CHAPTER 1: From Cosmos to Machine

A basic premise of modern science is that we are observers of an external world entirely independent of our observations. We can measure, predict, and manipulate this world by breaking it down into basic elements, but we participate in it only in the sense that our bodies are made of the same physical constituents found in everything else. The prevailing assumption—born from the Galilean conception and evolved into the modern scientific worldview—holds that the universe is an exclusively physical place, and that subjective experience is entirely derivative from physical processes. This view is now so deeply embedded in modern thought that it seems like common sense, but it is actually a relatively recent development.

Premodern cultures imagined the cosmos as a living, intelligent, and relational whole. It was a world defined by participation, not detached observation. Most cultures imagined that spirit or a similar notion permeated existence. Moreover, they framed it as process or flow–as an action rather than an object. A river or a mountain possessed agency; it and was a presence to be related to, possessing its own interiority and purpose. In early Chinese thought, the world was understood as a dynamic field of relations, patterns of correspondence and resonance, not discrete substances[2]—a perspective that continues through Taoist,Confucian and similar traditions. People believed that they were part of an animate reality—they had a direct, unmediated relationship with a living world. It was a deeply experiential world defined by participation, in contrast to the abstractive mode that would later come to dominate Western thought.

This ancient intuition was fundamental for many of the earliest and most influential Western philosophers. Plato saw the physical world as a moving image of an eternal, intelligible reality, and the cosmos as a living creature endowed with soul and intellect—*nous*—that brought order and reason to material existence. His student Aristotle was more grounded in empirical observation, but likewise saw

the world as saturated with purpose. All natural things, he argued, possess a *telos*—an innate, indwelling end toward which they strive. The telos of an acorn is to become a mighty oak, and this striving is an intrinsic part of its nature.

These metaphysical conceptions were the foundation of Western thought for two millennia. Qualities such as warmth, color, purpose, and even soul were real and irreducible features of the world. Reality was not divided into "primary" and "secondary" qualities, but was understood as a seamless whole in which mathematical relationships coexisted with meaning, beauty, and intention. The universe was intelligible because it was alive and intelligent. Owen Barfield spoke of it as original participation, a mode of consciousness in which humans experienced themselves as *participating in* the life of nature rather than standing apart from it.[3]

The integrated vision of a meaningful cosmos began to fade in Western thought with the rise of Christianity, particularly during the medieval period, which shifted the locus of agency from an inherent aspect of the world toward a transcendent God who guaranteed cosmic order. The universe came to be seen as fundamentally intelligible because it was the creation of a rational, divine mind. Nature was seen as a "second book," a divine text that, like Scripture, revealed the mind of its author. This worldview found its most famous expression in the concept of the Great Chain of Being—a model that organized all of existence, from God and the angelic hosts down to the most humble stone, in a single, unbroken, value-laden hierarchy. Everything had its proper place and purpose in the divine order.

Within this framework, what we now call science was not seen as an alternative or threat to theology, but as a form of it. To study the natural world was to engage in a fundamentally spiritual act: to read the mind of God as expressed in the rational structure of creation. For the great minds of the Scientific Revolution—Johannes Kepler, Isaac Newton, Robert Boyle and others—scientific inquiry re-

mained a deeply spiritual pursuit. When Kepler discovered the elliptical orbits of the planets, he famously exclaimed that his desire was "only to taste the flavor of seeing, if I could, with my own eyes, what I had learned from the mouth of God."[4] Similarly, Newton, a profoundly religious man who wrote more on theology than on physics, saw his discovery of universal gravitation not as evidence of a self-sufficient mechanism, but as proof of God's ongoing, rational design and dominion over the cosmos.

For these founders of modern science, there was no conflict between physics and faith; they were integrated paths to understanding a single, divinely ordered reality. The mathematical elegance they discovered in planetary motion and terrestrial mechanics was not mere utility—it was a glimpse into the aesthetic and rational perfection of divine creativity. Yet the very power and elegance of the system they created contained the seeds of a major transformation that would ultimately remove the creator from the picture—and, more significantly, would strip the universe of meaning, purpose, and the possibility of genuine participation.

The Great Divorce

The beginnings of this transformation are often attributed to Francis Bacon and Galileo Galilei in the late 16th and early 17th centuries. Bacon promoted an empirical, inductive method of science, while Galileo largely redefined science as the study of what is measurable. Galileo's notion was particularly powerful, introducing one the most consequential shifts in the history of Western thought. Galileo argued that the world is fundamentally accessible only through mathematics—that the "book of nature is written in geometrical characters." This was not merely a methodological preference but a metaphorical reorientation. It meant that whatever could not be described mathematically—qualities such as color, warmth, taste, purpose, meaning—belonged not to the world itself but to the perceiving mind And it implied that what could not be

mathematized was somehow less real, less worthy of serious attention.

The *Galilean conception*, as it is often referred to, created a new ontological hierarchy. Quantities became "primary" and therefore real; qualities became "secondary" because they were subjective. Galileo's conception launched a long cultural trajectory in which only the measurable is true, and everything else was dismissed as merely subjective. Modern science would inherit this metaphor, gradually transforming it into a worldview: a universe understood as a set of mathematically expressible mechanisms rather than a living, participatory cosmos.

But metaphors are not merely ways of talking about reality—they are ways of thinking about reality. This insight, developed most comprehensively by cognitive linguist George Lakoff and philosopher Mark Johnson, represents one of the most important findings in cognitive science over the past half-century. Their research revealed that abstract thought itself operates through metaphorical mappings from concrete, embodied experience. We don't just happen to speak of arguments in terms of war ("defending a position," "attacking weak points"); we actually think about arguments through the structure of combat. We don't just describe time as a valuable resource ("spending time," "investing hours"); we conceptualize and experience time itself through the logic of economic transaction.

These conceptual metaphors are not conscious choices; they are deeply-embedded in our cognitive infrastructure—largely invisible frameworks that shape what we can perceive, what questions we can ask, and what answers seem reasonable. They determine which aspects of reality we recognize and which ones we don't. The metaphor of the universe as a machine doesn't just change our vocabulary, it controls what we can notice. Machines have parts but not purposes. They can be disassembled and optimized but not participated in. They operate according to deterministic laws but lack interiority, meaning, or value. The metaphor makes certain inquiries natural (How does it work? What

are its mechanisms?) while rendering others nonsensical or naive (What does it mean? What is its purpose? What is it like to be this?).

The philosopher and systems theorist Jeremy Lent has extended this insight to civilizational scale. In *The Patterning Instinct* and *The Web of Meaning*, Lent argues that the root metaphors animating a culture—its deepest assumptions about what reality is—shape everything from social organization to ecological relationship to conceptions of human flourishing. These are not abstract philosophical positions debated in seminar rooms but lived frameworks that determine how societies relate to nature, how they justify hierarchies, how they define progress, and ultimately whether they survive or collapse. The metaphor of nature as dead matter to be exploited generates a profoundly different civilizational trajectory than the metaphor of nature as a living web in which humans are embedded participants

This means the Galilean conception was never merely methodological. It was—and remains—a metaphorical reorientation with cascading consequences. By insisting that only the mathematically measurable is truly real, Galileo wasn't just proposing a useful technique for studying planetary motion. He was installing a root metaphor that would gradually colonize Western thought, transforming a cosmos alive with meaning, purpose, and consciousness into a collection of mechanisms to be measured, predicted, and controlled. The metaphor made modern science possible—its extraordinary predictive power, its technological achievements, its capacity to reveal previously hidden patterns. But it also made certain things invisible: the interior dimensions of experience, the reality of consciousness, the possibility that mind might be fundamental rather than derivative.

This essay examines competing metaphors and their consequences. The modern scientific worldview treats consciousness as a side effect of matter—a recent accident, a curious byproduct of sufficient neural complexity, essentially an illusion generated by blind processes. This metaphor has

dominated Western thought for centuries, shaping not just scientific research programs but cultural narratives, ethical frameworks, and our most intimate sense of what we are. The alternative framework explored here reverses the priority: consciousness as fundamental, matter as one aspect of a reality that is both physical and experiential, mind as a basic feature of nature rather than an uncomfortable anomaly.

We cannot prove which metaphor is ultimately "true"—such proof may be impossible or even incoherent. But we can examine their consequences. We can ask: Which framework better accounts for the evidence? Which generates more useful predictions? Which supports more sustainable relationships with the natural world? Which addresses the meaning crisis? Which makes the possibility of cosmic equivalence thinkable? These are pragmatic questions about how competing metaphors perform in practice, not metaphysical claims about ultimate reality.

The Galilean conception launched a trajectory that would prove immensely powerful in certain domains while systematically excluding others. Understanding this as a choice of metaphors rather than an inevitable conclusion of rational inquiry opens space for alternatives—alternatives that might preserve science's genuine achievements while making room for dimensions of reality the Galilean metaphor renders invisible.

But something even deeper was happening alongside these methodological innovations. The Enlightenment project increasingly positioned human reason—rather than divine revelation—as the ultimate arbiter of truth and the path to perfection. Where medieval scholars had sought to know God's mind through nature, Enlightenment thinkers pursued human mastery over nature itself. Knowledge was no longer primarily about understanding divine order but about prediction and control. Francis Bacon's own writings reveal this shift explicitly: knowledge, he argued, should yield "power and utility" and enable humanity to "recover that right over nature which belongs to it by divine bequest."

This represented a profound reimagining of humanity's relationship to the natural world. Rather than participants in a divinely ordered cosmos, humans were positioned as rightful masters destined to subdue and control nature through rational understanding. The goal was no longer to know creation in order to glorify the creator, but to manipulate creation for human benefit. This pattern—the secularization of religious impulses into technological projects—would prove remarkably persistent, shaping everything from 19th-century industrialization to contemporary pursuits of artificial intelligence and space colonization. We'll return to this theme repeatedly as we trace how technology came to inherit the redemptive promises once associated with divine grace.

In the middle of the 17th century, René Descartes provided the philosophical architecture for this new science with his ontological[5] dualism. Descartes split reality into two distinct and incompatible substances—inert, extended, mechanical matter (*res extensa*) and unextended, private, thinking mind (*res cogitans*)—effectively exiling mind and all its qualities from the physical world.

A few decades later, Isaac Newton published *Principia,* widely regarded as a pivotal event in the emergence of modern science. Newton's equations could predict eclipses, calculate trajectories, and explain the tides with unprecedented precision. This was genuinely revolutionary: for the first time in human history, natural phenomena could be predicted with mathematical exactitude.

Mathematical modeling was so successful that it seemed to validate not just the method, but the entire machine-like worldview that accompanied it. The mathematical tools of physics gradually came to be seen as a complete description of the world itself—what Alfred Korzybski described as confusing the map with the territory.[6] This confusion, neither intentional nor rapid, occurred gradually across multiple generations and eventually hardened into a metaphysical commitment to physical representations of reality—what would become the modern scientific worldview.

Galileo's mathematical reorientation of nature was not only a scientific advance; it was the installation of a new root metaphor. In Lakoff and Johnson's terms, a root metaphor is a deep conceptual mapping that organizes an entire domain of understanding. Galileo replaced the ancient metaphor of nature as organism, intelligence, or presence with a new metaphor: nature is geometry. What counts as real becomes what can be expressed in mathematical form.

This metaphor, once accepted, quietly reorganized the Western mind. If the real world is the mathematically describable one, then the world of qualities—color, sound, warmth, purpose, meaning—belongs not to nature but to subjective experience. The metaphor does not merely describe reality; it defines the boundary between what reality is and what it is not. It determines what questions are permitted, what phenomena are admissible, and what kinds of explanations are considered legitimate.

Over time, this metaphor hardened into ontology. The measurable became "objective," while anything not amenable to quantitative description was relegated to the realm of the merely "subjective." In this way, a metaphorical choice made in the 17th century gradually evolved into the modern scientific worldview, which often presents itself as a direct reading of nature rather than the historical product of a conceptual framing.

Recognizing the metaphor beneath the method is essential, not to diminish science but to understand its boundaries. A worldview built on a metaphor of mechanism excels at prediction and control, but it struggles with interiority, consciousness, and meaning—domains that the metaphor itself implicitly excludes. To imagine a broader framework, we must examine not only the findings of science but the metaphors that guide what science believes is worth finding.

The commitment to mathematical and physical descriptions cast doubt on everything they couldn't capture. If mathematics could reveal the "true" behavior of planets and pendulums with such precision, then it could reveal the

true nature of the universe. The stunning success of the quantitative approach created an implicit bifurcation of the world—what could be measured and predicted was "objective" and real, while subjective phenomena that couldn't be mathematized were marginalized as "not scientific."

Over time, what began as a methodological limitation—the practical decision to study only what could be measured—evolved into an ontological claim about what was real. Qualities like color, beauty, meaning, and purpose, which could not be captured by mechanical physics, were deemed "secondary qualities"—not real features of the world but subjective projections of the human mind. The elegant, predictive power of Newton's mechanics allowed subsequent thinkers, perhaps most famously the French mathematician Pierre-Simon Laplace, to envision a "clockwork universe" in which God no longer had a place. When asked by Napoleon where God fit into his cosmic system, Laplace is said to have replied, "I had no need of that hypothesis." He had articulated the vision of a perfect, deterministic machine that, once set in motion, required no ongoing divine agency or purpose. This marks what Alfred North Whitehead would later call the "bifurcation of nature"—the decisive cleaving in two of the seamless, meaningful whole of the premodern world.

This transformation changed not only how we understood the world, but what we considered worth understanding. Mathematical models, originally designed as tools for prediction and control, gradually became the standard for what counted as real knowledge. Anything that could not be quantified, measured, or reduced to mechanical terms was relegated to the realm of the subjective—inherently private, not amenable to scientific methods, and therefore not real.

The experiential way of being—participation, connection, and relationship—gave way to an abstractive mode characterized by detachment, manipulation, and symbolic representation. We became observers and manipulators rather than participants, knowing the world through mea-

surements and models rather than through direct experience and relationship.

This drift into a purely abstractive worldview was so gradual that each generation of thinkers could reasonably see themselves as simply building on their predecessors' work, not fundamentally altering humanity's relationship to reality. Yet by the end of the process, the seamless, meaningful cosmos of the ancients had been replaced by something entirely different: particles and forces mindlessly acting according to mathematical laws. Consciousness became relegated to the status of an emergent accident.

The Problem of Mind

The materialist framework that emerged from this conceptual drift worked brilliantly—as long as it confined itself to the external world. For centuries, the mechanical approach could focus on planetary motions, falling bodies, chemical reactions, and other objective phenomena. Our understanding of the physical universe expanded and solidified. The laws of planetary motion are no different in distant galaxies than they are in our solar system. We can reasonably conclude that our basic understanding of the physical universe is true, even if not complete.

But as science matured and began turning its attention inward toward the subjective phenomena of consciousness—awareness, experience, and the spectrum of all that stems from it—it became increasingly clear that there was far more to consciousness than mathematics and measurement could fully account for.[7]

Here we encounter the difficulty explored earlier: the very terms we need most—consciousness, mind, awareness—resist the literal precision that the Galilean conception demands. These words are not technical labels awaiting proper definition but metaphorical gestures toward something that may be too fundamental to reduce to anything more basic. We cannot step outside consciousness to examine it as we might examine a rock or a chemical reaction; the investigator and the investigated cannot be isolated

from one another.

Various metaphorical strategies for confronting this difficulty point in different directions. “Mind” suggests something bounded, perhaps something organisms “have.” “Consciousness” emphasizes awareness and experience—what philosopher Thomas Nagel called “what it is like to be something.” “Spirit” invokes animation and connection. “Tao,” the ground of being. Each metaphor illuminates different facets while necessarily leaving others in shadow. Throughout this book, I’ll use these terms somewhat interchangeably, not from imprecision but from recognition that none fully captures what we’re pointing toward.

I’ve chosen to use “mind” not in the narrow sense of mental processing, but as a placeholder for a qualitative dimension that may be intrinsic to reality itself—as fundamental as any physical property. Consciousness, in this broader view, refers to the awareness of experience, the felt dimension of existence. If the cosmos truly consisted of nothing but particles moving according to deterministic laws, how could it give rise to the felt experience of being a conscious observer?

This explanatory gap became particularly acute when viewed through the broader lens of evolutionary history—one extending well beyond the relatively recent emergence of large-brained primates. Complex brains represent one of evolution’s most costly investments, yet they have evolved repeatedly across dramatically different lineages and vast timescales. Long before the first humans appeared, odontocetes—toothed whales and dolphins—had already evolved highly encephalized brains with elaborate neural architectures. These structures, which achieved their current complexity millions of years ago, challenge the prevailing narrative of consciousness as an accidental phenomenon.

The pattern suggests something more fundamental might be at work—a possibility we’ll explore in depth when we examine cetacean neuroscience and behavior. But for now, the puzzle itself is sufficient: the modern scientific worldview, which had seemed so complete when focused on the external

world, suddenly finds itself confronting evidence suggesting that consciousness might be far more fundamental than its framework can accommodate.

Why the Framework Persists

Despite its inability to accommodate consciousness, the Galilean framework persists for powerful reasons. It remains dominant not because it is philosophically complete or spiritually satisfying, but because of its undeniable technological efficacy, its deep institutional entrenchment, and the lack of a coherent, widely-known alternative. The technological argument is obvious: this worldview works—it has given us antibiotics, space travel, computers, and genetic engineering. The institutional argument is equally powerful: scientific materialism is now so deeply embedded in our universities, research institutions, and funding agencies that alternative approaches struggle to gain hearing, let alone resources. But perhaps most importantly, its core assumptions have become so pervasive as to be invisible, mistaken for objective truth rather than what they are: one possible map of the territory, one interpretive framework among others.

The psychological toll of this framework is deep and widespread, though often unrecognized. The "real" world is the one devoid of care, purpose, or meaning, while everything we actually care about—beauty, purpose, love, moral obligation, spiritual longing—is rendered unreliable. We are asked to believe that our most intimate experiences are the least trustworthy, while mathematical equations and neurological correlates reveal the ultimate truth about our condition. This creates what many have called a meaning crisis—a pervasive sense of disconnection, meaninglessness, and spiritual malaise that no amount of material prosperity seems able to cure.

This creates a kind of existential vertigo that may manifest throughout contemporary culture: the epidemic of depression and anxiety in materially prosperous societies, the desperate search for meaning through consumption or

achievement, and a pervasive sense of alienation from nature and from each other. If consciousness is merely an accident, if we are nothing but complex machines, then why does the absence of genuine connection and purpose feel so devastating? The modern scientific worldview demands that we treat our most direct experiences as less real than abstract mathematical descriptions—a psychological contortion that may be impossible to sustain without profound consequences.

The Fork in the Road

Ecological, psychological, and spiritual crises born from the scientific worldview presents us with a fork in the road. Most urgently, we face the prospect of losing the very evidence that might help us transcend our limited perspective. The odontocete lineages that represent millions of years of alternative experiments in consciousness—perhaps representing forms of awareness as rich or richer than our own—are rapidly disappearing due to industrial processes driven by mechanistic thinking. Ocean acidification, chemical pollution, underwater noise, and climate change are systematically destroying the marine ecosystems that have sustained these remarkable beings for geological ages.

We may be approaching a moment when the only large-brained conscious beings left on Earth are humans—not merely an ecological tragedy but potentially a cosmic one. If the possibility of cosmic equivalence has any validity, we are destroying peers, perhaps even superiors in ways we barely comprehend, without even recognizing what we're doing. We are eliminating the very evidence that could help us understand consciousness as a fundamental rather than accidental feature of reality. The extinction of these lineages would represent not just biological loss but the elimination of alternative modes of conscious being that took millions of years to evolve and may never emerge again.

Yet there is cause for hope. A new story of a cosmos that is fundamentally both material and experiential is beginning to emerge—a story that integrates our intuitive sense

of being and connection with the indisputable truths revealed by science. But as we work to ground and expand this more inclusive narrative, it is critical to distinguish scientific facts from the interpretations and stories that have been built around those facts. The modern scientific worldview presents itself not as one interpretive framework among others but as the inevitable conclusion of rational inquiry—when in fact it represents a series of philosophical choices that, however useful in certain domains, may be profoundly inadequate in others.

Presenting an idea or narrative as "scientific" has become a powerful means of establishing credibility and dismissing challenges, even when there is little factual basis for it. The most powerful of all such claims is the belief that science—specifically, the methods of empirical measurement and mathematical modeling—constitutes the only valid means of establishing truth about the nature of the world. This belief, which goes by the name of scientism, represents not a scientific finding but a philosophical position, one that cannot itself be validated by scientific methods. Distinguishing between science as a method (powerful, valid, indispensable) and scientism as an ideology (a choice about what counts as knowledge and what counts as real) is essential for developing frameworks about the world that can readily accommodate mind and spirit alongside physics and biology.

Confronting this ideology directly—showing how it maintains the modern scientific worldview despite its inadequacies, recognizing its genuine institutional power while identifying its profound limitations, and opening space for alternative frameworks—is the next part of our story. Only by understanding how we arrived at our current intellectual predicament can we begin to imagine and construct better alternatives—frameworks that might address the meaning crisis, recognize the possibility of cosmic equivalence, and help us live more sustainably and meaningfully in a cosmos that may be far richer than we have been taught to believe.

[1] Benton-Banai, Edward. *The Mishomis Book: The Voice of the Ojibway*. University of Minnesota Press, 2010 (originally 1979).

[2] Ames, Roger T., and David L. Hall. *Thinking Through Confucius*. State University of New York Press, 1987.

[3] Owen Barfield, *Saving the Appearances*, 1957.

[4] Johannes Kepler, in a letter to Herwart von Hohenburg, 1599.

[5] Ontology—the study of existence, being and reality—is the term most often used by philosophers for conceptions of what is true.

[6] Alfred Korzybski, *A Non-Aristotelian System and Its Necessity for Rigour in Mathematics and Science*, 1931; and *Science and Sanity: An Introduction to Non-Aristotelian Systems and General Semantics*, 1933.

[7] Of course, many contemporary scientists and philosophers disagree. We'll explore some of their positions and the broader debate in subsequent chapters.