

What Is Scientific Reality?

Mohammad Shahadat Hossain
Chittagong University, Bangladesh

Abstract:

This study aims to critically re-examine the concept of scientific reality in the context of rapid advancements in Artificial Intelligence (AI), Big Data, and Financial Technology (FINTECH). While these innovations have significantly improved efficiency, connectivity, and decision-making, they have simultaneously intensified structural inequality, surveillance practices, and ecological degradation. The paper argues that such contradictions originate from a foundational epistemological rupture in modern science—namely, the separation of moral consciousness from material and technological processes. To address this gap, the study advances the Law of Unity of Knowledge, a holistic framework that integrates ethical intentionality (being) with empirical transformation (becoming) through circular causation. Drawing on interdisciplinary insights from Einstein, Hawking, Whitehead, and Imam Al-Ghazali, the paper reconceptualizes scientific reality as relational, ethically grounded, and dynamic rather than value-neutral. The framework culminates in a Wellbeing Function that links sustainability, technological progress, and moral responsibility through moral, material complementarity. Practical implications are illustrated through ethical AI governance in healthcare and Qur’ānic principles of trusteeship (khilāfah) in sustainable agriculture.

Keywords: Epistemology of Science; Artificial Intelligence; FINTECH; Big Data

Introduction

Scientific reality has become one of the most contested concepts in the post-modern world-system. The acceleration of scientific and technological innovation has pushed humanity beyond traditional epistemic boundaries, transforming social organization, economic systems, and human–nature relations at an unprecedented scale. Science no longer merely explains reality; it actively constructs it. Consequently, understanding what constitutes “scientific reality” is no longer a philosophical luxury but a civilizational necessity, particularly as scientific knowledge increasingly governs production, governance, and social control.

At its normative ideal, science is expected to advance human wellbeing, foster cooperation, and enhance collective intelligence. However, contemporary scientific practice often operates within market-driven and technocratic paradigms that privilege efficiency, profit, and control over ethical reflection.

This tension is especially visible in the deployment of Big Data analytics, FINTECH infrastructures, and algorithmic governance systems, which simultaneously promise financial inclusion and operational transparency while deepening inequality, exclusion, and asymmetrical power relations. Such contradictions signal not a failure of technology per se, but a deeper epistemological crisis within modern science.

The culmination of this crisis is evident in the rapid development of Artificial Intelligence, particularly in its neurocybernetic and autonomous decision-making architectures. AI represents the most advanced attempt to replicate, and potentially surpass, human cognitive functions. While AI-driven systems have delivered remarkable gains in healthcare, finance, and logistics, they have also introduced new ethical risks, including surveillance capitalism, algorithmic bias, and the erosion of human agency. These outcomes reflect a scientific worldview that treats intelligence, data, and value as morally neutral commodities rather than ethically embedded realities.

This paper argues that the root of these challenges lies in the fragmentation of knowledge, specifically, the separation of moral consciousness from material processes within modern scientific epistemology. In response, the study proposes the Law of Unity of Knowledge as an alternative framework for redefining scientific reality. By integrating ethical intentionality (being) with empirical transformation (becoming) through circular causation, the paper repositions science as a morally purposive and relational enterprise. In doing so, it seeks to reclaim scientific reality as a holistic, ethical, and transformative force capable of addressing contemporary socio-economic and ecological crises.

Contemporary Manifestations of Scientific Contradictions

Artificial Intelligence and Neurocybernetics

The emergence of sophisticated AI systems like DeepMind's AlphaFold, which has addressed the longstanding protein-folding conundrum, exemplifies the transformative potential of scientific inquiry in the realm of medicine. Nonetheless, the identical machine-learning frameworks can be adapted for applications in autonomous weaponry, cyber-espionage, and extensive surveillance. Language models such as OpenAI's GPT have revolutionized the realms of education and business communication; however,

they simultaneously pose a risk of displacing millions of jobs, prompting profound ethical considerations regarding technological accountability (Choudhury, M.A. & Hossain, M.S.).

FINTECH and Capitalist Acceleration

Digital finance platforms such as PayPal, Stripe, and China's Ant Group have significantly enhanced the speed and accessibility of transactions. Nonetheless, high-frequency trading algorithms, operating within extensive data centers, utilize substantial quantities of electricity and can occasionally lead to destabilization within financial markets. These systems are inherently structured to prioritize material gain, neglecting to incorporate ethical safeguards that would protect vulnerable investors.

BIG DATA and Surveillance Capitalism

The magnitude of global data collection is truly remarkable: Google handles more than 3.5 billion searches daily, while Facebook/Meta accumulates behavioral data from upwards of 3 billion active users each month. Data analytics serves as a catalyst for personalized services and scientific inquiry, yet it simultaneously opens the door to potential manipulation. The Cambridge Analytica scandal revealed the potential for personal information to be manipulated in order to sway electoral outcomes. Furthermore, the systems established for the storage and transmission of this data currently account for 2–3% of global CO₂ emissions, surpassing the total emissions produced by the entire airline sector.

The 4IR Spirit of Competition

The Fourth Industrial Revolution (4IR) involves the amalgamation of artificial intelligence, robotics, biotechnology, and the Internet of Things, alongside the incorporation of blockchain into global production systems. While automation undoubtedly improves efficiency, the social costs that accompany it are often overlooked. The integration of robotics within Amazon's warehouses has indeed augmented productivity; nonetheless, it has simultaneously compromised working conditions and resulted in an increase in injury rates. The current geopolitical rivalry in artificial intelligence between the United States and China diverts considerable resources from ecological restoration to military-industrial pursuits.

Ecological Disparagement and Human Obliviousness

The rapid advancement of technology in human society has paralleled a concerning disregard for ecological well-being. Deforestation: In 2024, the Amazon rainforest experienced a loss exceeding 5,000 km², predominantly due to the production of beef and soybeans for export, thereby undermining the planet's vital carbon sink. Ocean Pollution: The "Great Pacific Garbage Patch" currently encompasses an expanse that is twice the size of Texas, primarily attributed to the proliferation of single-use plastics. The climate crisis has reached a critical juncture: 2024 has been documented as the hottest year on record, characterized by concurrent wildfires, floods, and droughts spanning multiple continents—phenomena that disproportionately affect marginalized communities.

These advancements demonstrate that modern science and technology lack an inherent worth in contributing to societal improvement. Without a fundamental incorporation of moral and ethical considerations in scientific pursuits, the progression of knowledge could unintentionally become a driving force for inequality, exploitation, and environmental disruption. This reality calls for a deep investigation into the foundational principles of science — an endeavor to grasp the nature of scientific truth and its capacity to improve the overall welfare of humanity and the planet.

Scientific Objectivity and the Unity of Knowledge

The intellectual objectivity of science towards its essential aim of contributing to the wellbeing of the world-system commences from its epistemological root premised on cause and effect of universal interrelations. In this context wrote the great minds: Albert Einstein to his friend Neils Bohr: Science without epistemology is muddle-headed (Bohr, 1985).

Stephen Hawking (1980) wrote on the objectivity of science as intellectual pursuit in the following words: "The eventual goal of science is to provide a single theory that describes the whole universe. However, the approach most scientists actually follow is to separate the problem into two parts. First, there are the laws that will tell us how the universe changes with time..... Second, there is the question of the initial state of the universe. Some people feel that science should be concerned with only the first part; they regard the question of the initial situation as a matter for metaphysics or religion. They would say that God, being omnipotent, could have

started the universe off any way he wanted. That may be so, but in that case he also could have made it develop in a completely arbitrary way. Yet it appears that he chose to make it evolve in a very regular way according to certain laws. It therefore seems equally reasonable to suppose that there are also laws governing the initial state."

Alfred North Whitehead wrote about the objectivity of science as the weaving of events of the universe in the framework of unity of relational causes and effects. Imam Ghazali wrote (Marmura,) regarding the high alter of intellection with the following intensive reality of embedded truth in scientific thought: Allah will reign His Judgment on three kinds of people in the Hereafter. Firstly, there will be the philosophes who had speculated on God and the World without being able to invoke God in earthly experience. These are believers who firstly will be cast in of Hell. From Hell they will be rescued later, because they had the tiny grain of divine belief of God's Oneness in them. Secondly, there will be people of ordinary walks of life, who believed in God's Oneness without question. These will inherit heaven. Lastly, there will be those who invoked God in earth to understand His Oneness and apply them in earthly existence. These will be the learned epistemologists who will inherit the pinnacle of heavenly bliss. The hadith goes: The blood of the scholar is sweeter than that of the martyr.

Our objectivity in this paper is to study scientific reality in the framework of the episteme of unity of knowledge as the law that encompasses relational consequences of being and becoming in 'everything'. The epistemological scientists referred to this great intellection as the theory of everything. Yet the meaning of 'everything' in this western episteme of science treats the quiddity of morality and ethics as an independent cause and effect in the explanation of the dynamics of materiality. Contrary to this exogenous nature of morality, ethics, and materiality interrelations is the permanence and pervasive continuum of inter-causal interaction, integration, and evolutionary sustainability by relations between 'everything'. This is the meaning of ethical endogeneity in the moral-material inter-causal relations.

Scientific Method: Theory and World-System

Scientific Reality in reference to the relational cause and effect between 'everything' is thereby explained in the light of

relational cause and effect circular relations between moral-material endogeneity that remains embedded. The result consequently has a methodological way of its explanation with a totality of epistemic foundation, identification of the problem under study, establishment of the objectivity of wellbeing by logical formalism. This sequence of logical formalism uses research methodology, and analytical substantiation. Following thereby, inferences are drawn to establish sustainability of the law of unity of knowledge underlying the details of the conceptual-empirical problem under study.

Whereas the schema of studying any socio-scientific problem either in respect of ethical exogeneity of moral-material relations or of ethical endogeneity in the inter-causal relations of being and becoming of 'everything', remains. The phenomenological outlooks of exogenous and endogenous logical formalisms are identical. Nonetheless, their epistemic and ontological foundations are substantially different. Consequently, moral-material substantiation of issues and problems, and the embedded world-systems are vastly opposite to each other. The similarity of procedural mechanism; yet the substantive oppositeness in the meanings of the exogenous and endogenous treatment of ethics and materiality by the underlying laws governing them respectively, result in disparate models of the world-system.

The two aspects of dysfunctional foundations of the law of unity of knowledge that activates socio-scientific circular causation relations as the substantiation of scientific reality are shown in Figure 1 (Choudhury, 2023). These map the entire historical development of scientific doctrine by their failure in realizing endogenous unification of truth, consciousness, and reality, while dispelling falsehood and irrelevance. Scientific theory has thus been rendered to fictive containment. For instance, science as fictive cosmological study gave a fictive beginning to cosmological science. Sagan was a popular public advocate of skeptical scientific inquiry and the scientific method; he pioneered the field of exobiology and promoted the search for extraterrestrial intelligence (SETI) (Sagan, Wikipedia, 2025).

There is also Einstein's belief in what he wrote: Scientific thought is a development of pre-scientific thought (Einstein, 1960). As the concept of space was already fundamental in the latter, we must begin with the concept of space in pre-scientific thought. There are two ways of regarding concepts, both of which are necessary to

understanding. The first is that of logical analysis. It answers the question, How do concepts and judgments depend on each other? In answering it we are on comparatively safe ground. It is the security by which we are so much impressed in mathematics. But this security is purchased at the price of emptiness of content. Concepts can only acquire content when they are connected, however indirectly, with sensible experience. But no logical investigation can reveal this connection; it can only be experienced. And yet it is this connection that determines the cognitive value of systems of concepts.

Carnap (1966) characterised the problem of science in his following words: The consequential problems arising from these multiple views of the universe and the questioning of the axiomatic foundations of physics, lead to two deep problems of occidental epistemology. These problems are firstly, the question of appropriateness of the axiomatic premise, which involves the Kantian-type problematique with the a priori nature of universal constants. Secondly, the problem of unification theory in physics, remains still distant away because of its un-unified understanding of the ontological and ontic inter-causal relationship.



The problem of epistemological indeterminacy pointed out in Figure1 is further established by modern scientific incapability to address moral values as endogenous moral-material integration. This axiomatic absence in science can be explained firstly, by a theory expounded by Einstein on the construction of scientific theory in

relation to the world-system. We denote the choice of this universal scientific theory as the one that comprehends (i) rejection of T1; (ii) rejection T2 and like-wise; and establishing the proof and certainty of itself and its labyrinth of multiverses, $T3(T3', T3'', \dots)$, referred to as the totality of 'everything' shown in bracketed T3. Figure 2 explains this construction of socio-scientific theory $T3(T3', T3'', \dots)$, as rejection of T1 and T2 being semblances of falsehood and indeterminateness ($\leftarrow$; $\rightarrow$; $\leftrightarrow$). The corresponding world-systems are represented by, $W1(W1', W1'', \dots)$, and $W2(W2', W2'', \dots)$. The double directional arrows signify relational circular causation between the T3-metaverses. ($\quad$) denotes the absence of circular causation interrelations, as this absence between morality/ethics and materiality. Contrarily, (T3, W3) are able to explain this absence of complementarity in the case when (T, W) are uni-directional signifies the absence of circular causation, and thereby, of the underlying law of unity of knowledge.

The universality and unique cases of (T3, W3)-metaverses are signified by the interactive-integrative closure and evolutionary learning expansion. This case is fully characteristic of the holism of (T3, W3). We show this case below.

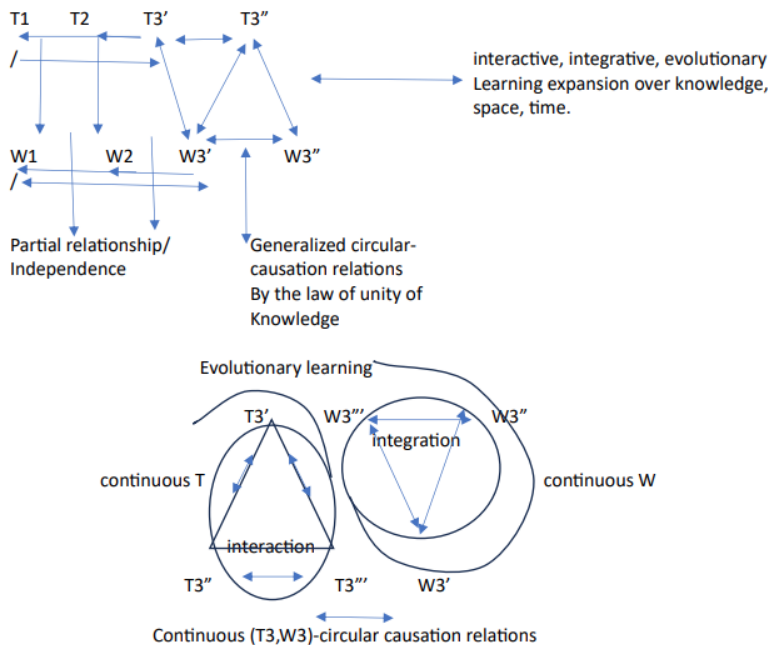


Figure 2: The unique and universal nature of (T3, W3) in explaining moral-material complementarity while rejecting the dissociative materialism of modern science.

Scientific Reality

A question that was asked by Stephen Hawking (is this: “Are we nearing the FINAL frontier of physics? Is there an ultimate equation that unites all forces of nature? Or have we hit an intellectual dead end?”)(Hawking, 1980). The quest for scientific reality, that is the end of science in its quest for the ultimate theory of ‘everything’ arises from the methodological characterization of Figures 1 and 2. The resulting equation of the universe would then be the most elegant equation of scientific reality. Such an equation amongst many was offered by Paul Dirac; and by Leibniz in his words that, if a geometrical point can explain the entire universe, then this point is more profound than the universe.

We now claim and prove that, the most lucid and inclusive of ‘everything’ that explains the universe in its vastest meaning of unity of knowledge, derived from Figures 1 and 2 is the following one:

1. Primal Ontological Universe in the Law of Unity of Knowledge (Ω)
2. epistemic medium of explanation/identification of the Law of Unity of Knowledge (universal pairing (universal symbiosis) S
3. Primordial origin of moral consciousness (moral functioning) $\varepsilon \leftarrow (\Omega, S)$
4. Studying the Law of Unity of Knowledge endowing emergence of worldly knowledge in this respect of specified issues and problems of world-system θ
5. Evaluation of the knowledge-induced objective function in the light of the Law of Unity of Knowledge: Wellbeing Function $\{ W(\theta) = F(X(\theta), t(\theta)) [\theta \in (\Omega, S, \varepsilon)]$ subject to non-linear circular causation relations between multivariates of vector, $\{ X(\theta), t(\theta), \theta \} [\theta \in (\Omega, S, \varepsilon)]$,
6. Conscious Continuity: $d\theta > 0$, repeat of chain; $d^2W(\theta)/dt(\theta)$ Sustainability from subject to point (5) in evaluation scale. The beginning to end (Origin and Hereafter)

The above-mentioned chain is equivalent to:

$(\Omega, s) \rightarrow_{f_1} \{\varepsilon\} \rightarrow_{f_2} \{\theta(\varepsilon) \in (\Omega, S)\} \rightarrow_{f_3} \{\theta\}$
 $\rightarrow_{f_4}$ Selection of specific issues and problem variables $\{(X(\theta), t(\theta)) [\theta \in (\Omega, S, \varepsilon)]\}$

$\rightarrow_{f_5}$ Evaluat $W(\theta) = F(X(\theta), t(\theta)) [\theta \in (\Omega, S, \varepsilon)]$
subject to circular causation between $\{X(\theta), t(\theta), \theta\} [\theta \in (\Omega, S, \varepsilon)]$

$\rightarrow_{f_6}$ 6 completion of the $\rightarrow_{f_6}$ Repeat chain (1-5);

$\rightarrow_{t_7} d^2W(\theta)/dt(\theta)d\theta > 0$ until optimal time -event of Hereafter

The list of f 's denotes inter-systemic relations of complementarity according to the Law of Unity of Knowledge

Is this most elegant abbreviation of the above-mentioned chain of relations governed by the Law of Unity of Knowledge :

$$(\Omega, S) \leftrightarrow \theta\text{-induced world-system} \leftrightarrow (\Omega, S) \quad (1)$$

In circular simulacra from the beginning to the end (Hereafter)

Scientific reality comprises the theory, methodology, and application of the Law of Unity of Knowledge based on its unique and universal derivation from the ontological foundation of the law. Such an ontological foundation is explained by the pervasive complementarity between moral and material quiddities of 'everything' under study. The profound reality of this law is that of monotheism in the context of 'being' and 'becoming' governed by the divine Law of Unity of Knowledge. Modern science has failed to provide the concept, theory, methodology, and applied formalism towards explaining the endogenous complementarity in respect of inseparable pairing between the essentials of morality/ethics and materiality.

Conclusion

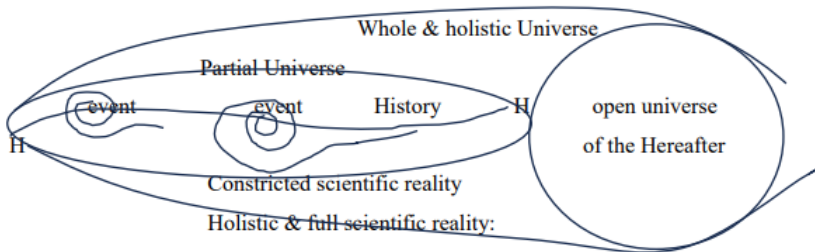
Within the framework of the postmodern world-system, where the advancements of late-capitalist techno-science have transcended significant boundaries of discovery, the Law of Unity of Knowledge presents a corrective epistemological approach by asserting that "being" (moral-ethical ontology) and "becoming" (material-empirical reality) are inherently interconnected. Separated from this cohesion, contemporary science frequently becomes a tool of the capitalist Fourth Industrial Revolution ethos—evident in AI, Big Data, and FINTECH—propelling competitive accumulation, the concentration of institutional power, and global upheaval. Sustainable agriculture presents a compelling alternative: when rooted in the ethical principles of trusteeship

and the prohibition of waste as outlined in the Qur'ān, practices such as crop rotation, organic fertilization, and water stewardship transcend mere environmental policies. They embody a profound ethical framework, fostering resilient ecosystems and ensuring food security. In the realm of neurocybernetic AI healthcare, the principle of *ḥifz al-nafs*, which emphasizes the preservation of life, necessitates a commitment to algorithmic fairness, transparency, and inclusivity, countering the corporate bias that emerges when profit takes precedence over patient welfare. In this context, morality serves not merely as a retrospective justification but as an essential foundational principle inherent to the scientific method and its application. This approach, by reintegrating ethics with materiality, challenges the commodification of knowledge, redirects technology towards a collective stewardship of the planet, and addresses the ecological and social estrangement characteristic of the anthropocene within the framework of postmodern capitalism.

Three outstanding properties designate the Scientific Reality. Any discontinuity in these properties deters scientific reality to gain credence with respect to any and every objective investigation. These properties are (1) the precedence of ontological, epistemological, and ontic coexistence to define the scientific reality in its representation in (2) explanation of its problem area by means of logical formalism endowed by analytical algorithmic language either in terms of the philosophical application of mathematics or argumentative investigation. (3) The continuous coexistences of (1) and (2) are subsequently applied to sustain the phenomenological inferences in application and conclusion. The continuous order of the three properties in unbroken chain comprises the substantive meaning of sustainability. The three properties now apply to every specific issue within a generalized problem-solving approach of science. The most outstanding nature of this problem that could not be integrated in the prevalent theory and application of science is the substantively endogenous interaction, integration, and evolutionary learning continuity of the scientific reality. Contrarily, this paper has argued in favor of reinstating such a holistic revolutionary theory of science in respect of the elegant equation given and explained in details by equation (1).

Equation (1) comprehending its complete and holistic universe (JOCRIFE,) overwhelms Paul Dirac Equation of Quantum Physics (Wikipedia) in respect of the phenomenological study of

consciousness. Likewise, Roger Penrose Quantum Physics Equation of consciousness is not tenable in the complete scientific reality mapped by equation (1). These Quantum limitations of the study of Consciousness, constricts the meaning of scientific reality to the partial universe. Contrarily, Equation (1) comprehends the fullest universe of 'everything' between the precepts of the earthly universe and the Hereafter, as total scientific reality.



$$(\Omega, S) \leftrightarrow \theta\text{-induced world-system} \leftrightarrow (\Omega, S) \quad (2)$$

In circular simulacra from the beginning to the end (Hereafter)

The inability of the study of Consciousness by Quantum Physics can be explained. The primal ontological origin of Equation (1) is premised in the Universal and Unique Law of Unity of Knowledge. Knowledge in this sense is generative of Consciousness in its two concerted forms. Firstly, Knowledge induced by Consciousness in the Ontological Law of Unity of Knowledge is of abstract quiddity. Simultaneously, Knowledge of the Consciously driven Law of Unity of Knowledge is materially explained by the methodology of pervasive complementarity between relationally interactive, integrative, and evolutionary learning of entities, as concretely measured. See Equation (2) below. Nothing remains abstract, unknown, and materially incomprehensible. Even God Almighty is observable by His attributes in the Hereafter (Nadira in the Qur'an 75:22-23). Thus, the completeness of scientific reality is possible in the full universe of the Hereafter. This quiddity is impossible in the limited universe of prevalent scientific reality.

References

- Arner, D.W. Barberis, J. and Buckley, R.P. (2016). "The Evolution of Fintech: A New Post-Crisis Paradigm?" *Georgetown Journal of International Law*, vol. 47, pp. 1271–1319.
- Bender, E.M., Gebru, T. McMillan-Major, A. and Shmitchell, S. (n.d.) "On the Dangers of Stochastic Parrots: Can Language Models Be Too Big?" in *Proc. ACM Conf. Fairness, Accountability, and Transparency*.
- Bohr, N. (1985), "Discussions with Einstein on epistemological issues", in H. Folse, *The Philosophy of Niels Bohr: The Framework of Complementarity*, North Holland Physics Publishing, Amsterdam, the Netherlands.
- Carnap, R. (1966). "Kant's synthetic a priori", in his *Philosophical Foundations of Physics*, Ed. M. Gardner, Basic Books, Inc. New York, NY.
- Choudhury, M.A. & Hossain, M.S. (2010). «Neuro-Cybernetics of Socio-Scientific Systems», *Mind and Society*, Springer-Nature, 9:2.
- Choudhury, M.A. (2023). "Circular Causation". *World Journal of Social Science Studies*, 10:3
- Einstein, A. (1960). *Relativity, The Special and the General Theory*. Methuen, London, Eng.
- Ghazzali A.H. [Imam] trans. Marmura, M.E. (1997). *The Incoherence of the Philosophers*, Brigham Young University Press, Provo, Utah. Also see, Ghazali A.H. [Imam] trans. Buchman (1998). *The Niche of Lights*, Brigham Young University, Provo, Utah.
- Gomber, P. J.-A. Koch, J. -A and Siering, M. (2017). "Digital Finance and FinTech: Current Research and Future Research Directions," *Journal of Business Economics*, vol. 87, no. 5, pp. 537–580, doi: 10.1007/s11573-017-0852-x.
- Hawking, S.W. (1980). "Is the End in Sight for Theoretical Physics?" Cambridge University Press, Cambridge, Eng.
- Hawking, S.W. (1988). *A Brief History of Time, From the Big Bang to*

- Black Holes*, Bantam Works, Inc. New York, NY.
- JOCRISE (Journal of Critical Realism in Socio-Economics, 2:4 July 2024). Beyond, 2:4,
- Penrose, R. (1989). *The Emperor's New Mind*, Oxford University Press, UK.
- Manyika, J. Chui, M. Brown, B. et al., (May 2011). "Big data: The next frontier for innovation, competition, and productivity," *McKinsey Global Institute Report*.
- Mayer-Schönberger, V. and Cukier, K. (2013). *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. Boston, MA: Houghton Mifflin Harcourt.
- Philippon, T. (2016). "The FinTech Opportunity," *NBER Working Paper No. 22476*, doi: 10.3386/w22476.
- Sagan, C. (2025). [Carl Sagan - Wikipedia](#)
- Silver, D. Schrittwieser, J. Simonyan, K. et al. (2017). "Mastering the game of Go without human knowledge," *Nature*, vol. 550, no. 7676, pp. 354–359, doi: 10.1038/nature24270.
- Wikipedia. "Dirac Equation", https://en.wikipedia.org/wiki/Dirac_equation
- Zuboff, S. (2019). *The Age of Surveillance Capitalism: The Fight for a Human Future at the New Frontier of Power*. New York: PublicAffairs.