

# From signal transduction to quantum biology: the evolution of a scientific paradigm across thermodynamics, immunotherapy, and the study of consciousness (1908–2026)

## Abstract

The present work traces more than forty years of scientific and academic research, delineating the evolution of a paradigm that spans from classical biochemistry to quantum biology. Commencing with the historical foundations of early 20th-century observational medicine, the author describes the intellectual trajectory that led from the deciphering of molecular signals within the leading laboratories of the NIH to the formulation of novel theories on biological energy and consciousness in Arizona. This work highlights the multidisciplinary synthesis of the author's roles as researcher, Full Professor, Editor-in-Chief, and inventor of pioneering technologies (Bravo, Praesidium, and the RK Protocol) conceived within the framework of "Citizen Science" and approved by a United States patent. By integrating oncology, radiology, quantum physics, and the millenary practice of Nichiren Shoshu Buddhism, the author reaffirms the necessity of an independent approach grounded in "Reason" and the pursuit of "Actual Proof." Documenting the extraordinary synthesis achieved during the first seventy years of his life, this profile serves not as a final assessment, but as a vital manifesto for the continuous and ambitious exploration of human complexity and the infinite potential of consciousness.

**Keywords:** thermodynamics, oncology, immunology, neuroscience, consciousness, signal transduction, infectious diseases

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## Historical roots and the thermodynamic debut (1908–1981)

The evolution of scientific thought documented in this profile did not emerge from an academic vacuum; rather, it is rooted in a robust generational continuity dedicated to observational medicine and clinical excellence. Born in Florence, Italy, in 1956, the author hails from a family of physicians: both parents were surgeons who held dual specializations in Radiology and Radiotherapy, as well as in Dentistry and Dental Prosthetics. A constant touchstone in this intellectual heritage is represented by the clinical observations made in 1908 by the author's grandfather, a physician who, while documenting the phenomenology of measles, intuited dynamics of heterologous immunity that modern science would only validate a century later.<sup>1</sup> This imprinting defined a method: the primacy of empirical clinical data over preconceived theory.

The author's academic path followed this vocation with rigor: he graduated in Medicine and Surgery from the University of Florence at the age of 24 with the highest honors (*summa cum laude*) and subsequently earned a PhD in Molecular Biology, consolidating the technical foundations for his future avant-garde research. Significant to his human and professional development was his experience as a Medical Officer in the Italian Army, operating within NATO forces—an assignment that added a dimension of discipline and service to his vision of medical practice.

His formal scientific debut occurred in 1981, with research dedicated to the nutritional status and dietary conditions in tropical countries.<sup>2</sup> Although seemingly distant from the molecular biology that would characterize subsequent decades, this work laid the

groundwork for a thermodynamic vision of the human organism and its environmental interactions. Within that context, nutrition was analyzed not merely as caloric intake, but as a flow of energy within an open system. The concepts of Primary Energy (E1)—energy captured from the environment—and Secondary Energy (E2)—energy generated by human activity—were already present in that 1981 study and have recently been revisited by the author to perform a systematic comparison between historical and contemporary data, analyzing the evolution of energy transformation processes within biological systems.<sup>3</sup> The circle begun in 1981 finds its completion today in a synthesis that views biology not as inert matter, but as an incessant transformation of energetic signals.

## The code of signals: the American phase (1982–1991)

The necessity of understanding how primary energy was translated into cellular decisions led the author to the United States, the epicenter of the 1980s biotechnological revolution. A pivotal milestone was represented by his collaboration with Eduardo G. Lapetina<sup>4</sup> at the Burroughs Wellcome Research Laboratories (North Carolina).

A turning point in the scientific output of those years was the 1986 publication in the Proceedings of the National Academy of Sciences (PNAS), a paper presented by Nobel Laureate Sir John Vane titled "Protease and cyclooxygenase inhibitors synergistically prevent activation of human platelets." In this study,<sup>5</sup> the author, alongside Eduardo G. Lapetina, described a potent synergistic effect between the protease inhibitor leupeptin and the cyclooxygenase inhibitor indomethacin in preventing platelet activation. The results showed that leupeptin alone only partially inhibited thrombin-induced aggregation,

and indomethacin alone was ineffective against this agonist. However, their combination completely blocked both aggregation and serotonin release, while fibrin clot formation remained unaffected.

This discovery provided a mechanistic explanation for the often equivocal results found in clinical trials conducted with cyclooxygenase inhibitors alone, such as aspirin, highlighting how thrombin-mediated platelet activation represents a critical signaling pathway that can only be neutralized through a combined approach. The implications of this work remain highly relevant for the prophylaxis of thromboembolic diseases such as stroke and myocardial infarction, suggesting strategies to optimize antiplatelet therapies and reduce side effects through a significant reduction in dosages made possible by pharmacological synergism.

The journey continued at the National Cancer Institute (NCI) of the NIH, in the Laboratory of Cellular and Molecular Biology (LCMB) directed by Stuart A. Aaronson. Bethesda at that time represented the world's pinnacle for oncogene research. In collaboration with Aaronson, the author contributed to the characterization of the Epidermal Growth Factor (EGF) receptor signaling cascade. The results of these studies, published in leading journals such as *Science*,<sup>6</sup> *PNAS*,<sup>7,8</sup> and *Oncogene*,<sup>9</sup> demonstrated how the activation of specific oncogenes induces chronic stimulation of Phospholipase C, bypassing cellular control mechanisms. This phase allowed the author to map the molecular “circuits” of cancerous cells, acquiring the technical toolkit necessary for subsequent clinical challenges.

## Academic consolidation and diagnostic integration (1992–2010)

Upon his return to Italy, the author embarked on a distinguished academic career at the University of Florence [10], serving first as Associate Professor and subsequently as Full Professor. Holding the chair of Molecular Biology in the Faculty of Mathematical, Physical, and Natural Sciences, his courses were noted for an exceptionally high pedagogical impact. According to the University's official “Evaluation of Teaching” system, the Molecular Biology course consistently ranked at the top of the Faculty, achieving a score of 8.94/10 and a student satisfaction rate of 98.2% in 2012–2013. Similar results were achieved at the Faculty of Engineering, where the course on “Advanced Methodologies in Medicine” reached a 100% satisfaction rating.

The scientific prestige of this period is attested by numerous honors displayed on the official homepage of the University of Florence. Of particular note was the resonance given in 2009 to research on AIDS pathogenesis which, through a critical analysis of ministerial epidemiological data, opened new fronts for methodological discussion.<sup>11,12</sup> Further mentions concerned the presentation at the XVIII International AIDS Conference in Vienna (2010) of studies on personalized immune responses based on VDR gene polymorphisms,<sup>13</sup> as well as the publication of discoveries regarding the mechanism of action of GcMAF in inhibiting the growth of tumor cells—works appearing in journals such as *Cancer Immunology and Immunotherapy*<sup>14</sup> and *Anticancer Research*.<sup>15</sup> Concurrently, his specialization in Radiodiagnostics obtained in Siena allowed him to integrate molecular rigor with clinical practice, focusing on the role of the Vitamin D Receptor (VDR) and the Vitamin D-Binding Protein (DBP) in modulating immunity and cellular radioresistance.<sup>16</sup>

## Immunotherapy innovation and citizen science (2010–2015)

In the second decade of the 21<sup>st</sup> century, the author's career pivoted toward translational immunotherapy. The discovery and application of GcMAF (Gc protein-derived Macrophage Activating Factor/ Vitamin D binding protein Macrophage Activating Factor) was a watershed moment. By demonstrating how a specific modification of the Vitamin D-binding protein could activate macrophages to counter tumor progression and chronic viral infections, the author challenged dominant therapeutic paradigms.<sup>17</sup>

This phase was characterized by a steadfast defense of scientific independence. Faced with the resistance of an often self-referential academic and industrial system, the author promoted the “Citizen Science” model. This approach advocates for transparent scientific research centered on patient needs and free from commercial bias, where the validity of a therapy is sanctioned by documented clinical results (“Actual Proof”).

In this context, the author embraced the role of inventor, translating laboratory discoveries into innovative and accessible nutritional solutions. His primary invention of this period is Bravo, a revolutionary product formulated to reconstitute microbiome diversity and endogenously produce immunomodulatory molecules. Bravo is not a mere probiotic, but a complex ecosystem<sup>18</sup> based on the fermentation of colostrum and milk (or plant-based proteins), where the coordinated action of hundreds of microbial strains and microbial-released enzymes allows for the natural synthesis of GcMAF and bioactive peptides.<sup>19</sup>

The success of Bravo and the ongoing dialogue with the Citizen Science community prompted the author to extend the concept of biological protection to the damages caused by the modern electromagnetic environment.<sup>20</sup> From this innovative drive, the concept of Praesidium was born—conceived as an “internal shield” for cellular resilience. This intuition later culminated in a fully developed scientific concept and the award of a United States patent<sup>21</sup> during his later years in Arizona.

This commitment led to the development of innovative protocols for complex pathologies such as autism, cancer, and certain chronic syndromes. An emblematic example of this integrative capacity is the formulation of the Ruggiero-Klinghardt (RK) Protocol,<sup>22</sup> born from a collaboration with Dr. Dietrich Klinghardt. This protocol introduced a genuine paradigm shift in the diagnosis and therapy of chronic conditions—including persistent Lyme disease, neurodegenerative diseases, and oncology—through the synergistic use of diagnostic and therapeutic ultrasonography. By utilizing ultrasound as a “provocation” tool to render pathogens, toxins, and compartmentalized transformed cells “visible” to the immune system and laboratory methods, the RK Protocol optimizes drug uptake and treatment efficacy in specific targeted body areas.

## The ultimate frontier: quantum biology, consciousness, and the Arizona synthesis (2015–2026)

His arrival in Arizona marked the beginning of a phase of profound synthesis in which molecular biochemistry merged with quantum physics, leading the author's research to challenge the boundaries of deterministic biology. At the core of this paradigm is the integration of the Orch OR (Orchestrated Objective Reduction) theory, proposed by

Stuart Hameroff (University of Arizona, Tucson) and Nobel Laureate Sir Roger Penrose (University of Oxford, UK).<sup>23,24</sup> The scientific robustness of the author's contributions in this field was attested by the presentation of his results at the 2022 and 2024 editions of the prestigious The Science of Consciousness (TSC) conference, held with the participation of the theory's founding fathers.

This dual expertise in traditionally distant fields such as immunology and radiology has found official recognition at the editorial level: the author serves as Editor-in-Chief for both the American Journal of Immunology (AJI) and the International Journal of Radiology and Radiation Therapy (IJRRT). This privileged position reflects the researcher's ability to integrate the microscopic analysis of molecular signals with the macroscopic vision of radiological imaging—a synthesis necessary for addressing complex subjects such as oncology, immunology, imaging science, and the science of consciousness.

In this context, a fundamental milestone is represented by the identification of the GcMAF receptor in human macrophages, published in IJRRT in 2024.<sup>25</sup> The discovery of the molecular “key” through which this protein transmits its signal provided definitive proof of GcMAF's mechanism of action, linking membrane biochemistry to the modulation of the cytoskeleton and intracellular informational processes.

The author's radiological expertise found its peak technological expression in the United States patent filed in 2021 and granted in 2024.<sup>21</sup> The invention concerns a revolutionary formulation to protect the organism from ionizing and non-ionizing radiation (including the 5G standard), based on biological quantum entanglement. The process utilizes Cherenkov radiation generated by natural isotopes to stimulate photosynthesis and induce DNA repair genes in commensal microorganisms, subsequently transferring this radio-resistance to human cells via the phage protein ORF252.<sup>18</sup> This technology allows for the protection of healthy tissues during radiotherapy, maximizing therapeutic efficacy on neoplastic cells.

Within this journey, the author's human and spiritual dimension assumes fundamental relevance; he has practiced Nichiren Shoshu Buddhism since 1979. This discipline has influenced every aspect of his life, including his academic rigor and the direction of his research. Two pioneering studies (2023–2024) examined the chanting of Nam-Myoho-Renge-Kyo. The first identified sound peaks at 8 Hz (Schumann resonance) and ‘solfeggio’ frequencies, which correlated with positive effects on the endocrine system and reduced oxidative stress. Using fNIRS spectroscopy, a significant increase in prefrontal-cortex activity was observed, together with heightened metabolic activity in probiotic cultures.<sup>26</sup> The second study investigated a novel psychoneuroimmunological pathway, detecting consistent variations in natural radioactivity (counts per second, CPS) during chanting (measured with RadiaCode 10X).<sup>27</sup> These data offer what is defined in the Buddhist tradition as “Actual Proof,” suggesting a measurable interaction between mind, biology, and the environment.

Finally, in his 2024 work on the natural intelligence of the immune system,<sup>28</sup> the author proposes that macrophages act as distributed quantum sensors. While the brain serves as a “reducing valve” for information (according to Aldous Huxley's famous definition), the immune system accesses the vast data of the microbiome, rendering consciousness a phenomenon interconnected with the energetic environment. The author's scientific path thus reaches an epistemological conclusion: the true understanding of life requires an act of intellectual freedom capable of uniting the precision of the

molecule, the vision of the radiologist, and the depth of quantum physics, under the sole guidance of Reason.

## Conclusions: reason and freedom of research as engines of scientific evolution

The scientific path delineated herein—which moves from thermodynamic theses on nutrition in 1981 to the heights of quantum biology in 2026—does not represent a terminal point; rather, it documents the extraordinary synthesis achieved in the author's first seventy years of life. The transition from collaborations with Nobel laureates to the chair of Molecular Biology in Florence, through to the editorial leadership of prestigious journals and the recognition of his innovative genius via a U.S. patent, portrays a researcher and inventor whose trajectory is in a phase of full ascent.

This trajectory demonstrates that the understanding of complex systems cannot be divorced from a vision that unites the infinitesimal scale of quantum signaling with the macroscopic image of the human body. The integration of Orch OR theory with the study of the immune system's natural intelligence has found fundamental clinical application in the RK Protocol, which has revolutionized the approach to chronic pathologies, and in the invention of solutions such as Bravo and Praesidium.

Relying on the power of these innovations and the tangible results they generate in terms of vitality and resilience, the author—with a touch of intentional irony grounded in the “actual proof” of his own biology—does not consider his task completed in the slightest. On the contrary, he plans to continue his investigation into the mysteries of life and consciousness for the next seventy years, intending to maintain the same spirit of discovery that characterized his first seven decades.

A cornerstone of this perennial intellectual youth is the practice of Nichiren Shoshu Buddhism, which since 1979 has served as a catalyst for an unprejudiced scientific inquiry. The pursuit of “Actual Proof” constitutes the bridge between mysticism and quantum physics, proving that life is an interconnected system of energy and consciousness that knows no fixed chronological limits.

In an era of centralized knowledge, the author's legacy resides in the reaffirmation of Reason and independence. The “Citizen Science” model, combined with the ability to identify fundamental mechanisms such as the GcMAF receptor or biological entanglement, indicates that intellectual freedom is the only antidote to stagnation. Biology is not understood here as inert matter, but as a manifestation of consciousness itself—a field of inquiry that the author intends to explore for a long time to come.

While this narrative focuses on the most significant milestones, the bibliography quoted in the EU Open Research Repository<sup>29</sup> constitutes the integral chronological collection of the author's scientific production to date. It is conceived as an integral part of this evolving profile, offering an exhaustive overview of over forty years of commitment, and remaining open to the numerous publications that will follow in the decades ahead.

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## Author's contribution

The sole author was responsible for the conceptualization, methodology, investigation, formal analysis, and data curation, as well as the preparation, visualization, and editing of the original manuscript.

## Conflicts of interest

The author is the founder of Silver Spring Sagl, the Swiss company producing some of the products whose inventions are described in this paper. He served as CEO of the company until his retirement in 2020. It is hereby declared that this article relies exclusively on data present in the scientific literature and in the public domain.

## Ethics

This article is original and contains material that has not been submitted or published in any scientific journal. A preprint version of this article is available in the EU Open Research Repository. <https://doi.org/10.5281/zenodo.18237385>

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