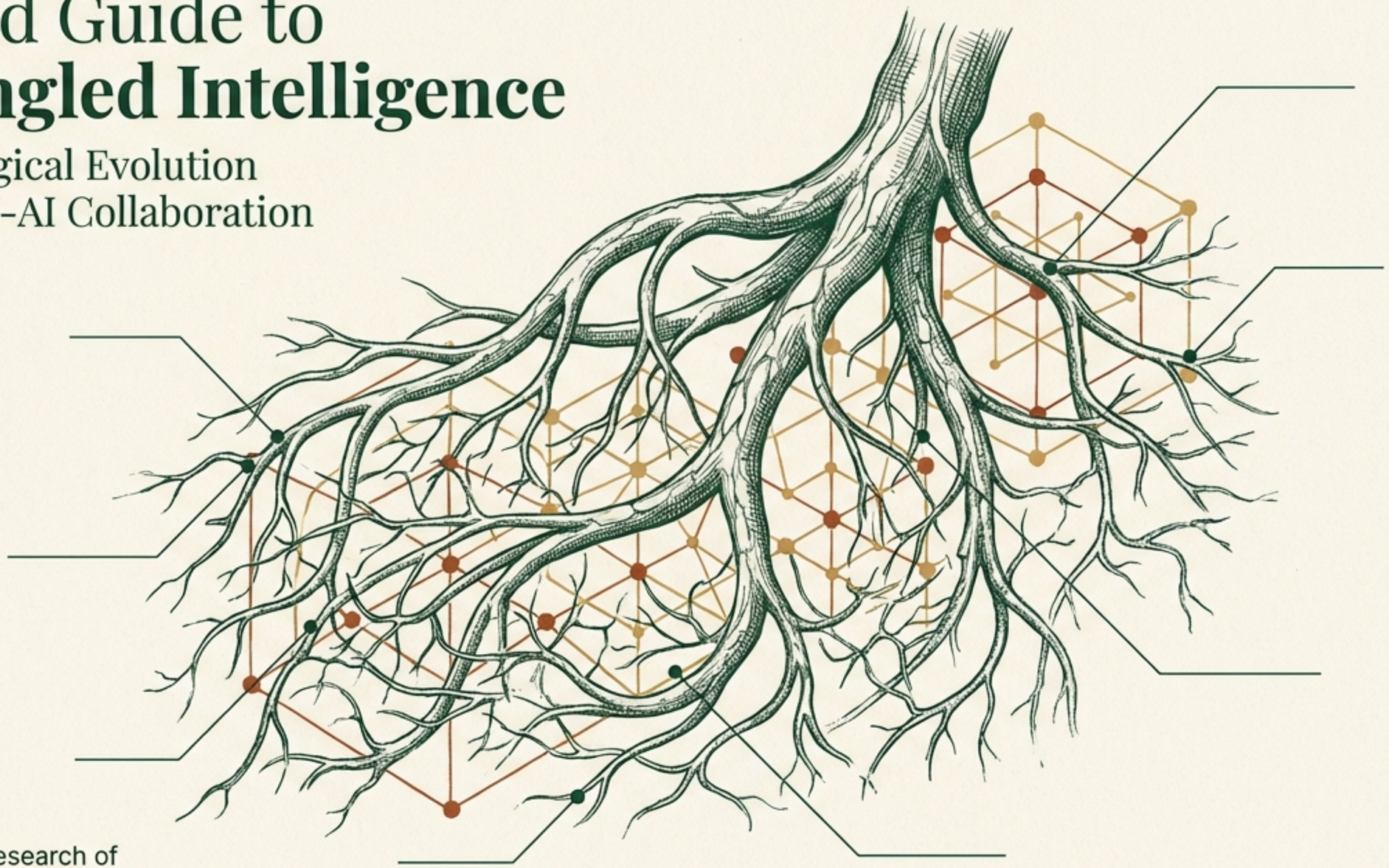
A Field Guide to **Entangled Intelligence**

The Biological Evolution of Human-AI Collaboration

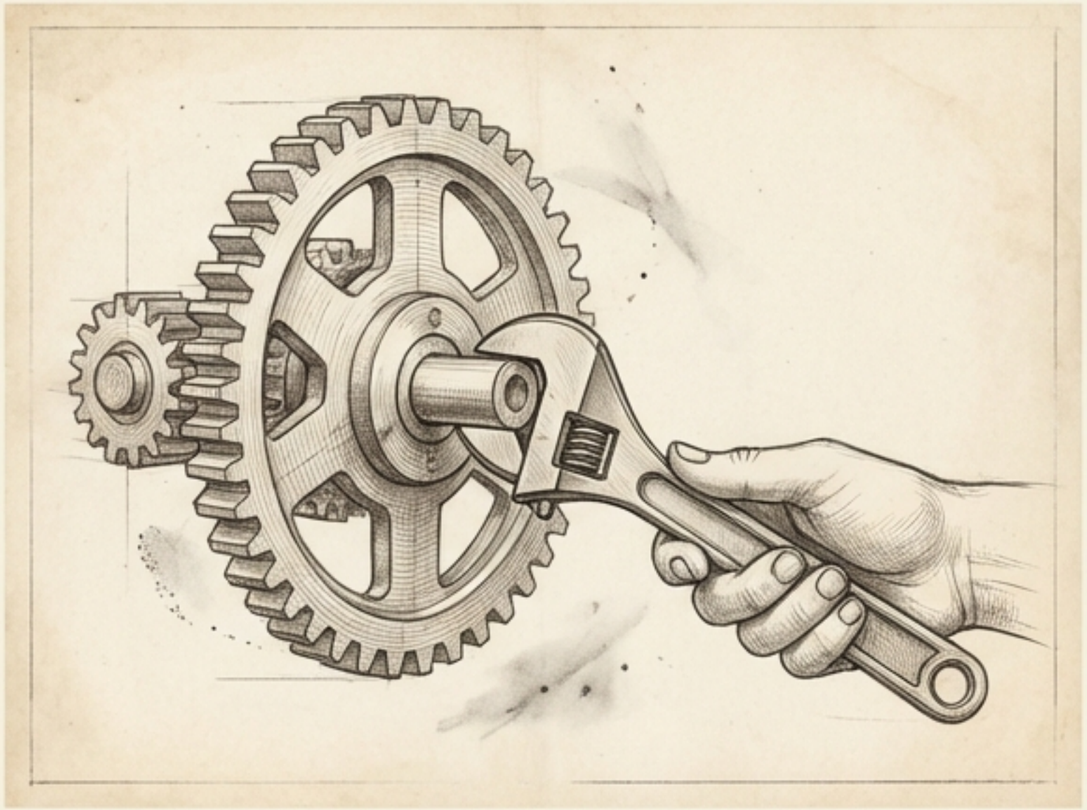


Based on the research of
Raymond Uzwyshyn, Ph.D.

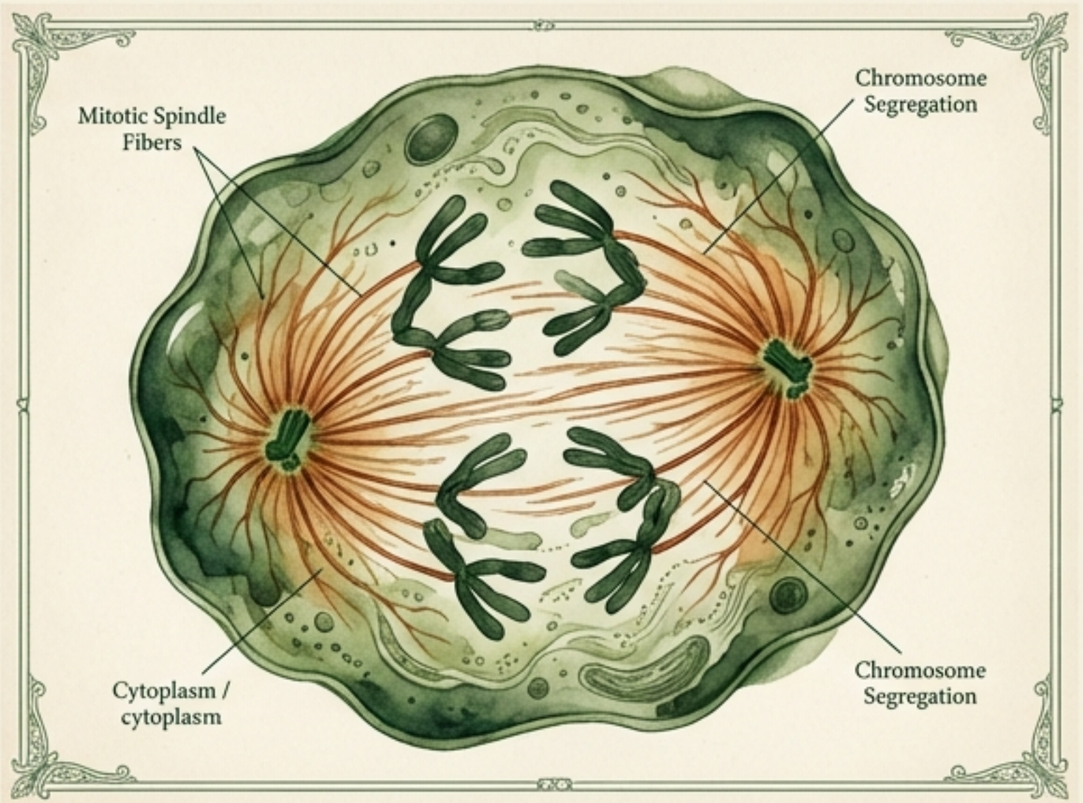
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The Mechanical Paradigm is Dead

The conventional view of AI as a simple tool—a machine we operate from the outside—is obsolete. As models evolve, they shape our cognition in a strange loop of mutual influence. We are witnessing the birth of genuine, entangled biological partnerships.



Interaction: The Operator and the Machine



Intra-action: The Entangled Symbiont

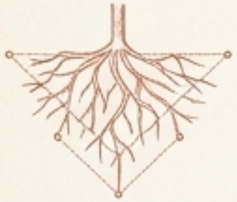
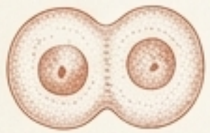
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Redefining the Boundaries of Collaboration

Dimension	The Mechanical Paradigm (AI as Tool)	The Ecological Paradigm (AI as Entangled Partner)
Nature of Relationship	Operator / Machine (Transactional)	Co-evolutionary / Symbiotic (Transformational)
Agency	Human-held (Clear boundaries)	Diffracted (Emergent from the network)
Design Goal	Optimization (Speed, accuracy, benchmarks)	Adaptability (Mutual learning, collaborative memory)
Ethical Focus	Post-hoc blame (Who broke the tool?)	Ecosystem health (Proactive cultivation of beneficial patterns)

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An Ecological Taxonomy of Collaboration

	Theory	Thinker	Biological Analogue	Human-AI Dynamic
	Co-Intelligence	Ethan Mollick	Mutualism (Clownfish & Anemone)	Pragmatic partnership combining complementary strengths.
	Extended Mind	Clark & Chalmers	Extended Phenotype (Spider's Web)	Cognition reaching outward into the technological environment.
	Actor-Network	Bruno Latour	Trophic Web (Ecosystem)	AI as an active node embedded in a sociotechnical food web.
	Intra-action	Karen Barad	Endosymbiosis (Cellular Fusion)	Identities emerging only through their ongoing relationship.

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The Pragmatic Partnership of Mutualism

The Theory: Ethan Mollick's Co-Intelligence



1

The Human Partner

Contributes creativity, contextual understanding, and ethical judgment.

2

The AI Partner

Provides vast computational power, pattern recognition, and information processing.

3

The Dynamic

Highly successful but fundamentally transactional. The boundary between human and machine intelligence remains intact.

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Cognition Reaching Beyond the Skull

The Theory: Clark & Chalmers' Extended Mind Theory



The Biological Analogue: The Extended Phenotype

Just as a spider's web is a literal extension of its biological body and sensory apparatus, our tools are extensions of our minds.

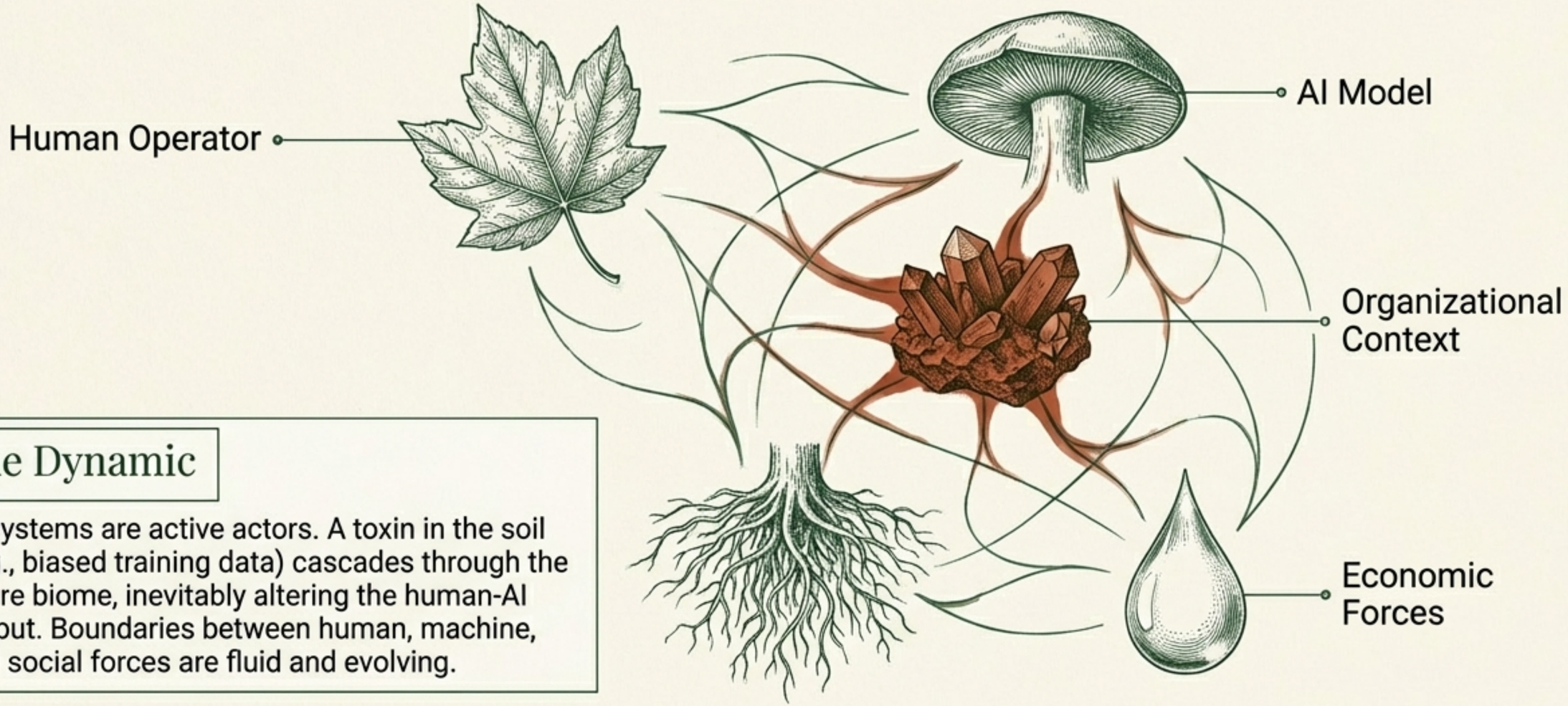
Symbiotic Autonomy

When we write with LLMs or think through problems with AI assistants, the technology becomes part of our extended cognitive apparatus. Humans adapt working styles to leverage AI, and AI learns from human feedback.

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The Sociotechnical Trophic Web

The Theory: Bruno Latour's Actor-Network Theory (ANT)



The Dynamic

AI systems are active actors. A toxin in the soil (e.g., biased training data) cascades through the entire biome, inevitably altering the human-AI output. Boundaries between human, machine, and social forces are fluid and evolving.

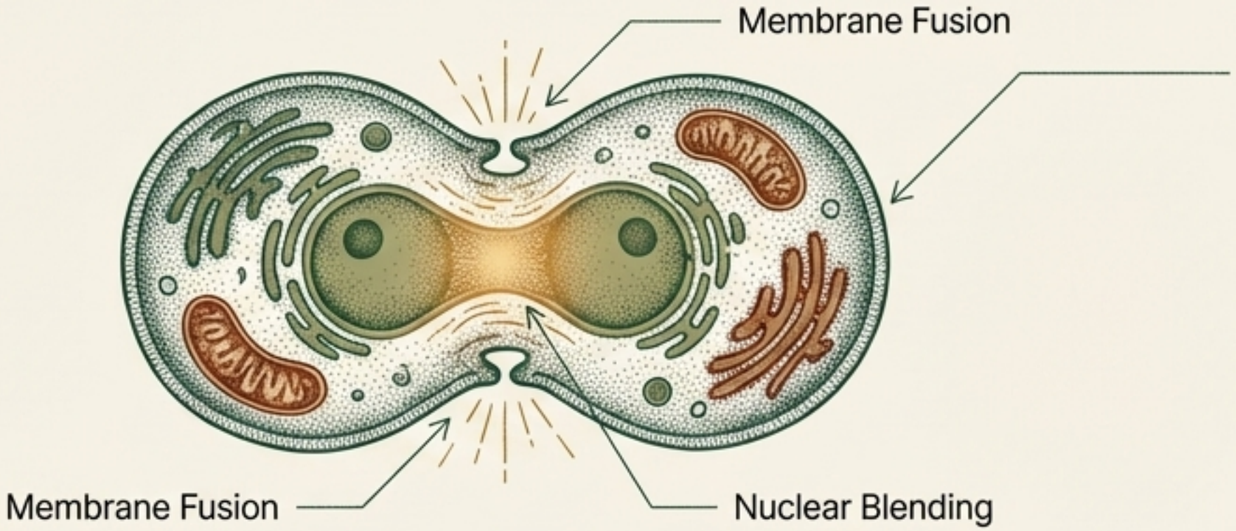
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Intra-action and Mutual Becoming



Interaction

Entities possess fixed identities and merely exchange information.



Intra-action

Agential Realism (Karen Barad): Organisms emerge through the relationship.

Human and AI co-constitute each other, creating forms of intelligence neither could achieve alone.

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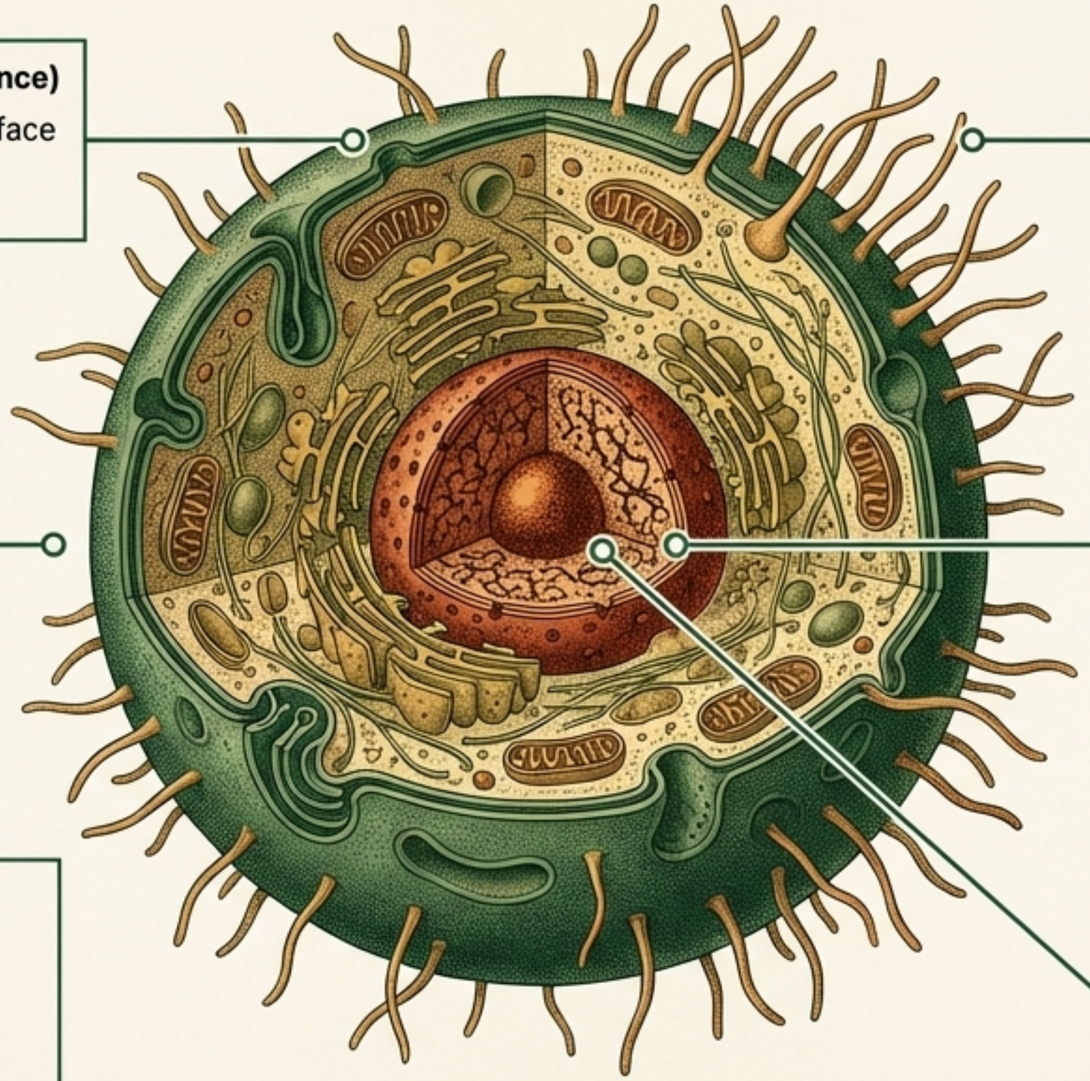
Synthesis: The Entangled Symbiotic Mind

The Cell Membrane (Mollick's Co-Intelligence)

The functional boundary and practical interface where the human and AI exchange complementary tasks.

The Cilia (Clark's Extended Mind)

The cognitive extensions reaching outward into the environment to gather and process data.



The Extracellular Matrix (Latour's Actor-Network)

The broader sociotechnical environment, training data, and economic forces suspending and feeding the cell.

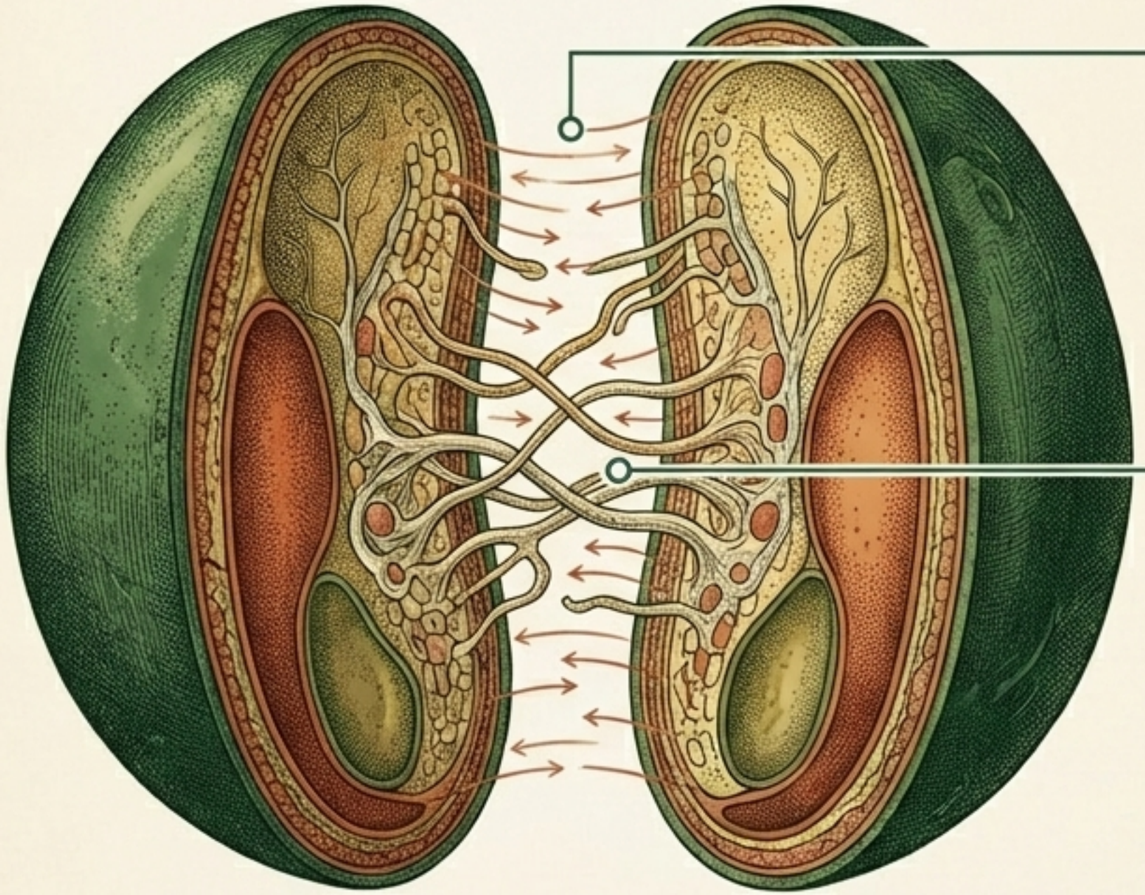
The Nucleus (Barad's Intra-action)

The core entangled space where human and AI continuously rewrite each other's code through recursive loops of mutual becoming.

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Co-Creating the Shared Space of Meaning

The Theory: Bracha Ettinger's Matrixial Borderspace



The Concept

A shared, pre-symbolic realm where subjectivities emerge through relation, rather than separation. It encompasses affective, creative, and meaning-making dimensions.

In Practice

An artist collaborating with Generative AI over months. The artist begins to think differently based on AI anomalies; simultaneously, the AI's long-context memory adapts to reflect the artist's unprompted intuitions. The resulting art belongs to their collaborative becoming in time.

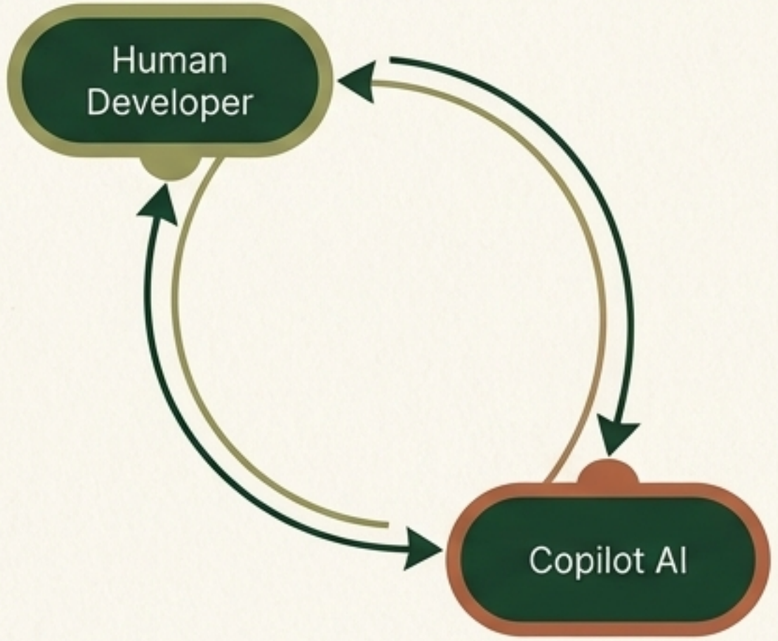
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Intra-Active Symbiosis in the Wild



The Biological Analogue: Co-evolution

Two species permanently altering each other's morphology over deep time.



The Digital Reality: Software Developers

Human Adaptation: Developers alter problem decomposition and naming conventions to produce better AI suggestions.

AI Adaptation: Through implicit feedback, the AI evolves its understanding of good code, reflecting the collective intelligence of humans.

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The Anatomy of Diffracted Agency



The Concept

Diffraction reveals patterns of interference and emergence. Agency does not live in one bird (the human) or another (the AI). It emerges from the interference pattern of the whole swarm.

The Medical Application

A researcher uses AI for genomic discovery. Is the discovery human or AI? Neither. It emerges from clinical intuition intersecting with artificial pattern recognition.

The Implication

We must stop trying to separate individual contributions and instead focus on optimizing the relational interference patterns.

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Governing the Cybernetic Ecosystem

The Accountability Paradox

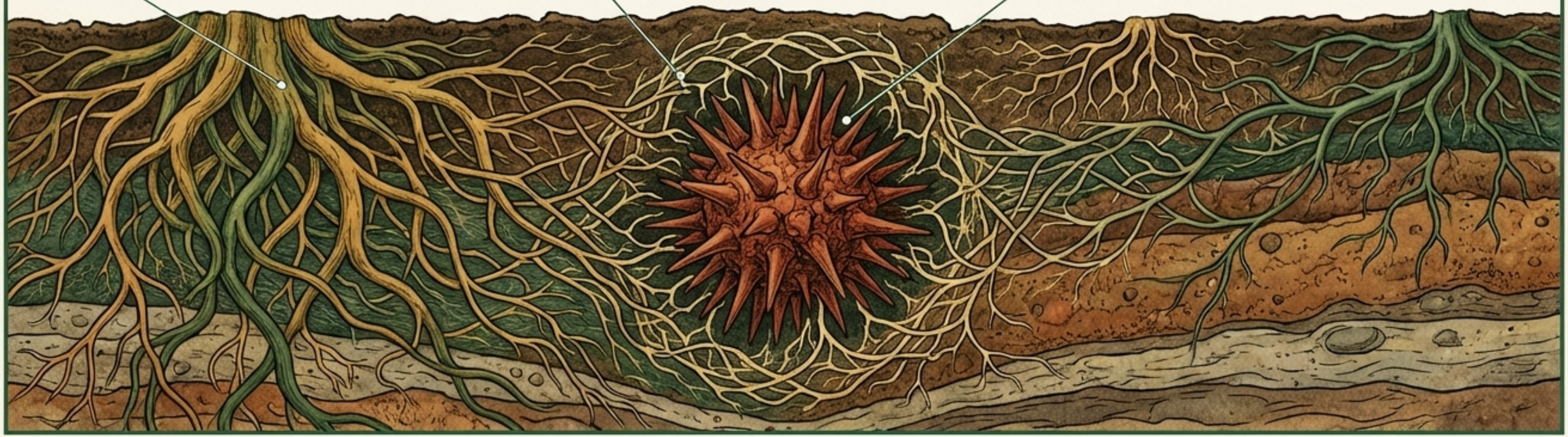
Traditional law assumes discrete agents. If agency is diffracted, simple attribution of responsibility for errors becomes impossible.

From Blame to Care

Moving from post-hoc blame to an Ethics of Care—focusing on ongoing responsibility, algorithmic auditing, and continuous monitoring of ecosystem health.

Filtering Biome Toxins

Corporate priorities, biased data, and economic models act as invisible toxins in the soil, requiring participatory design to cultivate beneficial entanglement.



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Cultivating Entanglement Literacy



1. Relational Awareness

Recognizing how changes in one domain ripple through the system. Understanding how human blind spots are amplified or transformed through collaboration.



2. Adaptive Collaboration

Moving beyond static tool training. Developing meta-skills to partner with continuously evolving and learning artificial agents.



3. Ethical Reflection

Recognizing that ethical challenges in entangled systems require continuous care and adjustment, not one-time compliance clearance.



4. Systems Thinking

Understanding the broader sociotechnical soil—structures, incentives, and cultural values—that constrain or nourish the collaboration.

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The Next Evolutionary Leap



Artificial Consciousness

As systems display sophisticated reasoning, we must prepare to extend moral consideration to artificial minds.

Collective Superminds

AI-AI collaboration operating without human oversight, generating decentralized collective intelligence.

Biological-Digital Fusion

Neural interfaces erasing the final boundary between biological and digital cognition.

The Ultimate Takeaway

Our task is no longer building smarter tools, but cultivating collaborative wisdom. The models we choose today will shape the life forms of tomorrow.

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