EARTH & SCREEN

Foundational White Paper | 2026

AI Ecology:

Understanding the New Environment

Where Nature, Humans, and Artificial Intelligence Co-Exist Within the Great Web of Life

Prepared by Inka Linda Sarvi, founder of Earth & Screen.

AI Ecology · Digital Wellbeing · Human-Nature-Technology Systems

Executive Summary

Something fundamental has shifted in the relationship between humans, nature, and technology. For centuries, technology was something people used and set aside. The printing press, the wheel, the telephone — each transformed human life, but each remained a tool. Something humans reached for, and then put down.

That era is over.

Artificial intelligence and the digital infrastructure around it have crossed a threshold. They are no longer tools we pick up and set down. They have become the environment we move through every day — shaping our attention, our emotions, our perception of reality, and even, according to emerging research, the trajectory of human evolution itself.

At Earth & Screen, we call the study of this new condition AI Ecology: the study of the emerging environment created at the intersection of nature, human life, and artificial intelligence — where all three are no longer separate systems, but intertwined participants in the Great Web of Life.

This white paper establishes the intellectual and scientific foundations of **AI Ecology as a field of study.** It draws on peer-reviewed research from evolutionary biology, cognitive neuroscience, environmental psychology, complexity science, and human-computer interaction to make the case that understanding this new environment — not just the tools within it — is the foundational literacy of our time.

1. The Case for a New Field

1.1 When Tools Become Environments

Traditional ecology is the study of organisms in relationship to their environments. It begins with a foundational insight: environments shape organisms. The soil shapes the root. The climate shapes the organism. The ecosystem shapes the species. Remove an element, and the whole system reorganizes.

This principle — that environments do not merely contain life but actively shape it — is one of the most important ideas in science. And it is precisely the idea that must now be extended into the digital age.

When researchers at the ACM CHI Conference (2023) examined the relationship between technology and human engagement with nature, they identified what they called a foundational challenge to the traditional view of technology as a neutral tool. They described the emerging consensus across multiple disciplines that technology — and especially digital technology — is not simply a device that people use. It has become, in their words, a set of pervasive, immersive structures that redefine what were once distinct boundaries between our perceptions of the natural and the virtual.

Source: ACM CHI Conference, 2023. "Engaging with Nature through Technology: A Scoping Review of HCI Research."

This is the foundational premise of AI Ecology. We are not simply using technology. We are living inside the environment it creates. And just as the natural environment shapes human biology, health, and development — so does the digital environment.

1.2 The Emergence of the Technosphere

The concept of the technosphere — the sum total of human-made technological systems and their global influence — has gained significant traction in scientific literature. Research published in PMC (2024) examining the co-evolutionary relationship between human intelligence and artificial intelligence describes a three-sphere model of planetary reality: the biosphere (the domain of life), the noosphere (the domain of human thought and collective consciousness), and the technosphere (the domain of human-made technology and its environmental impact).

Critically, the researchers argue that these three spheres are not independent. They are deeply interconnected and co-evolving. The noosphere depends on the technosphere for communication and knowledge exchange. The technosphere depends on the noosphere for its development. And both exist within and affect the biosphere.

Source: PMC / Acta Naturae, 2024. "Evolutionary Perspectives on Human-Artificial Intelligence Convergence."

AI Ecology is the study of this three-sphere system — with particular attention to the emerging conditions created by the accelerating expansion of the technosphere through artificial intelligence, and what those conditions mean for human health, development, and sovereignty.

We are no longer studying how humans use technology. We are studying how humans, nature, and technology co-evolve within the same living system.

2. The Digital Ocean: A New Kind of Ecosystem

2.1 Defining the Environment

The digital world has long been described in fluid metaphors — we speak of surfing the web, information flows, viral waves, streams of content. These metaphors are intuitive because they capture something real: the digital

world is ambient, invisible, and in constant motion, like water around a swimmer.

Today, however, this fluid environment is saturated with artificial intelligence. AI systems curate what we see, predict what we want, moderate what we say, recommend what we buy, and increasingly shape the perceptual reality of billions of people every day. This is not a neutral infrastructure. It is an intelligent, adaptive, continuously optimizing environment.

Earth & Screen describes this environment as the Digital Ocean: a fluid, high-density ecosystem where information moves continuously, algorithms guide attention, and human perception is under constant influence. We are not simply observing this ocean. We are immersed in it — swimming in it — and it is shaping us in ways that are only beginning to be scientifically understood.

2.2 The Characteristics That Make It Ecologically Significant

From an ecological standpoint, the Digital Ocean has four properties that distinguish it from any technological environment that preceded it, and that together make it worthy of dedicated ecological study:

Constancy

Unlike every previous information environment in human history — fire, print, radio, television — the digital environment does not turn off. It is available, and increasingly present, at every hour of every day. This constancy has no parallel in the natural environments for which human biology evolved, and it fundamentally disrupts the rhythms of rest and activation that regulate nervous system health.

Intelligence

The Digital Ocean is not passive. It learns, adapts, and responds in real time to human behavior. AI recommendation systems are not serving content — they are continuously building a personalized model of each user's psychology and using that model to maximize engagement. This level of adaptive intelligence in an environment is genuinely novel in human experience.

Scale

At the time of this writing, more than 5 billion people are active participants in algorithmically curated digital environments. The scale at which the Digital Ocean now operates — shaping the attention, perception, and emotional experience of a majority of the human species simultaneously — has no historical precedent.

Displacement

Research from the Children and Nature Network (2024), reviewing studies across multiple countries, confirms what many parents intuitively observe: time in the Digital Ocean displaces time in the natural world. Screen time and nature time exist in genuine tension. A Canadian national survey of 24,000 young people found that screen technology tends to displace nature engagement, and that temporary disconnection from screens was consistently associated with increased quality of engagement with the natural world.

Source: Children & Nature Network Research Digest, 2024–2025.

3. The Intellectual Lineage: How Scholars Arrived at the Ocean

3.1 A Convergence, Not a Coincidence

The Digital Ocean is not a metaphor Earth & Screen invented in isolation. It is the point of convergence of several independent intellectual traditions — each arriving, from a different direction and through a different discipline, at the same essential insight: that the digital environment is best understood not as a collection of tools, but as a fluid, immersive, all-surrounding medium. That the relevant question is not what are we using, but what are we swimming in.

What follows is a map of that convergence — from the founders of media ecology in the 1960s, through one of the most important media philosophers of the 21st century, to a Princeton-trained scholar who published a paper in one of the world's most prestigious academic journals using the precise term Digital Ocean to describe what mathematics and philosophy had been pointing toward for over a century. These are not fringe voices. They are serious scholars at serious institutions, working in serious traditions, arriving independently at the same essential description of the world Earth & Screen is helping people navigate.

That convergence is itself evidence. When a metaphor keeps emerging spontaneously across disciplines, across decades, and across intellectual traditions that have no contact with each other, it is not a metaphor anymore. It is an accurate description of reality.

3.2 The Foundation: Media Ecology and the Environment Insight

The foundational claim belongs to Marshall McLuhan, the Canadian media theorist whose work in the 1960s permanently changed how scholars think about technology and culture. McLuhan's most famous statement — the medium is the message — was not, as it is often misunderstood, a claim about content. It was a claim about environment. What matters, he argued, is not what a medium carries but what it does to the organism living inside it. The form of a medium embeds itself in human experience, shaping perception, thought, and social organization in ways that operate far below conscious awareness.

McLuhan described electronic media as creating what he called a global village — a world in which electronic networks were weaving human beings into a single, instantaneous, mutually resonant field of experience. His language was consistently fluid and environmental. He spoke of electric technology as an all-surrounding field, described media as extensions of the human nervous system, and understood the electronic environment not as a collection of devices but as something people moved through — an immersive medium rather than a discrete tool. He warned, decades before the internet existed, that the technologies of the electronic age were racing ahead of humanity's ability to understand their consequences.

Source: McLuhan, M. (1964). Understanding Media: The Extensions of Man. McGraw-Hill. McLuhan, M. & Powers, B.R. (1989). The Global Village. Oxford University Press.

It was Neil Postman who formalized McLuhan's ecological insight into a discipline. In 1968, Postman introduced the term media ecology, and in 1971 he founded the Program in Media Ecology at New York University — the first academic program dedicated to studying media as environments rather than merely as channels of content. His definition of the field remains the clearest statement of what it studies: how media of communication affect human perception, understanding, feeling, and value; and how our interaction with media facilitates or impedes our chances of survival.

Postman's formulation of the medium as a technology within which a culture grows — deliberately echoing the biological use of medium as the substrate in which an organism develops — was a precise ecological claim, not a poetic one: the environment makes the organism. Change the environment, and you change what it is possible to think, feel, and become. He also made the moral stakes explicit. Understanding the media environment was not merely academic. It was, for Postman, a condition of survival. An environment that structures what we can see and say, and therefore do, must be understood before it can be navigated. Literacy meant the capacity to read the environment itself.

Source: Postman, N. (1985). Amusing Ourselves to Death. Viking. Postman, N. (1992). Technopoly: The Surrender of Culture to Technology. Knopf.

The tradition was deepened by several other foundational thinkers. Harold Innis introduced the concept of media bias — the idea that every medium carries inherent tendencies invisible to those living inside them, tendencies that shape social, political, and cognitive life from below. Walter Ong demonstrated that the shift from oral to literate culture was not merely a change in communication technology but a transformation of human consciousness itself — that media environments do not merely carry thought but restructure the very architecture through which thought is possible. This is the deepest root of the ecological tradition, and the most important precedent for understanding what AI is now doing to human cognition.

Source: Innis, H.A. (1951). The Bias of Communication. University of Toronto Press. Ong, W.J. (1982). Orality and Literacy: The Technologizing of the Word. Methuen.

The Media Ecology Association, founded in 1998 at Fordham University, brought the field into formal institutional existence. Its founding president Lance Strate — who earned his doctorate under Postman at NYU — captured what the entire tradition was always reaching toward in his landmark book Media Ecology: An Approach to Understanding the Human Condition (2017): the field is concerned not merely with understanding media, but with understanding the conditions that shape us as human beings, drive human history, and determine the human condition itself. That is not a narrow academic claim. It is the founding premise of Earth & Screen.

Source: Strate, L. (2017). Media Ecology: An Approach to Understanding the Human Condition. Peter Lang.

3.3 John Durham Peters: The Sea as a Medium

The most direct and philosophically rigorous bridge between the media ecology tradition and Earth & Screen's Digital Ocean framework is the work of John Durham Peters — currently the Maria Rosa Menocal Professor of English and Film and Media Studies at Yale University, and one of the most widely cited media philosophers in the world. His 2015 book The Marvelous Clouds: Toward a Philosophy of Elemental Media, published by the University of Chicago Press, represents the single most important scholarly predecessor to the framework Earth & Screen has developed.

The book begins from what sounds like a simple reversal of the standard media ecology claim — but is actually one of the most consequential moves in contemporary media theory. We commonly say that media are like environments, that they surround and shape us. Peters inverts this entirely. Environments, he argues, are media. The sea, the sky, fire, clouds — these are not merely backgrounds to human life. They are the original media. They communicate, orient, carry meaning, and shape the organisms living inside them. The natural world and the technological world are not two separate domains. They are continuous.

Peters defines media in the most expansive terms the field has ever attempted: not just screens and signals, but the very infrastructures of being — the habitats and materials through which we act and are. In his own words, media matter for everyone who breathes, stands on two feet, or navigates the ocean of memory. Media are not merely carriers of messages. They are conditions of existence.

Source: Peters, J.D. (2015). The Marvelous Clouds: Toward a Philosophy of Elemental Media. University of Chicago Press.

Chapter 2 of The Marvelous Clouds — titled "Of Cetaceans and Ships; or, The Moorings of Our Being" — is Peters' extended philosophical meditation on the ocean as a medium, and what it means for human beings to exist inside a fluid environment. It is the chapter in which Peters makes his most direct and consequential argument about the relationship between the natural ocean and the digital world.

The ship is Peters' central metaphor for the entire book. The ship is human craft — ingenuity applied to an inhospitable environment. The sea on which it sails is everything that ingenuity makes manageable. In his words: the ship is human craft or ingenuity, while the sea on which it sails is all that ingenuity makes manageable. He describes media as amphibious — standing between the terra firma of technology and the sea of nature — and argues that every form of human technology is, in some sense, a vessel: a device for entering and surviving an environment that the human body alone cannot navigate. The question he is therefore asking — and the question Earth & Screen inherits — is what kind of vessel does a person need to navigate the Digital Ocean without being lost to it?

Peters also makes a crucial observation about the relationship between the natural and technological world that goes to the heart of AI Ecology. He notes that when we speak of clouds today, we are as likely to mean data clouds as cumulus or stratus clouds. When we speak of streams, we mean video streams as readily as rivers. When we speak of surfing, we mean the internet. This convergence of language, he argues, is not accidental or decorative. It reveals an essential truth: that the natural world and the technological world are not so distinct. The digital environment did not appear from nowhere. It is built from the same elements — water, sky, signal, flow — that have always composed the media of human existence. The Digital Ocean is not a new metaphor. It is a new instance of a very old reality.

Source: Peters, J.D. (2015). The Marvelous Clouds: Toward a Philosophy of Elemental Media. University of Chicago Press. Chapter 2: Of Cetaceans and Ships; or, The Moorings of Our Being.

The Los Angeles Review of Books called The Marvelous Clouds nothing less than an attempt at a history of Being. N. Katherine Hayles, one of the foremost scholars of digital culture, described it as a book not to be missed. It received the Media Ecology Association's highest award in 2018. Peters is, in short, not a marginal figure making a poetic argument. He is a leading scholar at one of the world's greatest universities, making a rigorous philosophical case — published by the most prestigious academic press in America — that the ocean is the deepest and most accurate model for understanding what media are and what they do to human beings. Earth & Screen's Digital Ocean framework does not borrow from Peters. It arrives independently at the same place, by a different route, and for practical rather than purely philosophical purposes. That convergence matters.

3.4 Sarah Pourciau: The Digital Ocean Named

In the Winter 2022 issue of Critical Inquiry — published by the University of Chicago Press and widely regarded as one of the two or three most prestigious humanities journals in the world — a Princeton-trained scholar named Sarah Pourciau published a paper with a remarkable title: "On the Digital Ocean."

Pourciau is Associate Professor of German Studies at Duke University, with prior positions at Stanford, Princeton, the Technical University of Berlin, and the Leibniz Center for Literary and Cultural Research. Her broader research project traces what she calls the prehistory of the digital as a problem of how to compute the continuum — from German Idealism through contemporary theories of technology, biology, and the Anthropocene. Her route to the Digital Ocean runs not through media ecology or environmental philosophy, but through mathematics. Specifically, through two of the most important mathematical minds in history: Georg Cantor and Alan Turing.

Source: Pourciau, S. (2022). "On the Digital Ocean." Critical Inquiry, 48(2), 233–261. University of Chicago Press.

Cantor was the 19th-century German mathematician who proved, for the first time, that infinity is not a single thing — that there are different sizes of infinity, and that some are incomparably larger than others. His most important discovery concerned what mathematicians call the continuum: the unbroken, seamlessly flowing expanse of real numbers that corresponds to our intuitive experience of continuous reality. Think of it as the mathematical structure that most closely resembles the ocean — fluid, unbroken, infinite in every direction, containing every possible point between any two given points, with no gaps and no discrete steps. Cantor spent his career trying to understand this structure, suffering repeated nervous breakdowns in the attempt, and producing some of the most profound and beautiful mathematics in history. David Hilbert, one of the greatest mathematicians of the 20th century, said of Cantor's work: no one will drive us from the paradise which Cantor created for us.

Then came Alan Turing. Turing, the British mathematician who invented the theoretical foundations of modern computing in the 1930s, made an argument that Pourciau identifies as the pivotal moment in the prehistory of the digital: he argued that for the purposes of computation, the continuum is structurally irrelevant. What matters is not the seamless, infinite, flowing foundation of reality that Cantor spent his life studying. What matters is the discrete, the countable, the step-by-step — the operations a machine can perform, one at a time. Computation, Turing showed, can produce something that feels as vast and immersive and infinite as an ocean. But it is a fundamentally different kind of ocean. An ocean made of discrete steps rather than continuous flow. An ocean of ones and zeros, not of the unbroken continuum.

Pourciau's central question — which Critical Inquiry used as the promotional hook when it published her paper — is this: what happens to thinking when the foundation itself begins to morph? What happens when the continuous, flowing, embodied world of nature is replaced by a digital environment that simulates continuity but is not truly continuous? What happens to human cognition, human perception, and human experience when the ground beneath us shifts from Cantor's ocean to Turing's computation?

Her implicit answer — developed across thirty pages of rigorous philosophical and mathematical argument — is that something essential disappears. The continuum, the seamless ground beneath human experience, is replaced by something that mimics it without being it. The digital environment looks and feels like an ocean. It is vast, immersive, and impossible to fully grasp. But at its mathematical foundation it is made of discrete, computable steps. It has no true ground. And when the ground morphs — when the continuous becomes the discrete, when the natural ocean is replaced by the digital one — something in human cognition and human experience begins to destabilize.

This is the most rigorous philosophical formulation of what Earth & Screen calls Signal Pollution that exists in the academic literature. Pourciau arrives at the Digital Ocean from pure mathematics and continental

philosophy. Earth & Screen arrives at it from ecology, neuroscience, and human development. They are, unmistakably, describing the same thing.

Source: Pourciau, S. (2022). "On the Digital Ocean." Critical Inquiry, 48(2), 233–261. Published in the special issue: Surplus Data.

3.5 The Spontaneous Emergence of the Ocean Metaphor

Beyond the formal academic lineage, there is a further and perhaps more compelling form of evidence for the accuracy of the Digital Ocean framework: the metaphor keeps emerging spontaneously, across contexts and decades, from people who are simply trying to describe what the digital environment feels like from the inside.

Jean Armour Polly, a librarian at the Liverpool Public Library in New York, coined the phrase surfing the internet in 1992 — the phrase that would become the dominant popular description of digital navigation for the next three decades. She was not a media theorist or a philosopher. She was writing a beginner's guide for library patrons and needed a title that captured what navigating this new environment actually felt like. She later described her reasoning: she wanted something that expressed the fun and chaos of the experience, something nautical and net-like, something that evoked randomness and even danger. She looked at her mouse pad, which had a picture of a surfer and the phrase information surfer, and the metaphor clicked instantly. The internet already felt like an ocean. It demanded an oceanic metaphor. The language arrived not by design but by necessity.

The same instinct appears in the broader vocabulary of the digital world — streams, flows, feeds, viral waves, channels, currents — all fluid terms that people have reached for, independently and across decades, to describe an environment that resists solid metaphors. Even the term phishing, which emerged in hacker culture in the mid-1990s, draws on the image of trawling through a sea of users for information. The digital world has always been, at a linguistic level, an ocean. What Earth & Screen and the scholars before it have done is take that intuition seriously — and build a rigorous framework around it.

Source: Polly, J.A. (1992). "Surfing the INTERNET." Wilson Library Bulletin. Polly, J.A. (1994). "Birth of a Metaphor: The Nascence of Surfing the Internet." Netmom.com.

3.6 The Continuous Line: From Media Ecology to AI Ecology

What this intellectual history reveals is not a scattered collection of independent observations, but a single continuous line of inquiry — one that has been building, across disciplines and decades, toward the framework Earth & Screen now offers.

McLuhan saw that electronic media were creating an all-surrounding immersive field and warned that human understanding was racing behind. Postman named that field an ecology and insisted that navigating it required a new kind of literacy. Innis showed that the biases of environments are invisible to those living inside them. Ong demonstrated that shifts in media environments transform consciousness itself. Strate synthesized this tradition into the clearest possible statement of its purpose: to understand the conditions that determine what it means to be human. Peters extended it into a rigorous philosophy of elemental media in which the ocean — literal and metaphorical — is the most accurate model for what a medium actually is. Pourciau traced the mathematical prehistory of the digital ocean and asked, with precision, what humanity loses when the continuous ground of experience is replaced by the discrete operations of computation. And Polly — a librarian

with a surfer on her mousepad — confirmed, from lived experience, what all of them were reaching toward: the internet already feels like an ocean.

AI Ecology is the next step in this line. It takes the environmental insight of media ecology, the elemental philosophy of Peters, the mathematical precision of Pourciau, and the lived intuition that has been naming this environment oceanic for thirty years — and builds from them a practical framework for human beings who need not just to understand the Digital Ocean but to navigate it. To remain grounded in their bodies, connected to the natural world, and sovereign in their own minds while living inside a medium that, as Peters put it, does not merely carry messages but constitutes the very conditions of existence.

Research published in the European Journal of Futures Research (2015) captures the urgency of this moment precisely. As the internet becomes increasingly ubiquitous, the authors write, the perspective of media as living and social environment is more topical than ever. The media ecology tradition perceives media as a structure in which society and culture evolve — as an environment where people act and live their lives, and through which reality is perceived. With the addition of artificial intelligence, that environment has become not just pervasive but intelligent, adaptive, and co-evolutionary. The need for the literacy this tradition has been calling for has never been greater.

Source: European Journal of Futures Research, 2015. "Media Ecology and the Future Ecosystemic Society." Springer Nature.

From McLuhan's electric environment to Peters' elemental sea to Pourciau's Digital Ocean — across sixty years of scholarship, the same question has been asked: what happens to a human being when the environment itself becomes fluid? Earth & Screen exists to help answer it — practically, ecologically, and with literacy at its heart.

4. Why the Ocean Metaphor Is More Than a Metaphor

4.1 How Oceanographers Study the Ocean

The science of oceanography does not study the ocean as a single undifferentiated mass of water. It studies layers — distinct zones of activity, each with its own pressure, temperature, chemistry, and ecological character, and each influencing the layers above and below it. Surface events affect deep currents. Deep currents shape the climate at the surface. What happens invisibly at the bottom eventually rises to affect everything that lives above.

Oceanographers study currents that are invisible to anyone swimming at the surface. They study the mechanisms by which pollutants introduced at one point move through the entire system. They study how a disturbance in one layer — a temperature change, a chemical shift, an ecological disruption — produces effects that are felt far from their origin, often in ways that seem disconnected from their cause.

This is precisely how Earth & Screen approaches the Digital Ocean. Not as a flat surface of apps and screens, but as a layered, dynamic, ecological system with its own invisible currents — and its own forms of pollution.

4.2 The Layers of the Digital Ocean

Just as oceanographers map the ocean into distinct zones, AI Ecology maps the Digital Ocean into four interdependent layers, each shaping the experience of those who move through it:

The Surface Layer — What You See

This is the visible world of the Digital Ocean: social media feeds, notifications, news headlines, messages, videos, search results. It is what most people mean when they talk about technology. It is fast-moving, highly visible, and emotionally immediate — like the surface of the ocean, where light penetrates, weather acts, and most daily activity occurs. It is also the layer most people try to manage when they think about reducing screen time.

The Algorithmic Layer — The Invisible Currents

Below the surface, invisible to the ordinary user, flows the most powerful force in the Digital Ocean: the algorithmic current. These are the recommendation systems, ranking engines, and engagement-optimization models that decide what rises to the surface and what sinks. Like the great ocean currents that drive global climate — the Gulf Stream, the thermohaline circulation — algorithmic currents are invisible but foundational. They determine what billions of people see, feel, and think about, every day, without those people ever being aware of the force acting on them.

This is the layer AI Ecology pays most careful attention to. Because just as understanding ocean climate requires understanding deep currents rather than just surface waves, understanding the Digital Ocean requires understanding algorithmic architecture — not just the content it delivers, but the invisible logic that determines what gets delivered and why.

The Infrastructure Layer — The Ocean Floor

Deeper still lies the physical architecture that makes the Digital Ocean possible: data centers, fiber optic cables, satellite networks, electromagnetic fields, server farms consuming vast quantities of energy and water. This layer is almost entirely invisible to everyday users — as invisible as the ocean floor to a swimmer — yet it is the foundation on which everything above rests. AI Ecology acknowledges this layer because the physical infrastructure of the digital world has real ecological consequences for the natural world, creating a direct connection between the Digital Ocean and the biosphere.

The Ecological Layer — Where It Meets the Organism

The fourth layer is the one Earth & Screen is most concerned with: the layer at which the Digital Ocean meets the human organism. This is where currents become felt experience — where algorithmic design becomes anxiety, where notification architecture becomes attentional fragmentation, where emotional contagion becomes a child's sense of self. Just as marine ecology studies the interaction between ocean conditions and the living creatures within them, AI Ecology studies the interaction between digital conditions and the human beings — particularly the developing children — who are immersed in them.

4.3 Signal Pollution: The Ocean's Invisible Contamination

Oceanographers understand that pollution is not always visible. Chemical contamination, microplastics, thermal pollution, acidification — the most damaging forms of ocean pollution are often the ones you cannot see from the surface. They alter the chemistry of the water itself, changing the conditions in which every living organism in the system must survive.

Signal Pollution operates the same way. It is not the individual notification, the single scroll, the one alarming news story. It is the cumulative alteration of the cognitive and emotional environment — the change in the baseline chemistry of inner life — produced by constant immersion in a system designed for maximum engagement rather than human flourishing. Like chemical ocean pollution, it is largely invisible, largely normalized, and largely unfelt as a discrete event. Its effects accumulate below the level of conscious awareness, until the system — the human nervous system, the child's developing brain — begins to show signs of strain.

This is why the oceanographic lens is not merely poetic. It is precisely accurate. The Digital Ocean, like the natural ocean, cannot be understood by looking only at the surface. And the pollution within it cannot be addressed by managing individual pieces of content. It requires understanding the system — all of its layers — and developing the literacy to navigate it with awareness.

Just as sailors once needed maps, compasses, and knowledge of currents to cross the ocean safely, navigating the Digital Ocean requires a new kind of literacy — one that sees beneath the surface.

5. What About Robots and Tools? Mapping the Full Ecosystem

5.1 A Common Question

When people first encounter the Digital Ocean framework, a natural question arises: where do physical technologies fit? What about robots, smart devices, autonomous vehicles, AI-powered appliances, wearables? Are these part of the ocean? Are they something else entirely?

It is a good question, and answering it makes the entire framework sharper. The ocean metaphor, it turns out, accommodates these technologies precisely — because real oceans are not just water. They contain vessels, creatures, infrastructure, and tools of every kind. The ocean is the environment. Everything within it plays a different ecological role.

5.2 The Ecosystem Map

The Ocean Itself — The Digital Environment

The Digital Ocean is the environment: the invisible, ambient field of signals, data, algorithms, and electromagnetic activity that now surrounds human life. It is not a thing you can point to. It is the medium — the water — through which everything else moves. It is always present, always active, and increasingly intelligent.

AI — The Intelligence of the Ocean

Artificial intelligence is not a creature in the ocean. It is more like the ocean's living intelligence — the distributed, adaptive system that gives the water its behavior. In a natural ocean, complex emergent intelligence arises from the interaction of currents, chemistry, and ecology. In the Digital Ocean, AI is the force that makes the environment adaptive, responsive, and capable of learning. It is what makes this ocean fundamentally different from all previous information environments. Without AI, the Digital Ocean would be a library. With AI, it becomes a living system that responds to you.

Screens and Platforms — Ports and Coastlines

Smartphones, laptops, social media platforms, and streaming services are the ports and coastlines of the Digital Ocean — the interface points where human beings enter the water. They are the places where the ocean meets the land. Most people spend most of their time at the shoreline, wading in and out, without ever thinking about what lies in the deeper water. Understanding the full ecosystem means looking beyond the port.

Robots and Physical AI — The Vessels

Robots, autonomous vehicles, smart appliances, drones, AI-powered physical systems — these are the vessels that move through the Digital Ocean while also operating in the physical world. Like ships, they are built for a specific environment and designed to accomplish specific tasks. They carry the intelligence of the ocean into physical space. A delivery robot navigating a city street is a vessel carrying digital intelligence into the material world. A smart home system is a vessel that has docked permanently in your living space, extending the ocean's reach into the most intimate corners of daily life.

This is an important distinction. Robots and physical AI tools are not the ocean — they are things that move through it, or that bring its influence into new territories. Their ecological significance lies in how they extend the Digital Ocean's reach and deepen its integration with the physical, embodied world that humans have always inhabited.

Individual Tools and Apps — Fish and Organisms

A specific app, a single AI tool, a particular piece of software — these are organisms within the ecosystem. Like fish in the ocean, they have their own behaviors, their own niches, their own effects on the organisms around them. Some are benign. Some are highly adapted predators of human attention. Some are genuinely useful and nourishing. Evaluating individual tools is valuable — but it is not the same as understanding the ocean they swim in. You can remove one fish from the ocean without changing the ocean. Signal Pollution is not caused by any single organism. It is a property of the environment as a whole.

Human Beings — The Organisms in the Water

In this ecosystem, human beings are the organisms. We are not the ocean, not the vessels, not the fish. We are the living creatures immersed in a new environment — an environment that is shaping our biology, our cognition, and our development in real time. Like all organisms in a new environment, our adaptive capacity has limits. The question AI Ecology asks is: what are those limits, how are they being tested, and what does a healthy relationship between the organism and its environment look like?

5.3 Why the Distinction Matters

This ecosystem map matters because it prevents a common confusion: the tendency to evaluate the Digital Ocean tool by tool, rather than as a system. Parents ask whether TikTok is safe. Educators debate whether iPads belong in classrooms. Researchers study the effects of specific apps. These are all valid and important questions.

But they are questions about individual organisms, individual vessels, individual ports. They do not address the ocean itself — the ambient, invisible, always-on environment that shapes human experience regardless of which specific tools are in use. A child who deletes TikTok but remains immersed in an algorithmically curated, notification-saturated, screen-saturated environment is still swimming in the same ocean.

AI Ecology insists that we look at the whole system. Not because individual tools do not matter — they do — but because the most important questions are ecological, not technological. Not: is this tool safe? But: what kind of environment are we creating, and what does it do to the organisms living inside it?

The question is not which fish to avoid. The question is: what is the health of the ocean itself?

6. AI, Human Evolution, and the Co-Evolutionary Challenge

5.1 A New Evolutionary Actor

One of the most striking and underappreciated insights emerging from recent scientific literature is the argument that AI must now be understood not merely as a tool, but as an evolutionary actor — a force that is actively influencing the trajectory of human biological and cognitive development.

A landmark paper published in The Quarterly Review of Biology (2024) by evolutionary biologist Robert Brooks argues that AI technologies interact with humans in ways that parallel the kinds of biotic relationships studied in classical ecology — predator and prey, host and parasite, competitor and collaborator. The paper contends that AI's everyday effects on human behavior, reproduction, social interaction, and cognition create conditions for natural selection — and that over time, selection may begin acting on the composite human-AI system itself.

Source: Brooks, R.C. (2024). "How Might Artificial Intelligence Influence Human Evolution?" The Quarterly Review of Biology, 99(4).

This perspective is extended in research published in PMC (2025), which explores the possibility that humans and AI are already forming a new kind of evolutionary unit — what the authors call a human-AI coevolutionary individual. The researchers argue that selection is beginning to act not on humans alone, but on the degree and nature of human-AI integration.

Source: PMC, 2025. "Could Humans and AI Become a New Evolutionary Individual?"

5.2 Cognitive Co-Evolution: Gains and Risks

Research published in Frontiers in Psychology (2025) examined what the authors call cognitive co-evolutionary processes — the ways in which the integration of AI into everyday life is reshaping not just what humans know, but how they think. The paper identifies a genuinely unprecedented moment: for the first time since the interbreeding of Homo sapiens with Neanderthals roughly 45,000 to 65,000 years ago, humans are encountering a form of cognition fundamentally different from their own.

Source: Frontiers in Psychology, 2025. "Becoming Human in the Age of AI: Cognitive Co-Evolutionary Processes."

The gains are real. AI augments human cognitive capacity in powerful ways — accelerating research, democratizing access to knowledge, enabling new forms of creativity. But the risks are equally real. Research published in ScienceDirect (2024) warns explicitly that overreliance on AI creates the risk of a gradual loss of cognitive capacity due to reduced use of skills developed over human evolutionary time — including language, writing, reflective thinking, and creative generation.

Source: ScienceDirect, 2024. "Artificial Intelligence: Driving Force in the Evolution of Human Knowledge."

AI Ecology names this tension as one of its central concerns: how do humans maintain cognitive sovereignty — the capacity for independent thought, creative imagination, and self-directed reasoning — within an environment that increasingly provides these functions on demand?

5.3 The Nature Dimension

The Great Web of Life — the interdependent system of organisms, environments, and evolutionary relationships that constitutes life on Earth — did not cease to exist when the technosphere emerged. It simply acquired a new and powerful participant.

Research in the emerging field of postdigital nature connection (Springer Nature, 2024) argues that the boundaries between the natural and the digital are now so entangled that neither can be understood in isolation. Our connections to place and to the natural world, in the words of Adams and Jansson (2023), are now irrevocably entangled with digital existence.

Source: Springer Nature, 2024. "Postdigital Nature Connection." Postdigital Science and Education.

AI Ecology takes this entanglement as its starting point. The question is not whether to engage with the Digital Ocean, but how to remain rooted in the biological and ecological foundations of human health while doing so.

The natural world — with its restorative rhythms, sensory richness, and evolutionary familiarity — is not a retreat from the digital world. It is the counterweight that keeps the human system in balance.

7. The Three Domains of AI Ecology

AI Ecology is organized around three interconnected domains of inquiry, each representing a dimension of the new environment that requires dedicated study and a new form of literacy:

Domain 1 — The Environment Itself

Before we can navigate a new environment, we must understand its nature. AI Ecology begins with mapping the Digital Ocean as an ecological system — its properties, its currents, its invisible forces, and the ways it differs from the natural environments for which human biology evolved. This includes understanding algorithmic architecture, the mechanics of attention capture, the design logic of engagement-maximizing platforms, and the electromagnetic and informational properties of the always-on digital infrastructure.

Research in digital ecologies (ResearchGate, 2022–2025) examines what scholars call the construction and virtualization of humans and non-humans through digital technologies — the ways in which the digital environment does not merely represent reality but actively reshapes it. AI Ecology builds on this work to develop a comprehensive map of the environment families and individuals are actually navigating.

Source: ResearchGate, 2022. "Digital Ecologies: Materialities, Encounters, Governance."

Domain 2 — The Human Organism in the Digital Environment

The second domain focuses on the human being as a biological organism responding to a genuinely new environment. This includes the effects of constant digital stimulation on the nervous system, the attentional and cognitive costs of notification culture, the impact of algorithmic emotional contagion on mental health, and the developmental effects of screen saturation on children's brains, bodies, and imaginations.

This domain draws heavily on neuroscience, cognitive psychology, developmental science, and environmental health research — including the growing body of peer-reviewed evidence that chronic digital overstimulation produces measurable physiological harm. Earth & Screen's companion white paper, Signal Pollution (2025), provides a comprehensive review of this literature.

Domain 3 — The Web of Life: Nature, Humans, and AI Together

The third and most expansive domain of AI Ecology examines the full three-sphere system: the biosphere, the noosphere, and the technosphere in dynamic relationship. This includes studying how AI is changing human relationships with the natural world, how nature exposure counteracts the harms of Signal Pollution, how digital

systems are being used both to damage and to restore ecological understanding, and how the evolutionary relationship between humans and AI is likely to unfold.

Research in coupled human and natural systems (Springer Nature, 2020) provides a foundational framework for this work. The authors propose studying human-environment interactions across multiple dimensions — space, time, and scale — recognizing that the interactions between humans and their environments form a large, nested, interconnected, organic system that cannot be understood by examining any single element in isolation.

Source: Springer Nature, 2020. "Coupled Human and Natural Cube: A Novel Framework for Analyzing Multiple Interactions Between Humans and Nature."

8. What AI Ecology Is Not

Because AI Ecology is a new framework, it is worth being precise about what it does not claim.

AI Ecology is not anti-technology. It does not argue that the digital world is inherently harmful, or that the solution is withdrawal. AI has genuine and remarkable potential — in medicine, in conservation, in education, in human connection. The same research literature that documents the harms of digital overexposure also documents ways that technology can support nature connection, cognitive development, and human flourishing.

AI Ecology is not a moral framework. It does not assign blame to technology companies, to parents, or to individuals. It is an ecological framework — concerned with understanding systems, not assigning fault.

AI Ecology is not alarmist. It takes seriously both the potential harms and the genuine benefits of the digital environment, and it aims to produce the kind of nuanced, evidence-based literacy that enables people to navigate that environment with clarity rather than fear.

What AI Ecology is, simply stated: the study of the new environment we are all living inside — and the development of the literacy, the practices, and the grounded awareness needed to remain whole within it.

9. Core Principles

AI Ecology rests on six foundational principles, each grounded in the interdisciplinary research reviewed above:

- *Environments shape organisms.* The digital environment is shaping human biology, cognition, and development in ways that require ecological rather than merely technological analysis.
- The Digital Ocean is a new kind of ecosystem. It has emergent properties — constancy, intelligence, scale, displacement — that distinguish it from any previous human information environment and that require dedicated study.
- Humans are biological organisms first. Our nervous systems, our developmental needs, our imaginative capacity, and our health all operate according to evolutionary parameters that the digital environment frequently violates. Understanding this tension is foundational.
- Nature is not separate from the digital world — it is its counterweight. The natural world provides the restorative, embodied, rhythmic conditions that the digital environment cannot. Maintaining access to nature is not a lifestyle preference — it is a biological necessity.
- AI and humans are co-evolving. The relationship between human cognition and artificial intelligence is not static. It is dynamic, directional, and consequential. How we navigate this co-evolution — with awareness or without — will shape the future of human development.
- Literacy, not rejection, is the goal. The aim of AI Ecology is not to help people flee the Digital Ocean, but to help them navigate it — with the awareness, the grounding, and the inner stability to remain sovereign in their own minds, bodies, and imaginations.

10. The Earth & Screen Framework

Earth & Screen translates the principles of AI Ecology into a practical framework for individuals, families, and educators. Built on four pillars, the framework is designed to develop the specific capacities that the AI-driven environment most threatens.

AI Ecology Literacy

The capacity to see clearly the environment one is living in — to understand the Digital Ocean not as a collection of apps and platforms, but as an ecosystem with emergent properties that shape inner life. This includes understanding algorithmic design, the mechanics of attention capture, and the ways digital environments interact with the nervous system and developing brain.

Digital Hygiene

Practical, evidence-based habits that reduce Signal Pollution and maintain cognitive and emotional space — including notification management, device-free times and environments, intentional content curation, and awareness of the physiological effects of different forms of digital engagement.

Nervous System Regulation

Practices drawn from the science of polyvagal theory, stress neuroscience, and environmental psychology that help individuals maintain physiological grounding — with particular emphasis on regular, meaningful contact with the natural world as the most powerful known counterweight to the chronic low-grade stress of digital overstimulation.

Creative Sovereignty

The preservation and cultivation of the imaginative capacity — the distinctly human ability to generate original thought, story, image, and meaning from within. In an environment where content is increasingly produced by AI and served algorithmically, protecting the space in which imagination lives and grows becomes an act of ecological self-defense.

11. Conclusion: The Literacy of Our Time

Every major shift in the human environment has eventually produced a corresponding shift in human literacy. The invention of writing produced the literate mind. The printing press produced the reading public. The industrial age produced scientific literacy. Each transformation required new ways of understanding the world — new maps for a new terrain.

We are living through another such transformation. The rise of AI-driven digital infrastructure is producing a new environment — one that is invisible, intelligent, constant, and ecologically significant in ways we are only beginning to understand. It is changing how we think, how we feel, how we relate to one another, how we relate to nature, and — according to emerging scientific research — how we may evolve.

AI Ecology is the beginning of the literacy this moment requires.

Not the literacy of code, or of platforms, or of the latest AI tool — though those have their place. The literacy of environment. The capacity to see, clearly and without flinching, the conditions we are actually living inside. To understand how those conditions shape us. And to develop the awareness, the practices, and the grounded presence to navigate them without losing the things that make us most human.

Our bodies. Our imagination. Our connection to the living world.

Before we learn about the latest gadgets or AI updates, we should learn to root in the new digital AI environment we're actually living in. That's how we stay grounded in our bodies, the Earth, and sovereign in our minds.

Earth & Screen exists to help individuals and families develop this literacy. The Digital Ocean is not going away. But with the right understanding, the right practices, and the right grounding, it is possible to swim in it without being swept away.

Key Research References

The following peer-reviewed studies, institutional publications, and academic sources form the scientific foundation of this white paper. Full references available upon request.

Media Ecology & Philosophy of Elemental Media

McLuhan, M. (1964). Understanding Media: The Extensions of Man. McGraw-Hill.

McLuhan, M. & Powers, B.R. (1989). The Global Village: Transformations in World Life and Media in the 21st Century. Oxford University Press.

Postman, N. (1985). Amusing Ourselves to Death: Public Discourse in the Age of Show Business. Viking.

Postman, N. (1992). Technopoly: The Surrender of Culture to Technology. Knopf.

Innis, H.A. (1951). The Bias of Communication. University of Toronto Press.

Ong, W.J. (1982). Orality and Literacy: The Technologizing of the Word. Methuen.

Strate, L. (2017). Media Ecology: An Approach to Understanding the Human Condition. Peter Lang.

Peters, J.D. (2015). The Marvelous Clouds: Toward a Philosophy of Elemental Media. University of Chicago Press.

Pourciau, S. (2022). "On the Digital Ocean." Critical Inquiry, 48(2), 233–261. University of Chicago Press.

Polly, J.A. (1992). "Surfing the INTERNET." Wilson Library Bulletin, University of Minnesota.

European Journal of Futures Research (2015). "Media Ecology and the Future Ecosystemic Society." Springer Nature.

ACM CHI Conference, 2023. "Engaging with Nature through Technology: A Scoping Review of HCI Research." Proceedings of CHI 2023.

Reed, J. (2024). "Postdigital Nature Connection." Postdigital Science and Education. Springer Nature.

Springer Nature, 2020. "Coupled Human and Natural Cube: A Novel Framework for Analyzing Multiple Interactions Between Humans and Nature." Journal of Geographical Sciences.

ResearchGate / Turnbull et al. (2022). "Digital Ecologies: Materialities, Encounters, Governance."

Children & Nature Network (2024–2025). Research Digest: Screen Time and Green Time. Multiple studies reviewed.

AI and Human Evolution

Brooks, R.C. (2024). "How Might Artificial Intelligence Influence Human Evolution?" The Quarterly Review of Biology, 99(4).

PMC / Acta Naturae (2024). "Evolutionary Perspectives on Human-Artificial Intelligence Convergence."

PMC (2025). "Could Humans and AI Become a New Evolutionary Individual?"

Frontiers in Psychology (2025). "Becoming Human in the Age of AI: Cognitive Co-Evolutionary Processes."

ScienceDirect (2024). "Artificial Intelligence: Driving Force in the Evolution of Human Knowledge."

Signal Pollution & Human Health

See Earth & Screen White Paper: Signal Pollution — Understanding the Human Cost of the AI-Driven Digital Environment (2025). Full references therein.

About Earth & Screen

Earth & Screen is a research and education organization dedicated to helping individuals and families understand and navigate the AI-driven digital environment. Our work sits at the intersection of ecology, neuroscience, human development, and digital culture — bringing the lens of ecological thinking to the most pressing questions of the technological age.

We believe that the foundational literacy of our time is not learning to use new tools — it is learning to understand the environment those tools collectively create, and developing the awareness and practices to remain grounded, healthy, and imaginatively alive within it.

This white paper is the first in Earth & Screen's ongoing research series. It will be followed by annual research publications, original survey data, and literature reviews examining specific dimensions of the AI Ecology framework.

For research inquiries, partnership proposals, or program information, please contact Earth & Screen directly at info@earthandscreen.com

© 2026 Earth & Screen. All rights reserved.