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Science Proclaims Materialism Is Dead by Adil Kabbaj

A Revolutionary Synthesis of Physics, Philosophy, and Information Theory

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Overview and Background

Adil Kabbaj's monumental work *Science Proclaims Materialism Is Dead: From Substantialism to Non-Substantialism* (Iff Books, 2026) represents an extraordinarily ambitious, philosophically daring, and interdisciplinary deep exploration that seeks to demonstrate, through a comprehensive examination of contemporary physics, that materialism—the dominant worldview of the modern era—has been scientifically and philosophically invalidated. Drawing on decades of research in quantum mechanics, quantum field theory, quantum gravity, and information theory, the author argues persuasively that the universe is not composed of matter or any other substance, but rather of activity, energy, action-information, and ultimately, relational agents (fail/agent).

The book constitutes a genuinely significant contribution to the growing literature challenging materialist metaphysics from within the framework of rigorous scientific analysis. What fundamentally distinguishes Kabbaj's work from others in this field is its systematic integration of multiple interpretative traditions in quantum physics—from Bohr and Heisenberg through Bohm, Wheeler, Rovelli, and far beyond—synthesizing them into a coherent, substantiality-transcending (non-substantialist) worldview. In this respect, the work

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not only summarizes existing interpretations but goes beyond them to present an original metaphysical framework.

Structure and Methodology: A Comprehensive Analysis

The book is structured around eight substantive chapters, framed by an introduction and conclusion, each building systematically upon the previous one. This architectural choice reflects Kabbaj's deeply pedagogical approach: the argument progresses methodically from foundational epistemological considerations toward increasingly complex metaphysical conclusions. The summaries at the end of each chapter and the internal subheadings throughout make it considerably easier for readers to follow the intricate chain of argumentation.

Chapter 1: The Perception/Reality Relationship and the Transition to Non-Substantialism

This foundational chapter establishes the epistemological groundwork for the entire book's argument. Kabbaj draws extensively on the philosophy of perception, perceptual psychology, and neuroscience to demonstrate that what human beings perceive as material substance is actually a mental construction relative to our perceptual scale. Emphasizing that perception depends fundamentally on the distance between observer and observed, the author provides vivid examples contrasting the perception of an apple with the naked eye, under a microscope, and at the molecular level.

At each level of perception, we encounter a completely different description of "reality": at the macroscopic level, a solid, unitary material object; at the cellular level, a dynamic system composed of millions of cells; at the molecular level, a complex interaction of billions of molecules. This situation demonstrates with compelling clarity the dependence of perceptual description on the observer and his or her scale of perception.

According to Kabbaj's penetrating analysis, the fundamental error into which the vast majority of humanity falls is the acceptance of their own macroscopic perceptual scale as an absolute and universal reference frame, thereby identifying the appearance of the world with its reality. However, the categories of substance and material object describe the way the world appears to human beings; they do not describe the world itself. Through this phenomenological analysis, Kabbaj aims to demonstrate that substantialist worldviews, and especially materialism, rest fundamentally on a perceptual illusion. This chapter lays the essential groundwork for the radical ontological conclusions that will be powerfully reinforced by the findings of contemporary physics in subsequent chapters.

Chapter 2: Contemporary Physics

This chapter provides a concise yet remarkably thorough and accessible introduction to the entire landscape of contemporary physics. Kabbaj demonstrates an impressive command of highly technical material while maintaining remarkable accessibility for the general reader. The chapter covers, in systematic fashion: relativistic physics (special and general relativity), quantum mechanics (quantization, wave-particle duality, the uncertainty principle, superposition, the measurement problem, entanglement, non-locality, and contextuality), quantum field theory and the Standard Model, the quantum vacuum, quantum gravity, and quantum information and computing.

Particularly noteworthy is Kabbaj's treatment of the quantum vacuum, which he presents not as empty space but as the fundamental arena of physical processes—a seething cauldron of virtual particles constantly appearing, interacting, and disappearing. He draws on the work of numerous physicists to demonstrate that the quantum vacuum is now understood as the origin of everything we know, including space and time themselves. The chapter also introduces the second quantum revolution, based on entanglement and quantum information processing, which plays a central role in the book's overall argument.

Chapters 3 through 6: Interpretations of Quantum Mechanics and the Information-Processing Paradigm

These four chapters constitute the absolute heart of the book's argument, presenting and analyzing various interpretations of quantum mechanics before systematically developing the information-processing interpretation that Kabbaj ultimately favors.

Chapter 3 surveys the entire landscape of interpretations with remarkable fairness and scholarly depth. Kabbaj begins by distinguishing between realist, anti-realist, agnostic, and instrumentalist attitudes toward quantum theory. He then examines in considerable detail: the Copenhagen interpretation (Bohr, Heisenberg, Born), the pilot-wave interpretation (de Broglie, Bohm), spontaneous collapse models (GRW theory, Penrose), the many-worlds interpretation (Everett, DeWitt), quantum Bayesianism (QBism), structural relational interpretations (Rovelli, Smolin, Ladyman and Ross), possibility-potentiality based interpretations (Heisenberg, Shimony, Kastner, Epperson), and event-process based interpretations (Whitehead and his followers).

Throughout this comprehensive survey, Kabbaj maintains a balanced and scholarly tone, presenting each interpretation sympathetically before offering thoughtful critiques. He is particularly critical of the many-worlds interpretation, following Smolin in characterizing it as

"magic realism" that extravagantly multiplies worlds rather than recognizing the ontological reality of possibility as such. He also notes that the Copenhagen interpretation, despite its pragmatic value, refuses to engage with quantum ontology and tends to generate paradoxes by treating possibilities as actualities.

Chapter 4 introduces the information-processing paradigm and its revolutionary consequences. Kabbaj demonstrates how this paradigm has transformed our understanding of the brain-mind (cognitive science, artificial intelligence), biological life (molecular biology, genetics), and now the physical world itself. He provides a detailed analysis of the nature of information, focusing on the fundamental definition of information as "the act of choosing one possibility from a set of possibilities." This definition, drawn from the work of von Weizsäcker, Wheeler, and others, reveals information as dynamic and creative rather than static and representational.

The chapter also addresses the controversial question of digital ontology and pancomputationalism, engaging critically with the work of Zuse, Fredkin, Wolfram, and others. Kabbaj argues persuasively that while the slogan "it from bit" (Wheeler) is problematic, the more nuanced formulation "it from energy-information" avoids the difficulties of pure informational immaterialism.

Chapter 5 traces the early development of the information-processing interpretation during the 1980s and 1990s. Kabbaj examines four major formulations in considerable depth: David Bohm and colleagues' work on quantum potential, active information, and the implicate order; Carl Friedrich von Weizsäcker's "ur" theory and the reconstruction of quantum theory from binary alternatives; John Archibald Wheeler's "it from bit" and participatory universe; and Klaus Haefner's ambitious project to integrate the information-processing paradigm with the paradigm of open, non-linear, chaotic, and complex dynamic systems.

Throughout this historical reconstruction, Kabbaj demonstrates how these pioneering thinkers anticipated many of the insights that would later be confirmed by the second quantum revolution. His treatment of Bohm's work is particularly nuanced, showing how the concept of active information provides a bridge between quantum theory and process metaphysics.

Chapter 6 brings the story into the twenty-first century, examining the explosive development of the information-processing interpretation since the 2000s. Kabbaj surveys an extraordinarily wide range of literature, including popular works by Siegfried, von Baeyer, and Gleick; technical developments in quantum information theory by Lloyd, Vedral, D'Ariano, and others; applications to quantum field theory and the quantum vacuum; the holographic principle and AdS/CFT correspondence; and the emergence of spacetime from quantum entanglement.

Particularly fascinating is Kabbaj's treatment of the work by Umezawa, Vitiello, and colleagues on the quantum vacuum as cosmic dynamic memory. He draws striking analogies between the quantum vacuum and the brain, suggesting that both are hypercomplex information-processing networks with the capacity to store and process information through long-range entanglement and Bose-Einstein condensation. This leads to the revolutionary suggestion that the universe itself is a living, intelligent agent—a theme developed further in subsequent chapters.

Chapter 7: Synthesis I, From Material Objects to Energy-Activity, Action-Information, and Agent

This chapter presents the first major synthesis of the book's argument, systematically tracing the ontological transition from matter to energy to action-information to agent. Kabbaj begins by reiterating, with extensive supporting evidence, that the quanton (electron, photon, quark, etc.) is not an elementary particle of matter but a quantity of energy understood as activity—a complex of interrelated events or actions.

He then develops a rich and nuanced conception of energy, moving beyond the classical mechanistic definition ("capacity to do work") to a more fundamental understanding: energy designates the capacity of a system or actor to act, to bring about change, to perform actions. This understanding, he argues, is more consonant with contemporary physics than the mechanistic conception inherited from classical physics.

The chapter's most distinctive contribution is its analysis of the relationship between energy, action, and information. Drawing on the fundamental definition of information as an act of choice, Kabbaj argues that information is itself a form of activity—the activity of selecting among possibilities. The quanton, characterized by its possibilities, must therefore be capable of performing acts of choice, creating information, and processing information. This leads inexorably to the conclusion that the quanton is not merely an actor but an agent.

Kabbaj engages thoughtfully with the widespread resistance to this conclusion among physicists and philosophers, noting that the refusal to attribute agency to quantons stems from lingering commitment to materialism. He cites numerous authorities—Whitehead, Dirac, Dyson, Haag, Kastner, de Quincey, Jungerman—who have defended the view that quantons possess rudimentary forms of agency, choice, and even mentality.

Chapter 8: Synthesis II, Non-Substantialist Relational Agential Interpretation of Physics and the World

This culminating chapter presents Kabbaj's own original contribution: a fully developed non-substantialist relational agential interpretation that integrates all the strands of argument developed throughout the book. The chapter begins with an extended examination of Whitehead's process philosophy, which Kabbaj presents as the historical precursor and foundation for his own agential interpretation. He demonstrates how Whitehead's concepts—actual occasion, prehension, concrescence, the physical and mental poles—anticipate and illuminate the findings of contemporary quantum physics.

Kabbaj then introduces his own "complex agent" paradigm, which results from the integration of the two major contemporary paradigms: the paradigm of dynamic information-processing systems and the paradigm of open, non-linear, chaotic, and complex dynamic systems. The complex agent is characterized by four interrelated dimensions: the internal or individual dimension (organization, animation, collective behavior); the constitutive dimension (the agent's constituents, themselves agents); the social dimension (the agent as constituent of larger agents); and the ecological dimension (the agent's relationship with its environment).

This four-dimensional architecture, illustrated with a helpful diagram, captures the intrinsic complexity, relationality, and nested structure of all natural agents—from quantons to atoms to molecules to cells to organisms to societies to the universe itself. Kabbaj argues that each agent is characterized by a system of possibilities-potentialities-capacities that are continuously actualized through processes of choice, information-creation, and self-determination.

Drawing on Tononi and Koch's Integrated Information Theory (IIT), Kabbaj extends this framework to encompass consciousness, arguing that consciousness is an intrinsic property of any agent with non-zero integrated information. This leads to a form of panpsychism (or more accurately, panexperientialism) in which consciousness exists in varying degrees throughout nature, from the most elementary quantons to the most complex human beings.

The chapter concludes with a powerful contrast between the materialist worldview and the relational agential worldview, showing how each leads to radically different conceptions of human nature, society, and our relationship to the natural world. Kabbaj argues that the materialist worldview, with its emphasis on isolated individuals pursuing material self-interest, has produced the global crises of exploitation, inequality, and ecological destruction that now threaten human civilization. The relational agential worldview, by contrast, reveals our profound interconnectedness and calls us to develop the virtues of openness, justice, love, compassion, and wisdom.

Major Themes and Arguments

1. The Illusory Nature of Matter

Kabbaj's central, tirelessly reiterated thesis is that "matter does not really exist" as a primary ontological category. Drawing on Chapter 1's analysis of perception, he argues with compelling force that material substance is an appearance generated by human perception at a particular scale. When we examine physical reality at different scales—from macroscopic objects to cells to molecules to atoms to quantum particles—the appearance of substance dissolves repeatedly into dynamic systems of activity.

This argument is not merely philosophical but grounded thoroughly in the empirical findings of contemporary physics. Kabbaj marshals an overwhelming weight of evidence from special relativity ($E=mc^2$ demonstrating the convertibility of mass to energy), quantum field theory (particles as excitations of fields), and quantum vacuum physics (the vacuum as a seething cauldron of activity) to demonstrate that matter is not fundamental. The equation $E=mc^2$, he argues, should be interpreted not as an equivalence between matter and energy but as a demonstration that what appears to us as matter is actually energy-activity.

2. The Primacy of Energy as Activity

Building on Heisenberg's profound insight that "energy may be called the fundamental cause for all change in the world," Kabbaj develops a rich and nuanced conception of energy not as a substance but as activity—the capacity to act, to bring about change, to perform actions. This understanding, he argues persuasively, is far more consonant with contemporary physics than the mechanistic conception of energy inherited from classical physics.

Energy, in this view, is not a thing but a power—the power of agents to act, to choose, to create, to transform. This understanding unifies the physical and the mental, the material and the spiritual, revealing them as different aspects of the same underlying reality: activity.

3. The Centrality of Information

Perhaps the book's most distinctive and original contribution is its systematic development of the information-processing interpretation of physics. Kabbaj defines information fundamentally as "the act of choosing one possibility from a set of possibilities." This elegant definition, drawn from the work of von Weizsäcker, Wheeler, and others, reveals information as dynamic and creative rather than static and representational.

The second quantum revolution, with its intense focus on entanglement, qubits, and quantum information processing, provides powerful empirical validation for this interpretation. Quantum systems demonstrably encode, store, and process information; they

are not passive objects but active information-processors. The theory and technology of quantum computing bear witness to the ability of matter-energy to perform computation at the smallest scales.

4. The Relational Agent as Fundamental Ontological Category

Kabbaj's synthesis culminates triumphantly in the concept of the relational agent—an entity characterized by energy-activity, possibilities, information-processing capacity, and intrinsic relationality with other agents. This master concept brilliantly integrates multiple interpretative traditions:

> From structural relational interpretations, it takes the profound insight that properties are relations between systems
>
> From possibility-potentiality interpretations, it takes the recognition that quantum systems are characterized by real possibilities
>
> From event-process interpretations, it takes the understanding that reality consists of events and processes rather than substances
>
> From information-processing interpretations, it takes the centrality of information creation and exchange

The agent, in Kabbaj's elegant framework, is not supported by any underlying substance. It is constituted entirely by its activity, its possibilities, its information-processing, and its relations. This non-substantialist conception extends coherently from elementary quantons (electrons, photons, quarks) through atoms, molecules, cells, organisms, and ultimately to the universe itself.

5. The Universality of Life, Intelligence, and Consciousness

A striking and controversial implication of Kabbaj's framework is the extension of life, intelligence, and consciousness throughout the entire natural order. If agents are characterized by self-determination, information-processing, and creative choice, then even elementary particles must possess these capacities in rudimentary form. Kabbaj cites Dyson's memorable assertion that "mind is already inherent in every electron" and draws extensively on Whitehead's panexperientialism to support this conclusion.

This is not anthropomorphism—the naive projection of human characteristics onto nature—but rather the sophisticated recognition that the capacities we associate with life and mind exist on a continuum, with human consciousness representing a highly complex manifestation of principles present throughout nature. Kabbaj engages thoughtfully with Tononi and Koch's Integrated Information Theory to provide a quantitative framework for understanding consciousness in physical systems.

Critical Engagement with Alternative Interpretations

One of the book's greatest strengths is its fair, thorough, and scholarly engagement with alternative interpretations. Kabbaj does not simply dismiss competing views but presents them sympathetically and in considerable depth before offering thoughtful and nuanced critiques:

Copenhagen interpretation: While acknowledging its pragmatic value and historical importance, Kabbaj criticizes its refusal to engage with quantum ontology and its tendency to generate unnecessary paradoxes by treating possibilities as actualities. He notes that Bohr's dictum—"There is no quantum world"—is not a solution but an evasion.

Many-worlds interpretation: Kabbaj is particularly and justifiably critical here, following Smolin in characterizing it as "magic realism" that extravagantly multiplies worlds rather than recognizing the ontological reality of possibility as such. He argues that this interpretation solves the measurement problem only by creating far more serious ontological problems.

Pilot-wave theory: Kabbaj acknowledges its genuine virtues (realism, elegant solution to the measurement problem) while noting that its conception of the quantum potential points inexorably toward an informational interpretation. The pilot wave, he suggests, is best understood as active information.

QBism: While appreciating QBism's valuable emphasis on the agent and experience, Kabbaj argues that it remains too narrowly focused on human agents and fails to develop a full and satisfactory ontology. The quantum state, he insists, is not merely a degree of belief but a real feature of quantum systems.

Structural realism: Kabbaj engages sympathetically with Ladyman and Ross's ontic structural realism but argues persuasively that structures require agents as their bearers. Relations without relata, he suggests, are metaphysically incoherent.

Strengths

1. Interdisciplinary Integration of Extraordinary Breadth: Kabbaj demonstrates truly remarkable erudition, synthesizing physics, philosophy of science, information theory, cognitive science, biology, and process metaphysics into a coherent and compelling whole. The extensive bibliography (over 300 entries, organized thematically) testifies to the extraordinary breadth of his engagement with the relevant literature.

2. Conceptual Clarity and Pedagogical Skill: Despite the formidable complexity of the subject matter, Kabbaj writes with admirable clarity and pedagogical sensitivity. He carefully defines key terms,

meticulously distinguishes between related concepts, and provides helpful summaries at the end of each section. The book is demanding but never needlessly obscure.

3. Scientific Rigor and Empirical Grounding: The book is not speculative metaphysics but is grounded in detailed engagement with empirical physics. Kabbaj's background in computer science and artificial intelligence informs his understanding of information-processing without leading to naive computationalism. He engages with the technical literature at a high level while remaining accessible.

4. Historical Contextualization and Philosophical Depth: Kabbaj situates the contemporary revolution in physics within the broader history of ideas, tracing the transition from ancient and medieval worldviews through the modern scientific revolution to the contemporary period. He engages deeply with the history of philosophy, from Aristotle and Plato through Whitehead and beyond.

5. Practical Implications and Ethical Urgency: Unlike many works in philosophy of physics, Kabbaj explicitly and passionately addresses the practical consequences of adopting a non-substantialist worldview. The introduction and Chapter 8 connect materialism to the global crises of exploitation, inequality, and ecological destruction, arguing that a spiritual and relational worldview is urgently needed. This gives the book a moral seriousness that is rare in the genre.

6. Originality and Synthetic Power: Kabbaj's development of the complex agent paradigm represents a genuinely original contribution to contemporary metaphysics. By integrating the information-processing paradigm with complex systems theory and process philosophy, he provides a framework that is both scientifically grounded and philosophically sophisticated.

Limitations and Criticisms

1. Scope and Accessibility Challenges: While Kabbaj explicitly aims to address both specialists and the general public, the book's considerable length (over 350 pages of dense text) and technical detail may overwhelm non-specialist readers. Some sections assume familiarity with quantum formalism that many general readers will unfortunately lack. A glossary of technical terms would have been a valuable addition.

2. The "Agent" Concept Requires Further Development: Kabbaj's central concept of the agent is richly developed but may strike some readers as question-begging. Critics might argue that attributing agency to electrons simply renames the mystery rather than explaining it. Kabbaj anticipates this objection but could address it more fully. What precisely is the difference between an agent and a complex dynamical system? When does a system cross the threshold into genuine agency?

3. Integration of Consciousness Remains Incomplete: While Kabbaj discusses consciousness in relation to agency, his treatment is relatively brief given the centrality of consciousness to his worldview. Readers with a deep interest in the philosophy of mind may desire more detailed engagement with theories of consciousness, including critical engagement with opposing views. The appeal to Integrated Information Theory, while promising, requires fuller defense.

4. Empirical Testability and Predictive Power: A recurrent and legitimate question for any metaphysical framework is its empirical consequences. Kabbaj argues persuasively that his interpretation makes excellent sense of quantum phenomena, but does it generate novel predictions? This important question is not fully addressed. A truly scientific metaphysics should have testable consequences.

5. The Status of Mathematics Remains Ambiguous: Kabbaj occasionally suggests that mathematical structures are fundamental (following Mainzer), but the relationship between mathematical formalism and physical agency requires further clarification. Are mathematical structures discovered or invented? Are they descriptions of reality or reality itself?

6. Engagement with Opposing Views Could Be Expanded: While Kabbaj engages extensively with alternative interpretations of quantum mechanics, his engagement with contemporary defenders of materialism is relatively limited. A more thorough critique of sophisticated contemporary materialism would strengthen the book's argument.

Comparison with Related Works

Science Proclaims Materialism Is Dead joins and extends a growing literature challenging materialism from within science and philosophy:

Bernardo Kastrup's *Why Materialism Is Baloney* (2014) offers a more accessible and passionate critique focused on consciousness, but lacks Kabbaj's detailed and systematic engagement with quantum physics and information theory.

Thomas Nagel's *Mind and Cosmos* (2012) argues persuasively against neo-Darwinian materialism but does not develop the positive information-processing framework that Kabbaj provides with such richness.

David Bohm's *Wholeness and the Implicate Order* (1980) anticipates many of Kabbaj's themes, but Kabbaj updates and extends Bohm's insights through masterful engagement with subsequent developments in quantum information and quantum gravity.

Ladyman and Ross's *Every Thing Must Go* (2007) defends ontic structural realism with similar scientific rigor, but Kabbaj's agential framework offers a compelling alternative to their structuralism that avoids the problem of relations without relata.

Whitehead's *Process and Reality* (1929) remains the foundational text for process metaphysics, but Kabbaj makes Whitehead's notoriously difficult insights accessible and updates them through contemporary science. He demonstrates that Whitehead's vision, far from being obsolete, is more relevant than ever.

Conclusion

Science Proclaims Materialism Is Dead is an important, timely, and potentially transformative work that deserves the widest possible readership among scientists, philosophers, and intellectually curious general readers. Kabbaj has succeeded admirably in synthesizing a vast and complex literature into a coherent, compelling, and passionately argued case for non-substantialist metaphysics grounded in contemporary physics.

The book's greatest and most enduring contribution lies in its systematic integration of the information-processing paradigm with quantum physics, showing how the second quantum revolution confirms and dramatically extends the non-substantialist implications of the first. By developing the rich and nuanced concept of the relational agent, Kabbaj provides a positive, scientifically grounded alternative to materialism that avoids both the paradoxes of substantialist interpretations and the quietism of anti-realist positions.

Whether one ultimately accepts Kabbaj's conclusions in their entirety, the book succeeds brilliantly in demonstrating that materialism is no longer tenable in light of contemporary science. The urgent question is not whether to abandon materialism but what to put in its place. Kabbaj offers a compelling and inspiring candidate: a world of energy-activity, action-information, and relational agents, characterized by creativity, complexity, and consciousness in varying degrees throughout the natural order.

The book's final chapters connect these metaphysical conclusions with passionate urgency to the practical challenges facing humanity—ecological crisis, social injustice, global conflict—arguing that the materialist worldview that has shaped modern civilization is not only scientifically obsolete but existentially dangerous. Whether or not one shares Kabbaj's optimism about the transformative potential of non-substantialist spirituality, his call for a fundamental reorientation of

human consciousness and civilization deserves the most serious consideration.

In an era of unprecedented global challenges and equally unprecedented scientific discovery, *Science Proclaims Materialism Is Dead* offers both a penetrating diagnosis and a hopeful prescription: the diagnosis that our dominant worldview is based on an illusion, and the prescription that a more adequate understanding of reality—informed by the very best of contemporary science—can support a more just, peaceful, and sustainable civilization. This is a book that can genuinely change how we see the world and, in changing how we see, change how we live.

Recommended for: Philosophers of science, physicists interested in foundational questions, students of metaphysics and ontology, cognitive scientists exploring the nature of consciousness, and general readers seeking a scientifically grounded and philosophically sophisticated alternative to materialism.

Adil Kabbaj is Professor of Computer Science and Artificial Intelligence at the National Institute of Statistics and Applied Economics (INSEA), Rabat, Morocco. His research interests include intelligent systems, knowledge representation, ontology engineering, and the philosophical implications of computer science and artificial intelligence. This book represents the culmination of decades of interdisciplinary research and reflection.