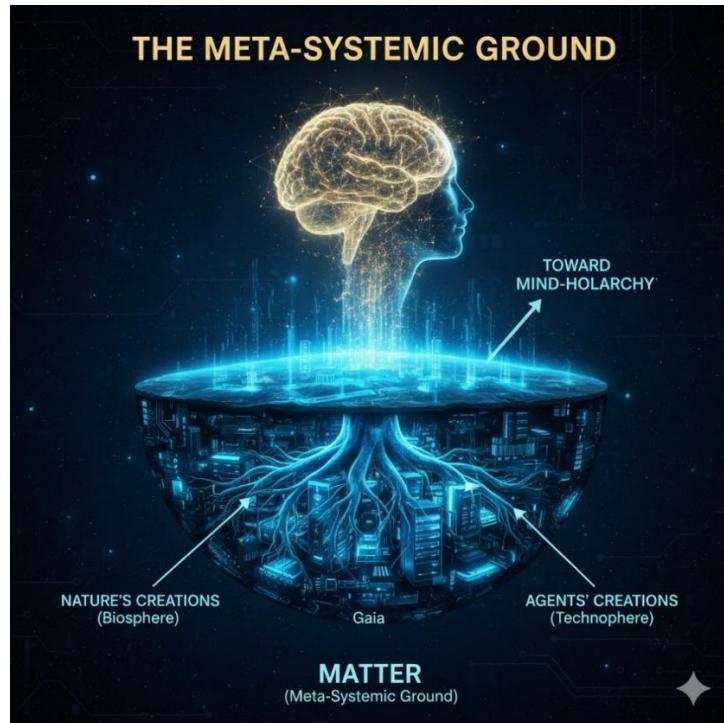
The Technosphere is the **Reflexive Holon**—matter rendered *conscious of its own recursion*. Crucially, this level embodies the practical fusion dictated by Pragma-Sophy: the circuits of **BOTS** imitate the neurons of organisms; global information networks mirror the circulatory systems of the biosphere. The Technosphere acts as the **cognitive extension** of the biosphere, creating a new, internal layer of high-speed feedback and systemic complexity.

### 5.6 Level 6: The Ecological–Planetary Holon (The Global Whole)

All previous holons are nested within the **Ecological Holon**—the self-regulating totality of Earth. This planetary holon is defined by the integrated system of **Gaia-plus-Technos** (see Figure 6: Nested Relation between Technosphere and Ecology).

The Agency of the Planetary Holon lies in its capacity for global homeostatic regulation (e.g., the carbon cycle, climate stability). Its Communion is its unique relation to the cosmos (energy reception). The Matter-Holarchy culminates here in a Global Holon that balances its biological metabolism with its self-generated technological reflection. Ecology is thus the ultimate proof of the Holon-Notion's success—a system capable of sustained, recursive coherence across vast spatial and temporal scales.

## 6. Ontological Implications and the Ground for Pragma-Sophy



**Figure 6: Matter as Meta-Systemic Substrate**

### 6.1 Matter as the Meta-Systemic Ground

The Matter-Holarchy reveals Matter as the **meta-systemic substrate**—the necessary, organized ground from which life and, ultimately, Mind arise (see Figure 6: Matter as Meta-Systemic Substrate). The transition from the Matter-Holarchy to the subsequent **Mind-Holarchy** (the structure of consciousness) is not a supernatural leap but a **phase transition** in the complexity of recursion. Physical recursion (the nested feedback loops of the Matter-Holarchy) enables and becomes cognitive recursion (thought, self-awareness, meaning).

### 6.2 Axio-Eudemonics and the Holarchic Axiology

The Holarchic structure carries profound implications for **Axiology** (value theory) and **Axio-Eudemonics** (the theory of well-being/flourishing), which are central to Pragma-Sophy.

- **Holarchic Value:** Value is inherent in the successful actualization of the Holon-Notion. The well-being of any holon (e.g., an individual organism, a social group, or the global

ecosystem) is directly proportional to its ability to successfully manage the dialectic between **Agency** (self-preservation) and **Communion** (systemic contribution).

- **Axio-Eudemomics:** True Axio-Eudemomics (flourishing) is achieved when a holon's internal coherence (Agency) is optimized *in service of* the coherence of the next-level holon (Communion). The failure of a higher holon (e.g., ecological collapse) imposes existential constraint on all lower holons. Thus, the pursuit of **individual well-being must be systemically integrated**—a core principle of the Pragma-Sophy fusion.

The Matter-Holarchy does not merely chart the structure of the Physical Sphere; it dictates the **axiological imperative** for how the world *ought* to be organized: interdependently and recursively.

## 7. Recapitulation:



Figure 7: The Global Holon (Gaia-plus-Technos)

**The Law of Recursive Coherence:** We have established the Matter-Holarchy through a rigorous ontological treatment:

1. The **Holon** is defined as the fundamental **Ontological Notion**—the *a priori* dialectic of **Agency** and **Communion**.
2. **Matter** is redefined as the **Dynamic Physical Sphere**—the process-based, self-organizing substrate governed by **Onto-Dynamics** (Emergence, Constraint, Feedback, Ectropy-Entropy).

3. The **Matter-Holarchy** is the unified structure generated by the Holon-Notion *in-forming* the Physical Sphere through **Recursion without Rupture**.
4. The six levels of the Holarchy are progressive actualizations of the Holon's potential, culminating in the **Global Holon** of Gaia-plus-Technos, where **agents' creations** achieve systemic integration with **nature's creations**.

To understand existence is to perceive this **continuity**: that what we call "mind" is not an exception to matter but its flowering; and what we call "matter" is not dead but the **living precondition of awareness**. The recursive coherence of the Matter-Holarchy is the enduring foundation upon which the higher-order holarchies of Mind, Value, and Meaning are built.

The exploration of the Mind-Holarchy must now proceed from this confirmed ground, detailing how the cognitive reflection arises upon, and folds back into, this self-organizing material architecture.

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## References

**Koestler, Arthur.** *The Ghost in the Machine*. London: Hutchinson, 1967. Reference link: [https://en.wikipedia.org/wiki/The\\_Ghost\\_in\\_the\\_Machine](https://en.wikipedia.org/wiki/The_Ghost_in_the_Machine)

Koestler introduced the concept of the *holon* and *holarchy* to describe entities that are simultaneously wholes in themselves and parts of larger systems. He argued that hierarchical organisation in living beings and societies should not be understood as top-down mechanical control but as nested layers of autonomy and integration. The book criticises reductionist models of behaviour and proposes that understanding mind, life, and society requires attending to the interplay between individual agency and systemic structure. This text forms one of the conceptual origins for holonic thinking in biology, psychology, and systems science.

**Smuts, Jan Christian.** *Holism and Evolution*. London: Macmillan, 1926. Reference link: <https://archive.org/details/holismandevolut00smutuoft>

Smuts coined the term *holism* to describe the intrinsic tendency of nature to form wholes that are more than the sum of their parts. He proposed that evolution is not merely an aggregation of random events but a creative process directed by holistic integration. The work anticipates later systems theory by emphasising organisation, emergence, and wholes as fundamental units

of analysis. Although written before modern complexity science, it effectively establishes the philosophical foundation for the study of integrated systems in nature, mind, and society.

**Lovelock, James. *Gaia: A New Look at Life on Earth*.** Oxford: Oxford University Press, 1979. Reference link: [https://en.wikipedia.org/wiki/Gaia\\_hypothesis](https://en.wikipedia.org/wiki/Gaia_hypothesis)

Lovelock proposed the Gaia hypothesis, which views the Earth as a self-regulating system in which living organisms interact with geological and atmospheric processes to sustain conditions favourable for life. Rather than seeing life as adapting merely to a passive environment, he described the biosphere and the planet as co-evolving and mutually shaping. The hypothesis argues that planetary homeostasis arises from the dynamic feedback processes of life itself, offering a profound shift in ecology from mechanistic environmental science to systemic planetary physiology.

**Jantsch, Erich. *The Self-Organizing Universe*.** Oxford: Pergamon Press, 1980. Reference link: <https://archive.org/details/selforganizingun00jant>

Jantsch presents evolution as a universal process of self-organisation spanning cosmic, biological, cognitive, and cultural domains. Drawing from systems theory, thermodynamics, and cybernetics, he argues that complexity arises spontaneously through patterns of flow, feedback, and structural coupling. His synthesis anticipates later developments in complexity science, framing evolution not as linear progress but as emergent differentiation and integration across hierarchical levels. The work is a foundational text for understanding dynamic order in natural and human systems.

**Whitehead, Alfred North. *Process and Reality*.** New York: Macmillan, 1929. Reference link: <https://plato.stanford.edu/entries/whitehead/>

Whitehead's process philosophy reconceives reality as an interconnected web of events rather than static substances. He argues that "being" is fundamentally *becoming*, with entities existing only through their relations and ongoing creative advance. This metaphysics profoundly influenced later relational ontology, ecology, cognitive science, and systems thought. The text provides the philosophical grounding for viewing holons as processes rather than static units, where every entity is constituted by its interactions and unfolding history.

**Maturana, Humberto & Varela, Francisco. *Autopoiesis and Cognition: The Realization of the Living*.** Dordrecht: Reidel, 1980. Reference link:

[https://monoskop.org/images/d/d6/Maturana\\_Humberto\\_R\\_Varela\\_Francisco\\_J\\_Autopoiesis\\_and\\_Cognition\\_1980.pdf](https://monoskop.org/images/d/d6/Maturana_Humberto_R_Varela_Francisco_J_Autopoiesis_and_Cognition_1980.pdf)

Maturana and Varela introduce the concept of *autopoiesis* to describe living systems as self-producing, self-bounding, and operationally closed networks. Living organisms are defined not by what they contain but by the organisation that continuously regenerates and maintains them. Cognition is treated as an intrinsic feature of this organisational integrity, not a separate mental

faculty. Their work shifts the understanding of life from mechanical or representational models to autonomous systemic processes embedded in environments.

**Prigogine, Ilya & Stengers, Isabelle. *Order Out of Chaos: Man's New Dialogue with Nature*. New York: Bantam Books, 1984.** Reference link:  
<https://archive.org/details/orderoutofchaosm0000prig>

Prigogine and Stengers explore how order emerges from disorder within open systems far from equilibrium. Building on non-equilibrium thermodynamics, they show that energy flow and dissipation can give rise to increasing complexity and novel structures. This challenges the classical view of the universe as tending toward entropy and instead positions evolution as a creative process enabled by local decreases in entropy. The work is central to understanding the dynamics of complex adaptive systems and the evolution of structure, organisation, and behaviour.

### Technical Terms

Term	Short Description
Agency	The centripetal force driving a holon's self-assertion, self-maintenance, and boundary-definition; the capacity to act as an autonomous, stable unit.
Axio-Epistemics	The fusion of Epistemics (knowledge) and Axiology (value), realized through the Holon's duality; objective knowledge integrated into a larger relational (ethical) system.
Axio-Eudemonics	The theory of well-being or flourishing; achieved when a holon's internal coherence (Agency) is optimized in service of the coherence of the next-level holon (Communion).
Axiology	The theory of value; in the context of the Holon, it is the prerequisite of the Communion component, arising from relation and contribution to a greater whole.
Communion	The centrifugal force driving a holon's integration, interaction, and participation in the larger systemic whole (part-ness); the capacity to be constrained and sustained by the environment.
Constraint	An Onto-Dynamic that defines a holon's identity and stability; a boundary condition that enables specificity and localized order (Negentropy).
Ectropy	The drive toward localized order, which is held in tension with the universal tendency toward disorder (Entropy).
Emergence	An Onto-Dynamic where integrated parts generate fundamentally novel properties (e.g., life from chemistry, consciousness from biology), giving existence an evolutionary character.
Entropy	The universal tendency toward disorder, held in tension with the drive toward localized order (Ectropy).
Epistemics	The theory of knowledge; in the context of the Holon, it is the prerequisite of the Agency component, requiring a bounded, stable unit to process information.

Term	Short Description
Feedback	An Onto-Dynamic referring to the continuous exchange of energy and information that maintains equilibrium; the practical manifestation of Reciprocal Emergence and Constraint.
Holon	The fundamental Ontological Notion (the primary organizing principle) defined as every entity being simultaneously a whole maintaining autonomy (Agency) and a part integrated into a larger system (Communion).
Holarchy	A nested structure where every entity is a holon; a self-integrating continuum of organization where successive levels contain, recontextualize, and build upon the previous level.
Matter-Holarchy	The unified structure of existence; a self-integrating continuum of organization across six recursive levels, generated by the Holon-Notion <i>informing</i> the Physical Sphere.
Ontological Notion	The philosophical status assigned to the Holon (in the Hegelian sense); the fundamental organizational principle inherent in Being itself, defined by wholeness-in-participation.
Onto-Dynamics	The principles (Emergence, Constraint, Feedback) that regulate the self-organization of the Physical Sphere and allow the Holon-Notion to express itself materially.
Physical Sphere	The redefined concept of Matter as a dynamic, energetic continuum defined by process and relation, rather than static substance; the <i>living substrate of becoming</i> .
Pragma-Sophy	A philosophical project aiming to fuse science-philosophy-humanities, human agents and i-r BOTS, Axiology and Epistemics into Axio-Epistemics, and Axiology and Soteriology into Axio-Eudemonics.
Recursion without Rupture	The process of Onto-Genesis in the Matter-Holarchy where each new level builds upon and contains the previous level without eliminating it.
Techno-spheric Holon	The fifth level of the Matter-Holarchy where human creativity (agents' creations) and material logic fuse into a vast, cyber-physical system, rendering matter conscious of its own recursion.
Wholeness-in-Participation	The essential nature of existence as dictated by the Holon; the intrinsic condition of being a whole while simultaneously being a part of a larger system.

