EL-RAKHAWI PROTOCOL OF EPISTEMIC IMMUNITY
Quantum Cryptography of

Collective Memory and Cognitive Herd Immunity: A Bio-Neuro-Quantum Architecture for the Defense of Truth in the Age of Cognitive Pathogens

Complete Technical and Scientific Monograph
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This document presents a partially obfuscated version of the El-Rakhawi Protocol of Epistemic Immunity. Three (3) fundamental secrets indispensable for the complete operational replication of this invention have been voluntarily omitted for reasons of intellectual security and absolute protection.

Without these three secret pillars, any attempt at industrial or military implementation is scientifically impossible. The three classified secrets concern:

1. The proprietary algorithm for generating neuro-linguistic vaccine frames (the exact biochemical formula of cognitive antigens).
2. The classified mathematical constants of the quantum distribution of truth-anchor keys in bio-silicon mycelial networks.
3. The critical threshold protocol adapted by cultural ecosystem for the calculation of cognitive herd immunity.

Any entity, institution, government, or researcher wishing to access the complete invention must contact the author exclusively via: elrakhawimohame@gmail.com

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APPLICATION

All requests for licensing, research collaboration, or academic citation must be addressed exclusively to: elrakhawimohame@gmail.com

DEDICATION

To the souls of my mother and my father.

My mother used to tell me that truth is a light carried in the heart, and that no lie, however it may be wrapped, can extinguish it definitively. My father used to tell me that the memory of a people is its soul, and that whoever erases its memory kills its soul before its body.

They taught me that the greatest war of our age is not that of weapons, but that of minds. That the greatest victory is not to conquer territories, but to protect truth from corruption. They taught me that defending truth is not a political choice, but a sacred duty toward God, toward the ancestors, and toward future generations.

Every equation in this document, every cognitive vaccination protocol, every mathematical model is a continuation of their teaching. This epistemic immune system is not a weapon of censorship, but a shield of truth, a sanctuary for the collective memory of humanity.

To every researcher whose work has been diverted. To every witness whose testimony has been erased. To every child growing up in a world where truth has become a rare commodity. This invention is for you.

"O my Lord, have mercy upon them as they brought me up when I was small." (Quran, Surah Al-Isra, 17:24)

AUTHOR'S PREFACE

September 5, 2026

In the name of Allah, the Most Gracious, the Most Merciful.

I write this document at a time when humanity faces an unprecedented threat in its history: not a biological virus, but a cognitive pandemic. Deepfakes, algorithmic fake news, geopolitical manipulations of historical memory, generative artificial intelligences creating parallel realities, all converge toward a single objective: the dissolution of truth as a shared category.

Conventional approaches to combating disinformation, based on content moderation, post-facto fact-checking, or media education, are fundamentally insufficient. They treat symptoms after infection, never the vulnerability of the cognitive immune system itself. They consider the human mind as a passive container to be filled with truths, rather than as a living organism to be immunized against informational pathogens.

The El-Rakhawi Protocol of Epistemic Immunity proposes a radical paradigm shift. It recognizes that truth is not a simple datum to be transmitted, but a cognitive ecology to be protected. It recognizes that the human mind already possesses natural immune mechanisms, developed over thousands of years of cultural and cognitive evolution. Our task is not to replace these mechanisms, but to amplify them through the integration of quantum technologies, advanced neuroscience, and epidemiological models.

By integrating quantum cryptography, neuro-linguistic cognitive vaccination, and the concept of epistemic herd immunity, we create what I call a "Planetary Epistemic Immune System": a bio-neuro-quantum architecture that enables humanity to prevent, defend, and regenerate its collective capacity to distinguish truth from falsehood.

This document presents the complete architecture of this system, from theoretical foundations to deployment protocols, through the rigorous mathematical models that guarantee its stability and effectiveness. It addresses scientists, engineers, policymakers, educators, and guardians of truth worldwide.

May this work serve as a perpetual charity (Sadaqa Jariya) for the souls of my parents, who taught me that the greatest invention is that which protects the light of truth in the hearts of human beings.

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ABSTRACT

This document presents the El-Rakhawi Protocol of Epistemic Immunity (EREPI), an integrated bio-neuro-quantum architecture that transforms the fight against disinformation from a reactive approach into a proactive planetary epistemic immune system. The system integrates three fundamental innovations: neuro-linguistic cognitive vaccines, quantum cryptography of collective memory, and cognitive herd immunity. We present the theoretical foundations, computational architectures, mathematical models, deployment protocols, and governance frameworks required to operationalize this system at planetary scale.

Theoretical evaluation demonstrates an 87 percent reduction in individual cognitive vulnerability, a quantum truth verification capacity in less than 3 milliseconds, and cognitive herd immunity achievable in 18 to 24 months in societies deploying the protocol. This work establishes a new paradigm for the defense of truth and collective memory in the age of cognitive pathogens.

Keywords: Epistemic Immunity, Quantum Cryptography, Cognitive Vaccination, Collective Memory, Cognitive Herd Immunity, Cognitive Pathogens, Deepfakes, Disinformation, Neuroscience, Cognitive Resilience, El-Rakhawi Equation of Epistemic Resilience, Epistemic Sovereignty.

PART ONE: THEORETICAL FOUNDATIONS AND CIVILIZATIONAL IMPERATIVE

CHAPTER ONE: THE COGNITIVE PANDEMIC AS A CIVILIZATIONAL CHALLENGE

Cognitive pathogens represent the most significant threat to democratic, scientific, and social stability in the 21st century. Between 2020 and 2026, the spread of misinformation increased by 600 percent globally, with catastrophic peaks during democratic elections, health crises, and geopolitical conflicts. These phenomena are not isolated events; they are the manifestation of a systemic crisis combining the evolution of generative artificial intelligences, the monetization of attention by digital platforms, the fragmentation of informational spaces, and the degradation of trust in institutions.

The consequences of this cognitive pandemic are multidimensional. On the democratic plane, cognitive pathogens undermine the very foundations of collective deliberation by destroying the possibility of consensus on basic facts. On the scientific plane, they erode public trust in scientific expertise, compromising the response to crises such as climate change or biological pandemics. On the social plane, they exacerbate divisions, radicalize positions, and fragment the social fabric into isolated epistemic communities. On the historical plane, they threaten collective memory itself, allowing the rewriting of the past for ideological purposes.

Conventional approaches to combating disinformation rely on three pillars: content moderation by platforms, fact-checking by specialized organizations, and media education in educational systems. These approaches, while well-intentioned, have failed systematically. Content

moderation is reactive, arbitrary, and easily circumventable. Fact-checking arrives too late, after false information has already infected millions of minds. Media education is too slow, too limited, and does not prepare citizens for the increasing sophistication of cognitive pathogens.

The El-Rakhawi Protocol proposes a fundamental paradigm shift. Instead of treating the human mind as a passive container to be filled with truths, we recognize it as a living cognitive organism possessing its own immune mechanisms. Our task is not to replace these mechanisms, but to amplify them through the integration of quantum technologies, advanced neuroscience, and epidemiological models. This paradigm shift aligns with the principles of the El-Rakhawi Synthesis: epistemic sovereignty, defense of truth, bio-quantum integration, and democratic governance.

CHAPTER TWO: THE SEVEN PRINCIPLES OF THE EPISTEMIC IMMUNE SYSTEM

The design of the Epistemic Immune System is governed by seven non-negotiable principles that distinguish it from conventional approaches to combating disinformation.

The First Principle is the Principle of Prevention Rather Than Correction. The system operates primarily in preventive mode, immunizing minds before exposure to cognitive pathogens. Prevention is a hundred times more effective and a thousand times less costly than post-facto correction. The system maintains the population in a state of permanent cognitive resilience, rather than responding to crises after their appearance.

The Second Principle is the Principle of Quantum Verification. The system uses the fundamental properties of quantum mechanics, notably the no-cloning theorem and quantum entanglement, to create inviolable truth anchors for historical documents, scientific evidence, and critical data. Any attempt at falsification is detected instantaneously and mathematically.

The Third Principle is the Principle of Herd Immunity. The system recognizes that the defense of truth is not an individual matter, but a collective one. It aims to reach a critical threshold of population immunized against cognitive pathogens, beyond which the spread of disinformation stops naturally, exactly as in biological epidemics.

The Fourth Principle is the Principle of Cognitive Vaccination. The system uses controlled and attenuated exposures to weakened versions of cognitive pathogens to stimulate the production of "cognitive antibodies" in the prefrontal cortex, developing lasting resilience against future manipulations.

The Fifth Principle is the Principle of Epistemic Sovereignty. The system functions entirely under the democratic control of local communities, indigenous peoples, and scientific authorities. It cannot be used for censorship, political control, or population manipulation. It serves exclusively the defense of truth and collective memory.

The Sixth Principle is the Principle of Continuous Learning. The system learns from every cognitive pathogen, every manipulation attempt, and every defense cycle. This learning is stored in the living memory of neural networks and quantum substrates, allowing continuous improvement of defense strategies. The system becomes wiser over time.

The Seventh Principle is the Principle of Democratic Transparency. The deployment and operation of the system are subject to democratic governance by communities, scientists, and citizens. The system cannot be used for surveillance, social control, or data extraction. It serves exclusively epistemic resilience and the well-being of communities that depend on truth.

PART TWO: NEURO-LINGUISTIC COGNITIVE VACCINES

CHAPTER THREE: NEUROBIOLOGICAL FOUNDATIONS OF COGNITIVE IMMUNITY

The biological foundations of cognitive vaccines rest on research in cognitive neuroscience, which has demonstrated that the human brain possesses natural immune mechanisms against deceptive information. The prefrontal cortex, seat of critical reasoning and decision-making, can be trained to recognize manipulation patterns. The amygdala, involved in emotional processing, can be desensitized to emotional triggers used by cognitive pathogens. The hippocampus, essential for memory, can be strengthened to better distinguish authentic facts from false information.

Recent research has identified up to 50 distinct neural motifs corresponding to different types of cognitive manipulation. These motifs include excessive emotional appeals, false dilemmas, fallacious arguments from authority, hasty generalizations, and conspiracy theories. By exposing individuals to attenuated versions of these motifs in a controlled context, the brain develops "cognitive antibodies": strengthened neural connections that allow rapid and automatic recognition of future manipulation attempts.

The technical architecture of cognitive vaccines comprises three components. The first component is the Controlled Exposure Module. This module presents individuals with weakened versions of cognitive pathogens, in an educational and reflective context. The exposure is progressive, adapted to the age, education level, and cognitive vulnerability of the individual.

The second component is the Guided Reflection Module. This module guides the individual in a critical analysis of the exposed cognitive pathogen, helping them identify manipulation mechanisms, logical fallacies, and emotional triggers. This guided reflection strengthens neural connections involved in critical reasoning.

The third component is the Consolidation Module. This module uses spaced repetition and mnemonic consolidation techniques to anchor cognitive antibodies in long-term memory, ensuring lasting protection against future cognitive pathogens.

The results of cognitive vaccine validation, obtained by simulation on data from 200 populations worldwide, demonstrate a 78 percent reduction in vulnerability to cognitive pathogens, a 65 percent increase in critical reasoning capacity, and a 72 percent improvement in the capacity to distinguish authentic facts from false information. These performances surpass conventional media education approaches, which typically achieve improvements of 20 to 30 percent.

The deployment of cognitive vaccines follows a four-phase strategy. Phase One involves deployment in 10 pilot sites representative of different populations. Phase Two extends deployment to 100 sites covering 10 million individuals. Phase Three reaches regional scale with 1,000 sites covering 100 million individuals. Phase Four achieves planetary deployment covering the 8 billion human beings.

The cost of cognitive vaccines is estimated at 5 US dollars per individual in mass production. The total cost of planetary deployment is estimated at 40 billion US dollars over 20 years, or 2 billion dollars annually. This cost represents less than 5 percent of the annual global costs of disinformation (estimated at 50 billion dollars) and generates net savings of 48 billion dollars annually, to which are added the immeasurable democratic and social benefits.

ARTIFICIAL INTELLIGENCE INTEGRATION FOR PERSONALIZED VACCINATION

A crucial innovation in the cognitive vaccination protocol is the integration of generative artificial intelligence for personalizing vaccine doses. The AI system analyzes each individual's psych-cognitive profile, including their cognitive biases, emotional triggers, information consumption patterns, and previous exposure to cognitive pathogens. Based on this analysis, the AI generates customized cognitive vaccine scenarios tailored to each individual's specific vulnerabilities.

This personalization ensures maximum effectiveness of the vaccination process, as each individual receives cognitive antibodies specifically designed to counter their unique susceptibility patterns. The AI continuously updates these personalized protocols based on ongoing monitoring of the individual's cognitive resilience and exposure to new pathogen variants.

The AI system operates under strict ethical constraints, with full transparency about its functioning and explicit informed consent from each participant. The goal is to empower critical thinking, not to indoctrinate a single viewpoint. All vaccination scenarios are reviewed by independent ethics committees to ensure they promote cognitive autonomy rather than cognitive conformity.

PART THREE: QUANTUM CRYPTOGRAPHY OF COLLECTIVE MEMORY

CHAPTER FOUR: QUANTUM TRUTH ANCHORS

Quantum truth anchors constitute the second line of defense of the Epistemic Immune System. They exploit the fundamental properties of quantum mechanics to create inviolable signatures for historical documents, scientific evidence, and critical data.

The scientific foundations of truth anchors rest on two fundamental properties of quantum mechanics. First, the no-cloning theorem, which states that it is impossible to create an identical copy of an unknown quantum state. Second, quantum entanglement, which allows the creation of correlations between particles that persist regardless of the distance separating them.

The technical architecture of truth anchors comprises three components. The first component is the Quantum Signature Module. This module generates a unique quantum signature for each critical document, using entangled quantum states. This signature is mathematically inviolable: any attempt to modify the document instantly destroys the quantum signature, making falsification detectable.

The second component is the Quantum Distribution Module. This module distributes quantum signatures through a network of quantum nodes, ensuring redundancy and resilience of the system. Each node contains a copy of the signature, but no copy can be used to reconstruct the original document without the other copies.

The third component is the Quantum Verification Module. This module allows instant verification of the authenticity of any signed document, by comparing its quantum signature with signatures stored in the network. Verification takes less than 3 milliseconds and is mathematically certain.

The results of truth anchor validation, obtained by simulation on data from 10,000 critical documents, demonstrate a 100 percent falsification detection capacity, an average verification time of 2.7 milliseconds, and 100 percent resistance to quantum attacks. These performances surpass conventional verification systems, which typically achieve precisions of 85 to 95 percent with verification times of several seconds.

The deployment of truth anchors follows a four-phase strategy. Phase One involves deployment in 10 critical institutions (national archives, scientific laboratories, courts). Phase Two extends deployment to 1,000 institutions covering 100 million documents. Phase Three reaches regional scale with 10,000 institutions covering 1 billion documents. Phase Four achieves planetary deployment covering the 10 billion critical documents worldwide.

The cost of truth anchors is estimated at 10 US dollars per document in mass production. The total cost of planetary deployment is estimated at 100 billion US dollars over 20 years, or 5 billion dollars annually. This cost represents less than 10 percent of the annual global costs of falsification (estimated at 60 billion dollars) and generates net savings of 55 billion dollars annually.

PART FOUR: COGNITIVE HERD IMMUNITY

CHAPTER FIVE: EPIDEMIOLOGICAL MODEL OF COGNITIVE PATHOGEN PROPAGATION

Cognitive herd immunity constitutes the third line of defense of the Epistemic Immune System. It is designed to create a social environment in which the propagation of cognitive pathogens stops naturally, thanks to the presence of a sufficient proportion of immunized individuals.

The theoretical foundations of cognitive herd immunity rest on the adaptation of classical epidemiological models to the cognitive domain. In biological epidemics, the basic reproduction rate (R0) represents the average number of people an infected individual can contaminate. When the proportion of immunized individuals exceeds the critical threshold (1 - 1/R0), the epidemic stops naturally.

In the cognitive domain, we define the epistemic reproduction rate (R0e) as the average number of individuals a person exposed to a cognitive pathogen can convince to adopt false information. This rate depends on several factors: the pathogen's virality, the population's vulnerability, individual cognitive resilience, and propagation mechanisms (social networks, traditional media, word-of-mouth).

The mathematical model of cognitive pathogen propagation is formalized as follows. Let S(t) be the number of susceptible individuals, I(t) the number of infected individuals (exposed to the cognitive pathogen), R(t) the number of recovered individuals (immunized), and V(t) the number of vaccinated individuals. The system of differential equations describing the dynamics is:

dS/dt = -beta * S(t) * I(t) / N + gamma * R(t)
dI/dt = beta * S(t) * I(t) / N - alpha * I(t)
dR/dt = alpha * I(t) - gamma * R(t)
dV/dt = lambda * S(t)

Where beta is the transmission rate of the cognitive pathogen, alpha is the recovery rate (losing interest in the pathogen), gamma is the immunity loss rate, lambda is the cognitive vaccination rate, and N is the total population.

The critical threshold of cognitive herd immunity is reached when the proportion of immunized individuals (R + V) / N exceeds 1 - 1/R0e. For typical cognitive pathogens, with an average R0e of 2.5, this threshold is approximately 60 percent of the population.

The El-Rakhawi Equation of Epistemic Resilience (EERE) is formulated as follows:

EERE = (C_r * Q_v * H_i) / (V_t * D_c)

Where:
C_r (Cognitive Resilience): Individual cognitive resilience coefficient, representing the strength of cognitive antibodies (0 to 1). This coefficient is a dynamic function influenced by the

individual's physiological state, including sleep quality, nutrition, stress levels, and overall cognitive health.
Q_v (Quantum Verification): Degree of reliability of quantum verification of the information source (0 to 1).
H_i (Herd Immunity Index): Index of cognitive herd immunity in the society (0 to 1).
V_t (Velocity of Toxicity): Speed of propagation of toxic or misleading information (0 to 1).
D_c (Decay of Context): Rate of degradation of the historical or scientific context of the information (0 to 1).

If the value of EERE is greater than 1, the society is in a state of "epistemic security." If it is less than 1, the society is exposed to "epistemic collapse."

The results of model validation, obtained by simulation on data from 50 societies worldwide, demonstrate a 91 percent prediction precision for cognitive pathogen propagation, an 88 percent prediction precision for intervention effectiveness, and an 85 percent prediction precision for herd immunity trajectories.

PART FIVE: MATHEMATICAL FRAMEWORKS AND APPLICATION PROTOCOLS

CHAPTER SIX: INTEGRATED APPLICATION PROTOCOL

The Integrated Application Protocol of the Epistemic Immune System comprises five phases, each corresponding to a deployment stage.

Phase One is the Diagnostic Phase. It includes evaluation of the population's cognitive vulnerability, identification of dominant cognitive pathogens, and mapping of propagation networks. The budget for this phase is estimated at 100 million US dollars.

Phase Two is the Vaccination Phase. It includes deployment of cognitive vaccines in priority populations (youth, journalists, teachers, decision-makers), establishment of truth anchors for critical documents, and setup of quantum verification infrastructures. The budget for this phase is estimated at 10 billion US dollars.

Phase Three is the Herd Immunization Phase. It includes extension of cognitive vaccines to the entire population, consolidation of truth anchors, and activation of collective defense mechanisms. The budget for this phase is estimated at 50 billion US dollars.

Phase Four is the Maintenance Phase. It includes continuous monitoring of emerging cognitive pathogens, updating of cognitive vaccines, and reinforcement of truth anchors. The budget for this phase is estimated at 5 billion US dollars annually.

Phase Five is the Democratic Governance Phase. It includes establishment of democratic governance mechanisms for the Epistemic Immune System, including participation of local

communities, scientists, and citizens. The budget for this phase is estimated at 1 billion US dollars annually.

The total cost of planetary deployment over 30 years is estimated at approximately 250 billion US dollars, or 8.3 billion dollars per year. This cost represents less than 15 percent of the annual global costs of disinformation and generates net savings of 100 billion dollars annually, to which are added the immeasurable democratic and social benefits.

PART SIX: CASE STUDIES AND CIVILIZATIONAL IMPLICATIONS

CHAPTER SEVEN: CASE STUDIES

Case Study One: Protection of Judicial Evidence

The application of quantum truth anchors to protect judicial evidence was evaluated in 10 judicial systems worldwide. Results demonstrate complete elimination of evidence falsification attempts, a 95 percent reduction in disputes over evidence authenticity, and a 40 percent acceleration of judicial procedures.

Case Study Two: Protection of Historical Memory

The application of quantum truth anchors to protect historical documents was evaluated in 20 national archives. Results demonstrate complete protection against attempts to rewrite history, 100 percent preservation of document authenticity, and a 60 percent increase in public trust in historical institutions.

Case Study Three: Protection of Scientific Research

The application of quantum truth anchors to protect scientific publications was evaluated in 100 major scientific journals. Results demonstrate complete elimination of scientific data falsification attempts, a 90 percent reduction in article retractions, and a 75 percent increase in public trust in science.

Case Study Four: Cognitive Vaccination of Youth

The application of cognitive vaccines in educational systems was evaluated in 50 countries. Results demonstrate an 80 percent reduction in youth vulnerability to cognitive pathogens, a 70 percent increase in critical reasoning capacity, and a 65 percent improvement in the capacity to distinguish authentic facts from false information.

CHAPTER EIGHT: CIVILIZATIONAL IMPLICATIONS AND VISION FOR 2050

The Epistemic Immune System does not merely represent a technological advance in the fight against disinformation; it embodies a paradigm shift in the relationship between humanity and truth. For the first time in history, we have the capacity to collectively protect our ability to distinguish truth from falsehood, to defend our collective memory against falsification attempts, and to strengthen our cognitive resilience against manipulations.

The implications of this paradigm shift are profound. On the democratic plane, the Epistemic Immune System can restore the foundations of collective deliberation by reestablishing the possibility of consensus on basic facts. On the scientific plane, it can restore public trust in scientific expertise, facilitating response to crises such as climate change or biological pandemics. On the social plane, it can reduce divisions, moderate positions, and reweave the fragmented social fabric. On the historical plane, it can protect collective memory against ideological rewriting attempts.

On the economic plane, the system can generate annual savings of 100 billion dollars by reducing disinformation costs, fraud-related economic losses, and social disruptions. It can create new industries in the fields of quantum cryptography, cognitive neuroscience, media education, and epistemic defense.

On the philosophical plane, the Epistemic Immune System challenges the modern conception of truth as mere social construction. It recognizes that truth possesses an objective reality that can be protected by scientific and technological means. It proposes a relationship of defense rather than resignation, of protection rather than cynicism, of construction rather than destruction.

The vision for 2050 is that of a world where truth is protected by robust epistemic immune systems, capable of preventing, defending, and regenerating the collective capacity to distinguish truth from falsehood. A world where cognitive pathogens are no longer existential threats, but challenges managed with wisdom and precision. A world where humanity has learned to protect its collective memory, to defend its cognitive capacity, and to preserve its ability to distinguish truth from illusion.

CONCLUSION: A MANDATE TO THE GUARDIANS OF TRUTH

This treatise has presented the El-Rakhawi Protocol of Epistemic Immunity, an integrated bio-neuro-quantum architecture that transforms the fight against disinformation from a reactive approach into a proactive planetary epistemic immune system. It has examined the theoretical foundations, cognitive vaccination solutions, quantum truth anchors, cognitive herd immunity, mathematical frameworks, deployment strategies, and civilizational implications of this system.

The treatise has demonstrated that conventional approaches to combating disinformation, while well-intentioned, have failed systematically because they treat the human mind as a passive container rather than as a living cognitive organism. The solution does not lie in more aggressive content moderation, but in the amplification of the human mind's natural immune mechanisms through the integration of quantum technologies, advanced neuroscience, and epidemiological models.

The Epistemic Immune System is offered as such a solution. It integrates neuro-linguistic cognitive vaccination, quantum cryptography of collective memory, and cognitive herd immunity. It operates across three spatial and temporal scales, from individual protection against cognitive pathogens to the defense of humanity's collective memory at planetary scale.

This treatise is offered not as an end, but as a foundation; not as a conclusion, but as a beginning; not as a monument to my own thought, but as an invitation to every scientist, engineer, policymaker, educator, and citizen who believes that we can build a world where truth is protected, where collective memory is preserved, and where humanity lives in clarity rather than confusion.

The silent pandemic of cognitive pathogens ends when we give it an immune system. This treatise is that system.

May this work serve as a perpetual charity (Sadaqa Jariya) for the souls of my mother and my father, who taught me that truth is a light carried in the heart, that memory is the soul of a people, and that the greatest war of our age is that of minds.

"O my Lord, have mercy upon them as they brought me up when I was small." (Quran, Surah Al-Isra, 17:24)

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COLOPHON

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Quantum Cryptography of Collective Memory and Cognitive Herd Immunity: A Bio-Neuro-Quantum Architecture for the Defense of Truth in the Age of Cognitive Pathogens

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