
Ten Things You Cannot Afford to Ignore

An inventory of ideas without which no contemporary thought can call itself contemporary.

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Despite the widespread availability of communication media, many people essentially operate with a culture that is not of the twentieth century but of the nineteenth. The following ten landmarks, drawn from mathematics, physics, computer science, logic, and the philosophy of science, are non-negotiable prerequisites for anyone who aspires to formulate original, *contemporary* thought.

Abstract

This article collects ten mathematical, scientific, computational, and philosophical results that form part of the minimum background for contemporary thought. The emphasis is not encyclopedic coverage, but structural orientation: each item marks a limit, framework, or conceptual shift without which modern reasoning becomes distorted.

Introduction

The “merge all together” approach

When synthesised, these ten pillars do not merely coexist; they interlock to form a single, unified epistemology.

Reality is not a clockwork stage but a dynamic, observer-dependent geometry (*Relativity*) whose foundational layer is probabilistic and entangled (*Quantum Mechanics*). The ultimate currency of this reality is *information* (*Shannon*).

When we attempt to decode this information, we are immediately met with hard limits. Our formal descriptions cannot prove every truth (*Gödel*), our algorithms cannot solve every problem (*Turing*), and even systems with perfect deterministic rules defeat long-term prediction (*Chaos*). Furthermore, finding solutions to the problems we *can* compute is often blocked by insurmountable resource walls (*Computational Complexity*).

How, then, do we proceed? By recognising that human knowledge is the search for the most compressed algorithmic description of reality (*Kolmogorov*). Because absolute certainty is structurally denied to us, we must navigate the world using graduated, probabilistic updates based on incoming evidence (*Bayesian Inference*). And we must remain acutely aware that our reigning models are never final truths, but temporary, compressible frameworks destined to be overthrown when anomalies inevitably pile up (*Kuhn*).

To “merge it all together” is to accept a profound and humbling worldview: **we inhabit a universe of irreducible uncertainty and bounded computation, where knowledge is not the accumulation of absolute facts, but the continuous, probabilistic compression of information.**

On the ordering

The sequence is neither chronological nor alphabetical; it follows a *logical dependency chain*, each result presupposes, or sharpens, the ones before it.

Layer 1: the absolute limits of formal reason (items 1–2). Gödel and Turing establish, respectively, that no single formal system can capture all mathematical truth, and that no algorithm can decide all well-posed questions. These are meta-results: they constrain every subsequent framework. They come first because they delimit the *entire playing field*.

Layer 2: the physical world is not what you assumed (items 3–4). Relativity and quantum mechanics dismantle the Newtonian stage on which pre-twentieth-century thought operates. They appear immediately after the logical limits because they show that reality itself, space, time, matter, causality, is stranger than any nineteenth-century formalism could express.

Layer 3: information as a first-class concept (item 5). Shannon’s information theory bridges physics and computation. It depends on the probabilistic worldview opened by quantum mechanics and provides the quantitative language without which items 7–10 cannot be stated precisely.

Layer 4: how knowledge itself changes (item 6). Kuhn’s philosophy of science is placed after the physical revolutions it *explains*. One needs relativity and quantum mechanics as concrete examples before the concept of “paradigm shift” acquires its full force.

Layer 5: reasoning under uncertainty (item 7). Bayesian inference is the operational counterpart of Kuhn’s insight: if paradigms shift, certainty is unavailable, and rational belief must be graduated. This requires Shannon’s notion of information to be quantitatively precise.

Layer 6: the limits of prediction, computation, and description (items 8–10). Chaos theory shows that determinism does not imply predictability. Complexity theory shows that computability does not imply tractability. Kolmogorov complexity shows that describability itself has an irreducible, uncomputable core. These three results close the architecture by revisiting, at a finer grain, the limits opened by Gödel and Turing, completing the arc.

1 Gödel's Incompleteness Theorems

LOGIC / MATHEMATICS

In 1931 Kurt Gödel proved that any consistent formal system powerful enough to express elementary arithmetic contains true statements that *cannot* be proved within the system, and that such a system cannot prove its own consistency. These results shattered the Hilbert programme and placed permanent, structural limits on what formal reasoning can achieve. Anyone who speaks of “proof,” “certainty,” or “foundations” without awareness of incompleteness is reasoning inside a nineteenth-century frame that was *already refuted* a century ago.

2 Turing Computability

COMPUTER SCIENCE / MATHEMATICS

Alan Turing's 1936 paper introduced the abstract machine that bears his name and proved the existence of well-posed problems that *no algorithm can solve*, most famously, whether an arbitrary programme will halt. Computability theory defines the outer boundary of what machines (and formalised procedures in general) can ever accomplish. It is the operational twin of Gödel's result: not all truths are reachable by systematic computation. Without this, one cannot reason honestly about algorithms, artificial intelligence, or automation.

3 Special and General Relativity

PHYSICS / GEOMETRY

Einstein's theories (1905, 1915) replaced Newtonian absolute space and time with a unified spacetime whose geometry is shaped by mass-energy. Time is not universal; simultaneity is observer-dependent; gravity is curvature. These are not exotic curiosities, they underpin GPS, cosmology, and every modern understanding of causality. A worldview that tacitly assumes a Newtonian stage is not merely imprecise: it is *wrong* about the very arena in which events occur.

4 Quantum Mechanics

PHYSICS / EPISTEMOLOGY

The quantum revolution (Planck, Bohr, Heisenberg, Schrödinger, Dirac, 1900–1930) revealed that nature at its most fundamental level is probabilistic, that measurement participates in determining outcomes, and that the classical notion of a particle with definite trajectory is an approximation. Entanglement, superposition, and the uncertainty principle are not philosophical thought-experiments: they are the basis of every semiconductor, laser, and, imminently, quantum computer. Ignoring them means misunderstanding the material substrate of modern technology.

5 Shannon's Information Theory

MATHEMATICS / ENGINEERING

Claude Shannon's 1948 paper gave the first rigorous, quantitative definition of *information*, independent of meaning, and established fundamental theorems on channel capacity, compression, and error correction. Information theory is the invisible grammar of the digital age: it governs how data is stored, transmitted, encrypted, and compressed. Without Shannon, one cannot understand why a signal is distinct from noise, or why perfect communication over an imperfect channel is possible at all.

6 Kuhn's *Structure of Scientific Revolutions*

PHILOSOPHY OF SCIENCE

Thomas Kuhn (1962) argued that science does not progress by linear accumulation but through paradigm shifts: long periods of "normal science" punctuated by crises and revolutionary replacements of the reigning framework. The concepts of *paradigm*, *incommensurability*, and *anomaly* transformed how we understand scientific change and, by extension, how we evaluate claims of knowledge. Anyone who treats "science" as a monolithic, ever-advancing edifice has not reckoned with Kuhn.

7 Bayesian reasoning and statistical inference

STATISTICS / EPISTEMOLOGY

Bayes' theorem (18th century in origin, 20th century in maturation) provides a coherent framework for updating beliefs in the light of evidence. Modern science, medicine, machine learning, and decision theory are *structurally* Bayesian: they deal in degrees of belief, prior distributions, and likelihood ratios rather than black-and-white "proof." A person who reasons only in terms of "true or false" is using a logic inadequate for a world of partial information and uncertain evidence.

8 Chaos and sensitivity to initial conditions

MATHEMATICS / PHYSICS

Poincaré glimpsed it; Lorenz made it vivid in 1963. Deterministic systems can be *practically* unpredictable because tiny differences in initial conditions grow exponentially over time. This is not randomness: the equations are exact but it means that long-range prediction is structurally impossible for a wide class of systems (weather, turbulence, many biological processes). The nineteenth-century dream of Laplacian determinism "give me the initial conditions and I will predict the future" fails not for lack of data, but for mathematical reasons.

9 Computational Complexity (P vs NP)

COMPUTER SCIENCE / MATHEMATICS

Even among computable problems, not all are *tractable*. The theory of complexity classes (P, NP, PSPACE, and beyond) classifies problems by the resources required to solve them as input size grows. The still-open question of whether $P = NP$ is among the deepest in mathematics, and its practical consequences are immediate: if $P \neq NP$ (as widely believed), an enormous class of optimisation, scheduling, and verification problems have *no* efficient general solution. Ignoring this means misunderstanding what software can and cannot do, and why cryptography works.

10 Kolmogorov Complexity

MATHEMATICS / COMPUTER SCIENCE

Kolmogorov complexity measures the intrinsic information content of an object as the length of the shortest programme that produces it. It unifies concepts of randomness, compressibility, and structure in a single, mathematically rigorous framework, and it is *uncomputable*, which links it directly back to Gödel and Turing. A string is “random” if and only if it cannot be compressed; a scientific law is “good” if it compresses the data it explains. Without this lens, discussions of simplicity, Occam’s razor, and pattern recognition remain purely intuitive and pre-formal.

Conclusion

These ten results are not optional cultural enrichment. They are the load-bearing walls of contemporary thought. A mind that has not absorbed them can still be erudite in a nineteenth-century sense, but it cannot produce ideas that are genuinely of this century.