CHAPTER 2

HOW WE GOT HERE

TECHNOLOGY AND HUMAN THOUGHT

Throughout history, human beings have struggled to fully comprehend aspects of our experience and lived environments. Every society has, in its own way, inquired into the nature of reality: How can it be understood? Predicted? Shaped? Moderated? As it has wrestled with these questions, every society has reached its own particular set of accommodations with the world. At the center of these accommodations has been a concept of the human mind's relationship to reality—its ability to know its surroundings, to be fulfilled by knowledge, and, at the same time, to be inherently limited by it. Even if an era or a culture held human reason to be limited—unable to perceive or understand the vast extent of the universe or the esoteric dimensions of reality—the individual reasoning human has been afforded pride of place as the earthly being most capable of understanding and shaping the world. Humans have responded to, and reconciled with, the environment by identifying phenomena we can study and eventually explain—either scientifically, theologically, or both. With the advent of AI, humanity is creating a powerful new player in this quest. To understand how significant this evolution is, we undertake a brief review of the journey by which human reason has, through successive historical epochs, acquired its esteemed status.

Each historical epoch has been characterized by a set of interlocking explanations of reality and social, political, and economic arrangements based on them. The classical world, Middle Ages, Renaissance, and modern world all cultivated their concepts of the individual and society, theorizing about where and how each fits into the enduring order of things. When prevailing understandings no longer

sufficed to explain perceptions of reality—events experienced, discoveries made, other cultures encountered—revolutions in thought (and sometimes in politics) occurred, and a new epoch was born. The emerging AI age is increasingly posing epochal challenges to today's concept of reality.

In the West, the central esteem of reason originated in ancient Greece and Rome. These societies elevated the quest for knowledge into a defining aspect of both individual fulfillment and collective good. In Plato's *Republic,* the famed allegory of the cave spoke to the centrality of the quest. Styled as a dialogue between Socrates and Glaucon, the allegory likens humanity to a group of prisoners chained to the wall of a cave. Seeing shadows cast on the wall of the cave from the sunlit mouth, the prisoners believe them to be reality. The philosopher, Socrates held, is akin to the prisoner who breaks free, ascends to level ground, and perceives reality in the full light of day. Similarly, the Platonic quest to glimpse the true form of things supposed the existence of an objective—indeed, ideal—reality toward which humanity has the capacity to journey even if never quite reach.

The conviction that what we see *reflects* reality—and that we can fully comprehend at least aspects of this reality using discipline and reason—inspired the Greek philosophers and their heirs to great achievements. Pythagoras and his disciples explored the connection between mathematics and the inner harmonies of nature, elevating this pursuit to an esoteric spiritual doctrine. Thales of Miletus established a method of inquiry comparable to the modern scientific method, ultimately inspiring early modern scientific pioneers. Aristotle's sweeping classification of knowledge, Ptolemy's pioneering geography, and Lucretius's *On the Nature of Things* spoke to an essential confidence in the human mind's capacity to discover and understand at least substantial aspects of the world. Such works and the style of logic they employed became educational vehicles, enabling the learned to develop inventions, augment defenses, and design and construct great cities that, in turn, became centers of learning, trade, and outward exploration.

Still, the classical world perceived seemingly inexplicable phenomena for which no adequate explanations could be found in reason alone. These mysterious experiences were ascribed to an array of gods whom only the devout and initiated could symbolically know, and whose attendant rites and rituals only the devout and initiated could observe. Chronicling the achievements of the classical world and the decline of the Roman Empire through his own Enlightenment lens, the

eighteenth-century historian Edward Gibbon described a world in which pagan deities stood as explanations for fundamentally mysterious natural phenomena that were deemed important or threatening:

> The thin texture of the Pagan mythology was interwoven with various but not discordant materials… The deities of a thousand groves and a thousand streams possessed, in peace, their local and respective influence; nor could the Roman who deprecated the wrath of the Tiber, deride the Egyptian who presented his offering to the beneficent genius of the Nile. The visible powers of Nature, the planets, and the elements, were the same throughout the universe. The invisible governors of the moral world were inevitably cast in a similar mould of fiction and allegory.[1]

Why the seasons changed, why the earth appeared to die and return to life at regular intervals, was not yet *scientifically* known. Greek and Roman cultures recognized the temporal patterns of days and months but had not arrived at an explanation deducible by experiment or logic alone. Thus the renowned Eleusinian Mysteries were offered as an alternative, enacting the drama of the harvest goddess, Demeter, and her daughter, Persephone, doomed to spend a portion of the year in the cold underworld of Hades. Participants came to "know" the deeper reality of the seasons—the region's agricultural bounty or scarcity and its impact on their society—through these esoteric rites. Likewise, a trader setting out on a voyage might acquire a basic concept of the tides and maritime geography through the accumulated practical knowledge of his community; nonetheless, he would still seek to propitiate the deities of the sea as well as of safe outbound and return journeys, whom he believed to control the mediums and phenomena through which he would be passing.

The rise of monotheistic religions shifted the balance in the mixture of reason and faith that had long dominated the classical quest to know the world. While classical philosophers had pondered both the nature of divinity and the divinity of nature, they had rarely posited a single underlying figure or motivation that could be definitively named or worshipped. To the early church, however, these discursive explorations of causes and mysteries were so many dead ends—or, by

the most charitable or pragmatic assessments, uncanny precursors to the revelation of Christian wisdom. The hidden reality that the classical world had labored to perceive was held to be the divine, accessible only partly and indirectly through worship. This process was mediated by a religious establishment that held a near monopoly on scholarly inquiry for centuries, guiding individuals through sacraments toward an understanding of scripture that was both written and preached in a language few laymen understood.

The promised reward for individuals who followed the "correct" faith and adhered to this path toward wisdom was admission to an afterlife, a plane of existence held to be more real and meaningful than observable reality. In these Middle (or medieval) Ages—the period from the fall of Rome, in the fifth century, to the Turkish Ottoman Empire's conquest of Constantinople, in the fifteenth—humanity, at least in the West, sought to know God first and the world second. The world was only to be known through God; theology filtered and ordered individuals' experiences of the natural phenomena before them. When early modern thinkers and scientists such as Galileo began to explore the world directly, altering their explanations in light of scientific observation, they were chastised and persecuted for daring to omit theology as an intermediary.

During the medieval epoch, scholasticism became the primary guide for the enduring quest to comprehend perceived reality, venerating the relationship between faith, reason, and the church—the latter remaining the arbiter of legitimacy when it came to beliefs and (at least in theory) the legitimacy of political leaders. While it was widely believed that Christendom should be unified, both theologically and politically, reality belied this aspiration; from the beginning, there was contention between a variety of sects and political units. Yet despite this practice, Europe's worldview was not updated for many decades. Tremendous progress was made in depicting the universe: the period produced the tales of Boccaccio and Chaucer, the travels of Marco Polo, and compendia purporting to describe the world's varied places, animals, and elements. Notably less progress was made in explaining it. Every baffling phenomenon, big or small, was ascribed to the work of the Lord.

In the fifteenth and sixteenth centuries, the Western world underwent twin revolutions that introduced a new epoch—and, with it, a new concept of the role of the individual human mind and conscience in navigating reality. The invention

of the printing press made it possible to circulate materials and ideas directly to large groups of people in languages they understood rather than in the Latin of the scholarly classes, nullifying people's historic reliance on the church to interpret concepts and beliefs for them. Aided by the technology, the leaders of the Protestant Reformation declared individuals were capable of—indeed, responsible for—defining the divine for themselves.

Dividing the Christian world, the Reformation validated the possibility of individual faith existing independent of church arbitration. From that point forward, received authority—in religion and, eventually, in other realms—became subject to the probing and testing of autonomous inquiry.

During this revolutionary era, innovative technology, novel paradigms, and widespread political and social adaptations reinforced one another. Once a book could easily be printed and distributed by a single machine and operator—without the costly and specialized labor of monastic copyists—new ideas could be spread and amplified faster than they could be restricted. Centralized authorities—whether the Catholic Church, the Habsburg-led Holy Roman Empire (the notional successor to Rome's unified rule of the European continent), or national and local governments—were no longer able to stop the proliferation of printing technology or effectively ban disfavored ideas. Because London, Amsterdam, and other leading cities declined to proscribe the spread of printed material, freethinkers who had been harried by their home governments were able to find refuge and access to advanced publishing industries in nearby societies. The vision of doctrinal, philosophical, and political unity gave way to diversity and fragmentation—in many cases attended by the overthrow of established social classes and violent conflict between contending factions. An era defined by extraordinary scientific and intellectual progress was paired with near-constant religious, dynastic, national, and class-driven disputes that led to ongoing disruption and peril in individual lives and livelihoods.

As intellectual and political authority fragmented amid doctrinal ferment, artistic and scientific explorations of remarkable richness were produced, partly by reviving classical texts, modes of learning, and argumentation. During this Renaissance, or rebirth, of classical learning, societies produced art, architecture, and philosophy that simultaneously sought to celebrate human achievement and inspire it further. Humanism, the era's guiding principle, esteemed the individ-

ual's potential to comprehend and improve his or her surroundings through reason. These virtues, humanism posited, were cultivated through the "humanities" (art, writing, rhetoric, history, politics, philosophy), particularly via classical examples. Accordingly, Renaissance men who mastered these fields—Leonardo da Vinci, Michelangelo, Raphael—came to be revered. Widely adopted, humanism cultivated a love for reading and learning—the former facilitating the latter.

The rediscovery of Greek science and philosophy inspired new inquiries into the underlying mechanisms of the natural world and the means by which they could be measured and cataloged. Analogous changes began to occur in the realm of politics and statecraft. Scholars dared to form systems of thought based on organizational principles beyond the restoration of continental Christian unity under the moral aegis of the pope. Italian diplomat and philosopher Niccolò Machiavelli, himself a classicist, argued that state interests were distinct from their relationship to Christian morality, endeavoring to outline rational, if not always attractive, principles by which they could be pursued.[2]

This exploration of historical knowledge and increasing sense of agency over the mechanisms of society also inspired an era of geographic exploration, in which the Western world expanded, encountering new societies, forms of belief, and types of political organization. The most advanced societies and learned minds in Europe were suddenly confronted with a new aspect of reality: societies with different gods, diverging histories, and, in many cases, their own independently developed forms of economic achievement and social complexity. For the Western mind, trained in the conviction of its own centrality, these independently organized societies posed profound philosophical challenges. Separate cultures with distinct foundations and no knowledge of Christian scripture had developed parallel existences, with no apparent knowledge of (or interest in) European civilization, which the West had assumed was self-evidently the pinnacle of human achievement. In some cases—such as the Spanish conquistadores' encounters with the Aztec Empire in Mexico—indigenous religious ceremonies as well as political and social structures appeared comparable to those in Europe.

For the explorers who paused in their conquests long enough to ponder them, this uncanny correspondence produced haunting questions: Were diverging cultures and experiences of reality independently valid? Did Europeans' minds and souls operate on the same principles as those they encountered in the Americas,

China, and other distant lands? Were these newly discovered civilizations in effect waiting for the Europeans to vouchsafe new aspects of reality—divine revelation, scientific progress—in order to awaken to the true nature of things? Or had they always been participating in the same human experience, responding to their own environment and history, and developing their own parallel accommodations with reality—each with relative strengths and achievements?

Although most Western explorers and thinkers of the time concluded that these newly encountered societies had no fundamental knowledge worth adopting, the experiences began to broaden the aperture of the Western mind nonetheless. The horizon expanded for civilizations across the globe, forcing a reckoning with the world's physical and experiential breadth and depth. In some Western societies, this process gave rise to concepts of universal humanity and human rights, notions that were eventually pioneered by some of these same societies during later periods of reflection.

The West amassed a repository of knowledge and experience from all corners of the world.[3] Advances in technology and methodology, including better optical lenses and more accurate instruments of measurement, chemical manipulation, and the development of research and observation standards that came to be known as the scientific method, permitted scientists to more accurately observe the planets and stars, the behavior and composition of material substances, and the minutiae of microscopic life. Scientists were able to make iterative progress based on both personal observations and those of their peers: when a theory or prediction could be validated empirically, new facts were revealed that could serve as the jumping-off point for additional questions. In this way, new discoveries, patterns, and connections came to light, many of which could be applied to practical aspects of daily life: keeping time, navigating the ocean, synthesizing useful compounds.

The sixteenth and seventeenth centuries witnessed such rapid progress—with astounding discoveries in mathematics, astronomy, and the natural sciences—that it led to a sort of philosophical disorientation. Given that church doctrine still officially defined the limits of permissible intellectual explorations during this period, these advances produced breakthroughs of considerable daring. Copernicus's vision of a heliocentric system, Newton's laws of motion, van Leeuwenhoek's cataloging of a living microscopic world—these and other developments led to

the general sentiment that new layers of reality were being unveiled. The outcome was incongruence: societies remained united in their monotheism but were divided by competing interpretations and explorations of reality. They needed a concept—indeed, a philosophy—to guide their quest to understand the world and their role in it.

The philosophers of the Enlightenment answered the call, declaring *reason*—the power to understand, think, and judge—both the method of and purpose for interacting with the environment. "Our soul is made for thinking, that is, for perceiving," the French philosopher and polymath Montesquieu wrote, "but such a being must have curiosity, for just as all things form a chain in which every idea precedes one idea and follows another, so one cannot want to see the one without desiring to see the other."[4] The relationship between humanity's first question (the nature of reality) and second question (its role in reality) became self-reinforcing: if reason begat consciousness, then the more humans reasoned, the more they fulfilled their purpose. Perceiving and elaborating on the world was the most important project in which they were or would ever be engaged. The age of reason was born.

In a sense, the West had returned to many of the fundamental questions with which the ancient Greeks had wrestled: What is reality? What are people seeking to know and experience, and how will they know when they encounter it? Can humans perceive reality itself as opposed to its reflections? If so, how? What does it mean to *be* and to *know*? Unencumbered by tradition—or at least believing they were justified in interpreting it anew—scholars and philosophers once again investigated these questions. The minds that set out on this journey were willing to walk a precarious path, risking the apparent certainties of their cultural traditions and their established conceptions of reality.

In this atmosphere of intellectual challenges, once axiomatic concepts—the existence of physical reality, the eternal nature of moral truths—were suddenly open to question.[5] Bishop Berkeley's 1710 *Treatise Concerning the Principles of Human Knowledge* contended that reality consisted not of material objects but of God and minds whose perception of seemingly substantive reality, he argued, *was* indeed reality. Gottfried Wilhelm Leibniz, the late seventeenth and early eighteenth German philosopher, inventor of early calculating machines, and pioneer of aspects of modern computer theory, indirectly defended a traditional concept of

faith by positing that monads (units not reducible to smaller parts, each performing an intrinsic, divinely appointed role in the universe) formed the underlying essence of things. The seventeenth century Dutch philosopher Baruch Spinoza, navigating the plane of abstract reason with daring and brilliance, sought to apply Euclidian geometric logic to ethical precepts in order to "prove" an ethical system in which a universal God enabled and rewarded human goodness. No scripture or miracles underlay this moral philosophy; Spinoza sought to arrive at the same underlying system of truths through the application of reason alone. At the pinnacle of human knowledge, Spinoza held, was the mind's ability to reason its way toward contemplating the eternal—to know "the idea of the mind itself" and to recognize, through the mind, the infinite and ever-present "God as cause." This knowledge, Spinoza held, was eternal—the ultimate and indeed perfect form of knowledge. He called it "the intellectual love of God."[6]

As a result of these pioneering philosophical explorations, the relationship between reason, faith, and reality grew increasingly uncertain. Into this breach stepped Immanuel Kant, a German philosopher and professor laboring in the East Prussian city of Königsberg.[7] In 1781, Kant published his *Critique of Pure Reason,* a work that has inspired and perplexed readers ever since. A student of traditionalists and a correspondent with pure rationalists, Kant regretfully found himself agreeing with neither, instead seeking to bridge the gap between traditional claims and his era's newfound confidence in the power of the human mind. In his *Critique,* Kant proposed that "reason should take on anew the most difficult of all its tasks, namely, that of self-knowledge."[8] Reason, Kant argued, should be applied to understand its own limitations.

According to Kant's account, human reason had the capacity to know reality deeply, albeit through an inevitably imperfect lens. Human cognition and experience filters, structures, and distorts all that we know, even when we attempt to reason "purely" by logic alone. Objective reality in the strictest sense—what Kant called the thing-in-itself—is ever-present but inherently beyond our direct knowledge. Kant posited a realm of noumena, or "things as they are understood by pure thought," existing independent of experience or filtration through human concepts. However, Kant argued that because the human mind relies on conceptual thinking and lived experience, it could never achieve the degree of pure thought required to know this inner essence of things.[9] At best, we might consider how

our mind reflects such a realm. We may maintain beliefs about what lies beyond and within, but this does not constitute true knowledge of it.[10]

For the following two hundred years, Kant's essential distinction between the thing-in-itself and the unavoidably filtered world we experience hardly seemed to matter. While the human mind might present an imperfect picture of reality, it was the only picture available. What the structures of the human mind barred from view would, presumably, be barred forever—or would inspire faith and consciousness of the infinite. Without any alternative mechanism for accessing reality, it seemed that humanity's blind spots would remain hidden. Whether human perception and reason ought to be the definitive measure of things, lacking an alternative, for a time, they became so. But AI is beginning to provide an alternative means of accessing—and thus understanding—reality.

For generations after Kant, the quest to know the thing-in-itself took two forms: ever more precise observation of reality and ever more extensive cataloging of knowledge. Vast new fields of phenomena seemed knowable, capable of being discovered and cataloged through the application of reason. In turn, it was believed, such comprehensive catalogs could unveil lessons and principles that could be applied to the most pressing scientific, economic, social, and political questions of the day. The most sweeping effort in this regard was the *Encyclopédie,* edited by the French philosophe Denis Diderot. In twenty-eight volumes (seventeen of articles, eleven of illustrations), 75,000 entries, and 18,000 pages, Diderot's *Encyclopédie* collected the diverse findings and observations of great thinkers in numerous disciplines, compiling their discoveries and deductions and linking the resulting facts and principles. Recognizing the fact that its attempt to catalog all reality's phenomena in a unified book was itself a unique phenomenon, the encyclopedia included a self-referential entry on the word *encyclopedia*.

In the political realm, of course, various reasoning minds (serving various state interests) were not as apt to reach the same conclusions. Prussia's Frederick the Great, a prototypical early Enlightenment statesman, corresponded with Voltaire, drilled troops to perfection, and seized the province of Silesia with no warning or justification other than that the acquisition was in Prussia's national interest. His rise occasioned maneuvers that led to the Seven Years' War—in a sense, the first world war because it was fought on three continents. Likewise, the French Revolution, one of the most proudly "rational" political movements of the

age, produced social upheavals and political violence on a scale unseen in Europe for centuries. By separating reason from tradition, the Enlightenment produced a new phenomenon: armed reason, melded to popular passions, was reordering and razing social structures in the name of "scientific" conclusions about history's direction. Innovations made possible by the modern scientific method magnified weapons' destructive power and eventually ushered in the age of total war—conflicts characterized by societal-level mobilization and industrial-level destruction.[11]

The Enlightenment applied reason both to try to define its problems and to try to solve them. To that end, Kant's essay "Perpetual Peace" posited (with some skepticism) that peace might be achievable through the application of agreed-upon rules governing the relationships between independent states. Because such mutually set rules had not yet been established, at least in a form that monarchs could discern or were likely to follow, Kant proposed a "secret article of perpetual peace," suggesting that "states which are armed for war" consult "the maxims of the philosophers."[12] The vision of a reasoned, negotiated, rule-bound international system has beckoned ever since, with philosophers and political scientists contributing but achieving only intermittent success.

Moved by the political and social upheavals of modernity, thinkers grew more willing to question whether human perception, ordered by human reason, was the sole metric for making sense of reality. In the late eighteenth and early nineteenth centuries, Romanticism—which was a reaction to the Enlightenment—esteemed human feeling and imagination as true counterparts to reason; it elevated folk traditions, the experience of nature, and a reimagined medieval epoch as preferable to the mechanistic certainties of the modern age.

In the meantime, reason—in the form of advanced theoretical physics—began to progress further toward Kant's thing-in-itself, with disorienting scientific and philosophical consequences. In the late nineteenth and early twentieth centuries, progress at the frontiers of physics began to reveal unexpected aspects of reality. The classical model of physics, whose foundations dated to the early Enlightenment, had posited a world explicable in terms of space, time, matter, and energy, whose properties were in each case absolute and consistent. As scientists sought a clearer explanation for the properties of light, however, they encountered results that this traditional understanding could not explain. The brilliant and iconoclas-

tic theoretical physicist Albert Einstein solved many of these riddles through his pioneering work on quantum physics and his theories of special and general relativity. Yet in doing so, he revealed a picture of physical reality that appeared newly mysterious. Space and time were united as a single phenomenon in which individual perceptions were apparently not bound by the laws of classical physics.[13]

Developing a quantum mechanics to describe this substratum of physical reality, Werner Heisenberg and Niels Bohr challenged long-standing assumptions about the nature of knowledge. Heisenberg emphasized the impossibility of assessing both the position and momentum of a particle accurately and simultaneously. This "uncertainty principle" (as it came to be known) implied that a completely accurate picture of reality might not be available at any given time. Further, Heisenberg argued that physical reality did not have independent inherent form, but was *created* by the process of observation: "I believe that one can formulate the emergence of the classical 'path' of a particle succinctly… *the 'path' comes into being only because we observe it*."[14]

The question of whether reality had a single true, objective form—and whether human minds could access it—had preoccupied philosophers since Plato. In works such as *Physics and Philosophy: The Revolution in Modern Science* (1958), Heisenberg explored the interplay between the two disciplines and the mysteries that science was now beginning to penetrate. Bohr, in his own pioneering work, stressed that observation affected and ordered reality. In Bohr's telling, the scientific instrument itself—long assumed to be an objective, neutral tool for measuring reality—could never avoid having a physical interaction, however minuscule, with the object of its observation, making it a part of the phenomenon being studied and distorting attempts to describe it. The human mind was forced to choose, among multiple complementary aspects of reality, *which one* it wanted to know accurately at a given moment. A full picture of objective reality, if it were available, could come only by combining impressions of complementary aspects of a phenomenon and accounting for the distortions inherent in each.

These revolutionary ideas penetrated further toward the essence of things than Kant or his followers had thought possible. We are at the beginning of the inquiry into what additional levels of perception or comprehension AI may permit. Its application may allow scientists to fill in gaps in the human observer's ability to measure and perceive phenomena, or in the human (or traditional computer's)

ability to process complementary data sets and identify patterns in them.

The twentieth-century philosophical world, jarred by the disjunctions at the frontiers of science and by the First World War, began to chart new paths that diverged from traditional Enlightenment reason and instead embraced the ambiguity and relativity of perception. The Austrian philosopher Ludwig Wittgenstein, who eschewed the academy for life as a gardener and then a village schoolteacher, set aside the notion of a single essence of things identifiable by reason—the goal that philosophers since Plato had sought. Instead, Wittgenstein counseled that knowledge was to be found in generalizations about similarities across phenomena, which he termed "family resemblances": "And the result of this examination is: we see a complicated network of similarities overlapping and criss-crossing: sometimes overall similarities, sometimes similarities of detail." The quest to define and catalog all things, each with its own sharply delineated boundaries, was mistaken, he held. Instead, one should seek to define "This *and similar things*" and achieve familiarity with the resulting concepts, even if they had "blurred" or "indistinct" edges.[15] Later, in the late twentieth century and the early twenty-first, this thinking informed theories of AI and machine learning. Such theories posited that AI's potential lay partly in its ability to scan large data sets to learn types and patterns—e.g., groupings of words often found together, or features most often present in an image when that image was of a cat—and then to make sense of reality by identifying networks of similarities and likenesses with what the AI already knew. Even if AI would never know something in the way a human mind could, an accumulation of matches with the patterns of reality could approximate and sometimes exceed the performance of human perception and reason.

THE ENLIGHTENMENT world—with its optimism regarding human reason despite its consciousness of the pitfalls of flawed human logic—has long been our world. Scientific revolutions, especially in the twentieth century, have evolved technology and philosophy, but the central Enlightenment premise of a knowable world being unearthed, step-by-step, by human minds has persisted. Until now. Throughout three centuries of discovery and exploration, humans have interpreted the world as Kant predicted they would according to the structure of their own minds.

But as humans began to approach the limits of their cognitive capacity, they became willing to enlist machines—computers—to augment their thinking in order to transcend those limitations. Computers added a separate digital realm to the physical realm in which humans had always lived. As we are growing increasingly dependent on digital augmentation, we are entering a new epoch in which the reasoning human mind is yielding its pride of place as the sole discoverer, knower, and cataloger of the world's phenomena.

While the technological achievements of the age of reason have been significant, until recently they had remained sporadic enough to be reconciled with tradition. Innovations have been characterized as extensions of previous practices: films were moving photographs, telephones were conversations across space, and automobiles were rapidly moving carriages in which horses were replaced by engines measured by their "horsepower." Likewise, in military life, tanks were sophisticated cavalry, airplanes were advanced artillery, battleships were mobile forts, and aircraft carriers were mobile airstrips. Even nuclear weapons maintained the implication of their moniker—*weapons*—when nuclear powers organized their forces as artillery, emphasizing their prior experience and understanding of war.

But we have reached a tipping point: we can no longer conceive of some of our innovations as extensions of that which we already know. By compressing the time frame in which technology alters the experience of life, the revolution of digitization and the advancement of AI have produced phenomena that are truly new, not simply more powerful or efficient versions of things past. As computers have become faster and smaller, they have become embeddable in phones, watches, utilities, appliances, security systems, vehicles, weapons—and even human bodies. Communication across and between such digital systems is now essentially instantaneous. Tasks that were manual a generation ago—reading, research, shopping, discourse, record keeping, surveillance, and military planning and conduct—are now digital, data-driven, and unfolding in the same realm: cyberspace.[16]

All levels of human organization have been affected by this digitization: through their computers and phones, individuals possess (or at least can access) more information than ever before. Corporations, having become collectors and aggregators of users' data, now wield more power and influence than many sovereign states. Governments, wary of ceding cyberspace to rivals, have entered,

explored, and begun to exploit the realm, observing few rules and exercising even fewer restraints. They are quick to designate cyberspace as a domain in which they must innovate in order to prevail over their rivals.

Few have thoroughly understood what exactly has occurred through this digital revolution. Speed is partly to blame, as is inundation. For all its many wondrous achievements, digitization has rendered human thought both less contextual and less conceptual. Digital natives do not feel the need, at least not urgently, to develop concepts that, for most of history, have compensated for the limitations of collective memory. They can (and do) ask search engines whatever they want to know, whether trivial, conceptual, or somewhere in between. Search engines, in turn, use AI to respond to their queries. In the process, humans delegate aspects of their thinking to technology. But information is not self-explanatory; it is context-dependent. To be useful—or at least meaningful—it must be understood through the lenses of culture and history.

When information is contextualized, it becomes knowledge. When knowledge compels convictions, it becomes wisdom. Yet the internet inundates users with the opinions of thousands, even millions, of other users, depriving them of the solitude required for sustained reflection that, historically, has led to the development of convictions. As solitude diminishes, so, too, does fortitude—not only to develop convictions but also to be faithful to them, particularly when they require the traversing of novel, and thus often lonely, roads. Only convictions—in combination with wisdom—enable people to access and explore new horizons.

The digital world has little patience for wisdom; its values are shaped by approbation, not introspection. It inherently challenges the Enlightenment proposition that reason is the most important element of consciousness. Nullifying restrictions that historically have been imposed on human conduct by distance, time, and language, the digital world proffers that connection, in and of itself, is meaningful.

As online information has exploded, we have turned to software programs to help us sort it, refine it, make assessments based on patterns, and to guide us in answering our questions. The introduction of AI—which completes the sentence we are texting, identifies the book or store we are seeking, and "intuits" articles and entertainment we might enjoy based on prior behavior—has often seemed more mundane than revolutionary. But as it is being applied to more elements of

our lives, it is altering the role that our minds have traditionally played in shaping, ordering, and assessing our choices and actions.