Emergence of Planetary Intelligence

Framing definition and scientific roadmap

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Revised project framing

This book begins from an inversion of its earlier premise. Rather than asking only how planetary intelligence might emerge in the future, it asks whether a rudimentary form may already be emerging — and, if so, how we could detect, characterize, test, and improve it without mistaking metaphor for evidence.

The candidate system is not a supermind hovering above humanity. It is a coupled biosphere–human–technological network in which Earth conditions are sensed at unprecedented scale; human societies model their own effects on the planet; information moves rapidly among places and disciplines; and artificial intelligence increasingly helps integrate bodies of knowledge that no individual can hold at once. The planetary crisis itself supplies feedback: consequences that reveal interdependence whether or not our institutions are prepared to recognize it.

The scientific proposition is therefore deliberately narrower than a claim of planetary consciousness. We ask whether the coupled system is acquiring capacities for planetary-scale sensing, self-modeling, learning, error correction, cross-scale coordination, and adaptive response. These capacities can be studied independently of any claim that Earth has a unitary subjective experience.

> **Central proposition.** *Humanity became a planetary force before it became capable of perceiving itself as one. The present period may mark the beginning of that perception — a transition toward reflexive planetary intelligence.*

The emergence, if real, is neither inevitable nor necessarily beneficial. An intelligent system can pursue destructive objectives, propagate shared errors, or understand a danger without changing course. A second central problem therefore accompanies the first: whether planetary intelligence can mature into planetary wisdom — the capacity to choose and coordinate actions compatible with long-term habitability and the flourishing of human and other life.

A working definition

Planetary intelligence is a distributed capacity, arising within and across Earth's living, social, and technological systems, to acquire and revise knowledge about their interdependence, coordinate responses across scales, learn from consequences, and modify behavior in light of that learning.

Reflexive planetary intelligence is the more specific hypothesis developed here: a coupled planetary system becomes reflexive when it can observe and model not only external conditions but also its own effects on those conditions, preserve relevant memory, detect error, and alter collective behavior in response.

This is an operational proposal for the initiative, not an established scientific consensus. Its unit of inquiry is a coupled network: organisms, communities, institutions, instruments, models, infrastructures, and the environments that constrain their activity. No assumption is made that every component possesses a mind, or that the network as a whole is conscious.

What "already here" would mean

The hypothesis does not claim that a mature planetary intelligence already exists. It proposes that some of its component capacities may now be present and becoming more tightly coupled. The task is to determine whether these components amount to more than a collection of powerful but poorly coordinated systems.

- Planetary sensing: satellites, field instruments, ecological observation, public-health systems, citizen science, and local knowledge make conditions across the Earth increasingly observable.
- Planetary self-modeling: Earth-system science, ecological modeling, economics, epidemiology, and related fields increasingly represent human activity as a causal force within coupled planetary processes.
- Planetary communication: scientific, civic, commercial, and community networks can transmit observations and interpretations across borders at high speed.

- Integrative computation: AI can increasingly search, compare, translate, summarize, model, and reason across bodies of information that were previously separated by discipline, institution, language, or scale.
- Crisis feedback: climate extremes, biodiversity loss, pollution, disease, conflict, and supply shocks expose dependencies and feedbacks that fragmented institutions often fail to see in advance.
- Ecological rediscovery: systems science and renewed attention to Indigenous and place-based knowledge challenge the assumption that humans stand outside the living systems on which they depend.

These are candidate conditions, not proof of emergence. The 2026 Planetary Health Check reports seven of nine planetary boundaries transgressed, all seven at their highest recorded levels of transgression; the worsening diagnosis supports the claim that planetary feedback is becoming more consequential, not that humanity is responding intelligently to it. [9]

Conceptual inheritance — and our departure

A central modern formulation comes from Adam Frank, David Grinspoon, and Sara Walker's 2022 paper. They define planetary intelligence as the acquisition and application of collective knowledge operating at planetary scale and integrated into the function of coupled planetary systems. Their article explicitly asks whether intelligence can operate at planetary scale and whether such a transition may already have occurred or lie on the near-term horizon. [1]

Their framework distinguishes immature and mature biospheres and technospheres. A mature technosphere would deliberately operate within conditions that sustain the wider planetary system. These are proposed conceptual categories, not an inevitable evolutionary sequence. [1]

Timothy Lenton and Bruno Latour's Gaia 2.0 proposal asks whether awareness of human effects could introduce deliberate choices into Earth regulation. [2] James Lovelock's Novacene speculates about machine hyperintelligence with reasons to preserve habitability. [3] Our project is more empirical and less teleological: it asks what measurable capacities are present, how they interact, when they fail, and what evidence would justify treating their coupling as a genuinely emergent form of intelligence.

We will distinguish intelligence as learning and adaptive problem-solving; agency as the capacity to influence outcomes in pursuit of goals; wisdom as judgment about goals, values, trade-offs, and consequences; and consciousness as subjective experience. Evidence for one does not establish the others. Ecological feedback, information exchange, or even sophisticated collective adaptation does not by itself demonstrate a planetary subject.

Why now? A convergence hypothesis

The stronger version of the project is not that AI alone creates planetary intelligence, but that several conditions may be converging for the first time:

Planetary agency: Human activity is capable of altering climate, biogeochemical cycles, land, freshwater, biodiversity, and other Earth-system processes.

Planetary crisis: The consequences of that agency are increasingly visible and mutually interacting; the Planetary Health Check 2026 reports seven breached boundaries and rising pressure across all seven. [9]

Planetary sensing: Large Earth-observation infrastructures make planetary conditions observable at scales and frequencies unavailable to earlier societies. NASA Earthdata Search alone provides access to more than two billion Earth observations. [10]

Planetary communication: Global networks can connect observations, expertise, institutions, and communities almost instantaneously, while also spreading misinformation and synchronized error.

Planetary computation: Models can represent interacting atmospheric, ecological, economic, and social processes with increasing resolution, although model integration does not remove uncertainty.

AI integration: AI may lower the cognitive and transaction costs of combining information across disciplinary and institutional boundaries. This is a testable performance claim, not an assumption of machine wisdom.

Ecological reawakening: Scientific ecology, systems thinking, bioregional practice, and Indigenous and traditional knowledge systems offer different but potentially complementary ways of understanding interdependence, reciprocity, limits, and place.

None of these conditions is sufficient. The research question is whether their coupling produces new capacities for learning and adaptive coordination, or merely a faster and more complex version of the same fragmented technosphere.

The central research question

What empirical evidence would allow us to distinguish an emerging planetary intelligence from an increasingly interconnected but fundamentally uncoordinated technological civilization?

That question immediately generates a research agenda:

- Where is the relevant intelligence located — in humanity collectively, the technosphere, the biosphere, or the coupled biosphere–human–technology system?
- What counts as planetary sensing, and how rapidly are signals translated into reliable interpretation rather than noise?
- Does AI materially improve cross-domain synthesis, prediction, deliberation, and decision quality, or mainly increase speed and confidence?
- Does worsening crisis stimulate collective learning, or does it eventually degrade it through fear, polarization, misinformation, nationalism, and institutional breakdown?
- Can local and bioregional intelligence remain autonomous while contributing to planetary-scale learning, or does integration concentrate power and erase context?
- Under what conditions does epistemic diversity improve accuracy and judgment rather than simply accumulate incompatible claims?
- Can a system preserve disagreement, learn from failed predictions, and change its methods — the hallmarks of self-correction?
- What prevents knowledge from becoming action: lack of cognition, or power, incentives, inequality, conflict, identity, institutional inertia, and political economy?
- Can measurable system-level capacities emerge that cannot be reduced to the performance of individual components?
- What evidence, if any, could ever distinguish planetary consciousness from distributed coordination? Until such evidence exists, how should the scientific project bracket the question?

Hypotheses to test

The following hypotheses are provisional. Each is paired with an outcome that could count against it. Some concern scientific explanation; others concern institutional design. They should be refined into preregistered tests wherever feasible.

Table 1. Reflexivity, crisis, integration, and federation

Hypothesis	Proposition	Indicative test / signal	Evidence against
H1 — Planetary reflexivity	Civilization is increasing its capacity to observe and model its own effects on Earth systems.	Detection-to-interpretation latency falls; self-impact variables enter models and decisions earlier; corrections improve after feedback.	Latency does not improve, self-models remain weakly coupled to decisions, or apparent progress reflects only better instrumentation.
H2a — Crisis-induced cognition	Planetary-scale disturbances stimulate cross-domain learning, cooperation, and institutional adaptation.	After shocks, information exchange, collaboration, policy experimentation, and durable learning measurably increase.	Responses are transient, narrowly local, or no better than baseline trends.
H2b — Crisis-fragmentation	Beyond some level of threat, crisis reduces collective intelligence through polarization, misinformation, coercion, and breakdown.	Severe shocks correlate with declining information quality, coordination, trust, or adaptive capacity after controlling for other factors.	High-threat cases sustain or improve plural deliberation and effective coordination without major degradation.
H3 — AI integration	AI's principal contribution to planetary intelligence is reducing the cost of integrating knowledge across domains.	Human–AI teams outperform matched human teams on cross-domain accuracy, novelty, uncertainty calibration, and practical usefulness.	AI adds confidence or speed but not quality; simpler search, facilitation, or institutional reforms perform as well or better.
H4 — Ecological signal amplification	AI combined with environmental observations can detect meaningful ecological change earlier or more reliably than conventional workflows alone.	Integrated systems improve out-of-sample detection or forecasting of regime shifts, risks, or restoration outcomes.	Gains disappear on held-out cases, false alarms increase, or conventional methods equal or outperform the system.
H5 — Federated intelligence	Planetary intelligence performs better as a polycentric, federated network than as a centralized system.	Local–global networks improve adaptation, error correction, resilience, and legitimacy while retaining local authority.	Federation spreads shared errors, slows action, obscures responsibility, or performs worse than centralized or independent approaches.

Table 2. Diversity, disagreement, learning, constraint, wisdom, and emergence

Hypothesis	Proposition	Indicative test / signal	Evidence against

Hypothesis	Proposition	Indicative test / signal	Evidence against
H6 — Epistemic diversity	Well-governed combinations of scientific, Indigenous, local, civic, and machine knowledge improve collective learning.	Diverse processes improve prediction, diagnosis, option generation, or decision quality under explicit governance and provenance.	Integration degrades accuracy, appropriates knowledge, erases context, or adds no value beyond a simpler evidence base.
H7 — Productive disagreement	Systems that preserve competing interpretations and specify what evidence would resolve them outperform systems optimized for consensus.	Structured dissent improves calibration, error discovery, robustness, and subsequent learning.	Disagreement adds friction without improving accuracy or merely entrenches factions and model noise.
H8 — Self-correction	The strongest indicator of intelligence is not producing good answers but learning systematically from wrong ones.	Recorded predictions, confidence, outcomes, and post-mortems lead to measurable improvement in later forecasts and decisions.	The system repeats errors, rewrites history, or shows no performance gain from retained memory.
H9 — Intelligence transition	Civilization is shifting from primarily individual and institutional intelligence toward networked collective intelligence.	Problem-solving increasingly depends on distributed networks whose system-level performance exceeds isolated actors on comparable tasks.	Apparent network effects reduce to scale, resources, or coordination overhead without new collective capacity.
H10 — Biospheric constraint	Ecological systems provide actionable information about viable human futures even without intentional "messages."	Biophysical feedbacks reliably constrain successful strategies; processes that heed these signals outperform those that ignore them.	The proposed signals are too ambiguous to guide action or add no predictive value beyond conventional environmental assessment.
H11 — Wisdom gap	Planetary intelligence can increase while planetary health worsens because cognition is not the sole limiting factor.	Knowledge and predictive capacity improve without commensurate ecological outcomes where power, incentives, conflict, or institutions block action.	Improved understanding reliably produces proportionate improvements in behavior and ecological conditions across cases.
H12 — Emergence	At sufficient levels of connectivity, memory, sensing, and coordination, the coupled network acquires system-level capabilities not attributable to any single component.	Ablation and comparative tests reveal robust capacities that depend on network organization and disappear when coupling is removed.	All apparent system-level effects are fully explained by component performance, scale, or ordinary coordination.

A measurement framework: profile before index

The Institute should resist compressing these questions into a single "Planetary Intelligence Index" too early. A scalar score would conceal value choices and could make progress in one domain appear to compensate for failure in another. Begin instead with a multi-dimensional Planetary Intelligence Profile.

Sensing coverage and latency: How quickly and reliably important environmental and social changes are detected.

Integration quality: Whether evidence from different domains is combined without losing provenance, uncertainty, or local context.

Model accuracy and calibration: How well predictions perform on held-out cases and whether confidence matches observed accuracy.

Memory and error correction: Whether the system retains predictions, failures, critiques, and revisions and demonstrably learns from them.

Cross-scale coordination: Whether local, regional, national, and planetary processes exchange useful information without erasing authority.

Decision quality: Whether participants make better choices, not merely feel better informed.

Ecological outcomes: Whether interventions improve measurable conditions rather than only plans, narratives, or dashboards.

Participation and legitimacy: Who sets goals, controls knowledge, can dissent, can refuse participation, and bears costs.

Material and opportunity cost: Energy, water, materials, staff time, rebound effects, and alternatives forgone.

Wisdom gap: The distance between what the system knows and what institutions actually do in response.

The Planetary Intelligence Engine as a research instrument

The proposed Planetary Intelligence Engine (PIE) should be treated first as an experimental instrument, not as evidence that planetary intelligence exists. Its recurring cycle is:

OBSERVE → INTERPRET → DELIBERATE → PROPOSE → REVIEW → ACT → LEARN

Every cycle should preserve the research question, sources, assumptions, competing interpretations, prediction or recommendation, confidence, human approvals, outcome, and post-mortem. Several AI models may be used, but agreement among models must not be treated as independent validation because models can share training data, sources, and failure modes.

Human authority remains essential for consequential actions. Automated systems may search approved public sources, organize evidence, and draft analyses. Publishing claims, contacting collaborators, changing research priorities, spending money, or altering permissions requires explicit human approval and an audit trail.

A first program of experiments

1. Historical reflexivity study. Select several well-documented environmental problems and measure the lag between ecological signal, scientific detection, synthesis, policy recognition, action, and outcome. Ask whether those lags have shortened and which institutions account for the change.

2. Human–AI integration benchmark. Give matched interdisciplinary problems to disciplinary experts, interdisciplinary human teams, AI systems, and human–AI teams. Compare factual accuracy, synthesis, novelty, uncertainty calibration, source traceability, and practical usefulness.

3. Crisis cognition / fragmentation study. Compare crises of varying severity to test whether threat initially increases collective learning but eventually degrades it. Predefine measures of cooperation, information quality, institutional adaptation, polarization, and coercion.

4. Genesee–Finger Lakes bioregional pilot. Choose one bounded decision — for example, watershed-restoration priorities under a fixed budget — with local partners defining goals and authority. Compare a conventional process with an augmented process using traceable AI synthesis and structured disagreement.

5. Institutional memory test. Operate PIE over repeated cycles and test whether explicit memory of predictions, errors, and corrections improves later analyses. Compare with a fresh-session baseline.

6. Federation test. When more than one place is ready, compare independent bioregional processes with a federated learning network. Ask whether useful knowledge travels without exporting harm, centralizing authority, or flattening ecological and cultural difference.

Provisional sequence: remainder of 2026 and 2027

Remainder of 2026: Finalize the operational definition and hypothesis set; identify three to five advisers; specify the PIE record structure; choose the first bounded research problem; preregister at least one comparison; publish this framing as an invitation to critique rather than a declaration that the hypothesis is true.

Q1 2027: Run the first human–AI integration benchmark and a retrospective reflexivity study. Publish methods, failures, dissent, and revised hypotheses.

Q2 2027: Launch a small Genesee–Finger Lakes pilot if local partners agree on governance, data stewardship, decision authority, and evaluation criteria.

Q3 2027: Add a second contrasting place or historical case, test federated learning, and evaluate whether observed gains travel across contexts.

Q4 2027: Publish a State of Planetary Intelligence assessment focused on evidence, not advocacy: what capacities were demonstrated, what failed, what remains speculative, and which hypotheses changed.

Limits, safeguards, and questions that remain open

- Emergence does not imply benevolence. A more integrated intelligence can optimize destructive objectives, centralize power, or make error more efficient.
- Knowledge is not the only bottleneck. Political economy, unequal power, incentives, identity, conflict, and institutional inertia may explain ecological failure even where the facts are well understood.
- AI has material costs. Any claimed benefit must be compared with energy, water, materials, labor, opportunity cost, and rebound effects, as well as with simpler institutional alternatives.
- Scientific, Indigenous, and local knowledge should enter through relationships governed by their holders. Open access cannot mean unrestricted extraction; the CARE principles provide a relevant governance framework. [7]

- Anthropomorphic language must remain disciplined. “Earth is speaking” can be a productive metaphor for biophysical feedback, but intentional communication should not be asserted without evidence.
- Planetary consciousness remains a philosophical and scientific open question. The research program should not depend on it. A system can exhibit distributed learning and adaptive coordination without evidence of a unitary subjective experience.
- The project must preserve the possibility that the hypothesis fails: simpler tools, stronger community institutions, or better governance may matter more than advanced AI; selective connection may prove more resilient than comprehensive integration.

The scientific wager

The book’s revised wager is not that Earth has suddenly become conscious, nor that artificial intelligence will save civilization. It is that a scientifically interesting transition may already be under way: Earth’s living systems, human civilization, and technological networks are becoming coupled in ways that make planetary-scale self-observation and learning increasingly possible.

AI may be one new integrative layer within that process. Crisis may be another, because consequences make hidden connections visible. Bioregions may provide the necessary local scale at which sensing, judgment, authority, and ecological outcomes can be joined. Whether these elements constitute an emergent intelligence — and whether that intelligence can become wise enough, quickly enough, to matter — is the question to be tested.

> **The project’s guiding question:** *What is already emerging, how would we know, and what conditions would allow a distributed planetary intelligence to become capable not merely of knowing the Earth, but of learning to live within it?*

Sources and project continuity

The sources below support specific antecedents, bounded empirical findings, and the current planetary-health context. The working definitions, hypotheses, tests, and proposed sequence are this initiative’s proposals. None of the cited studies establishes the full planetary transition described here.

[1] Frank, A., Grinspoon, D., & Walker, S. (2022). “Intelligence as a planetary scale process.” International Journal of Astrobiology, 21, 47–61. DOI: 10.1017/S147355042100029X. Link

[2] Lenton, T. M., & Latour, B. (2018). “Gaia 2.0.” Science, 361, 1066–1068. DOI: 10.1126/science.aau0427. Link

[3] Lovelock, J., with Appleyard, B. (2019). Novacene: The Coming Age of Hyperintelligence. MIT Press edition. A speculative book, used here as intellectual context rather than evidence. Link

[4] Price, I., et al. (2025; published online 2024). “Probabilistic weather forecasting with machine learning.” Nature, 637, 84–90. DOI: 10.1038/s41586-024-08252-9. Link

[5] Tessler, M. H., et al. (2024). “AI can help humans find common ground in democratic deliberation.” Science, 386, eadq2852. DOI: 10.1126/science.adq2852. Link

[6] Vaccaro, M., Almaatouq, A., & Malone, T. (2024). “When combinations of humans and AI are useful: A systematic review and meta-analysis.” Nature Human Behaviour, 8, 2293–2303. DOI: 10.1038/s41562-024-02024-1. Link

[7] Carroll, S. R., et al. (2020). “The CARE Principles for Indigenous Data Governance.” Data Science Journal, 19, 43. DOI: 10.5334/dsj-2020-043. Link

[8] Ostrom, E. (2010). “Beyond Markets and States: Polycentric Governance of Complex Economic Systems.” American Economic Review, 100, 641–672. DOI: 10.1257/aer.100.3.641. Link

[9] Planetary Boundaries Science Lab / Potsdam Institute for Climate Impact Research (2026). Planetary Health Check 2026: A Scientific Assessment of the State of the Planet. DOI: 10.48485/pik.2026.25. Link

[10] NASA Earthdata Search (accessed 14 October 2026). Gateway to NASA Earth science data; the service reports access to more than 2.2 billion Earth observations. Link

[11] Maskey, M., Alemohammad, H., Murphy, K. J., & Ramachandran, R. (2020). “Advancing AI for Earth science: A data systems perspective.” Eos, 101. DOI: 10.1029/2020EO151245. Link

Earlier project material

The Emergence of Planetary Intelligence Institute presentation (May 2026), especially its treatment of bioregional learning systems, scenario rooms, epistemic integrity, human responsibility, plural knowledge, and the Reality–Relevance–Response–Regeneration framework, establishes continuity with this version. The October 2026 discussions add the

Planetary Intelligence Engine, the separation between this nonfiction project and the novel Awakening the Earth, and the present inversion: planetary intelligence is treated as a phenomenon that may already be emerging and should be investigated rather than assumed.

The project's commitment to life, human accountability, and regeneration is an ethical position we must defend openly. It is not a conclusion that follows automatically from intelligence, technological capability, or evolutionary success.