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HADRONIC MATHEMATICS, MECHANICS AND CHEMISTRY

Volume I:

Limitations of Einstein's Special and General Relativities, Quantum Mechanics and Quantum Chemistry

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This volume is dedicated to the memory of

Professor Jaak Lôhmus

of the Estonia Academy of Sciences, Tartu, one of the greatest experts in nonassociative algebras of the 20-th century, for nominating the author among the most illustrious applied mathematicians of all times, the only Italian name appearing in the list, for his paternity on the initiation in 1967 of research on the most general possible algebras as defined in mathematics, the Lie-admissible algebras, that are at the foundation of the covering hadronic mechanics. The nomination was done in 1990 during communist times without any advance contact with or knowledge by the author, although, after the collapse of the communist era, the author was one of the firsts to visit Tartu with his wife Carla to express his appreciation, following a rather memorable trip by train from Moscow and return, while the former USSR was in disarray. The nomination is here reported also to honor the memory of the American mathematician **A. A. Albert** *who conceived the Lie-admissible algebras in 1947, although without detailed study. It is regrettable that, following Prof. Lôhmus death in 2006, the Estonia Academy of Sciences has been under criticisms by organized interests opposing the research reported in these volumes for evident personal gains. Consequently, the International Committee on Scientific Ethics and Accountability (www.scientificethics.org) has organized a monitoring of these misconducts for appropriate treatment.*


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ТАРТУ 1990 TARTU

Figure 0.1. The front page of the nomination in Russian.

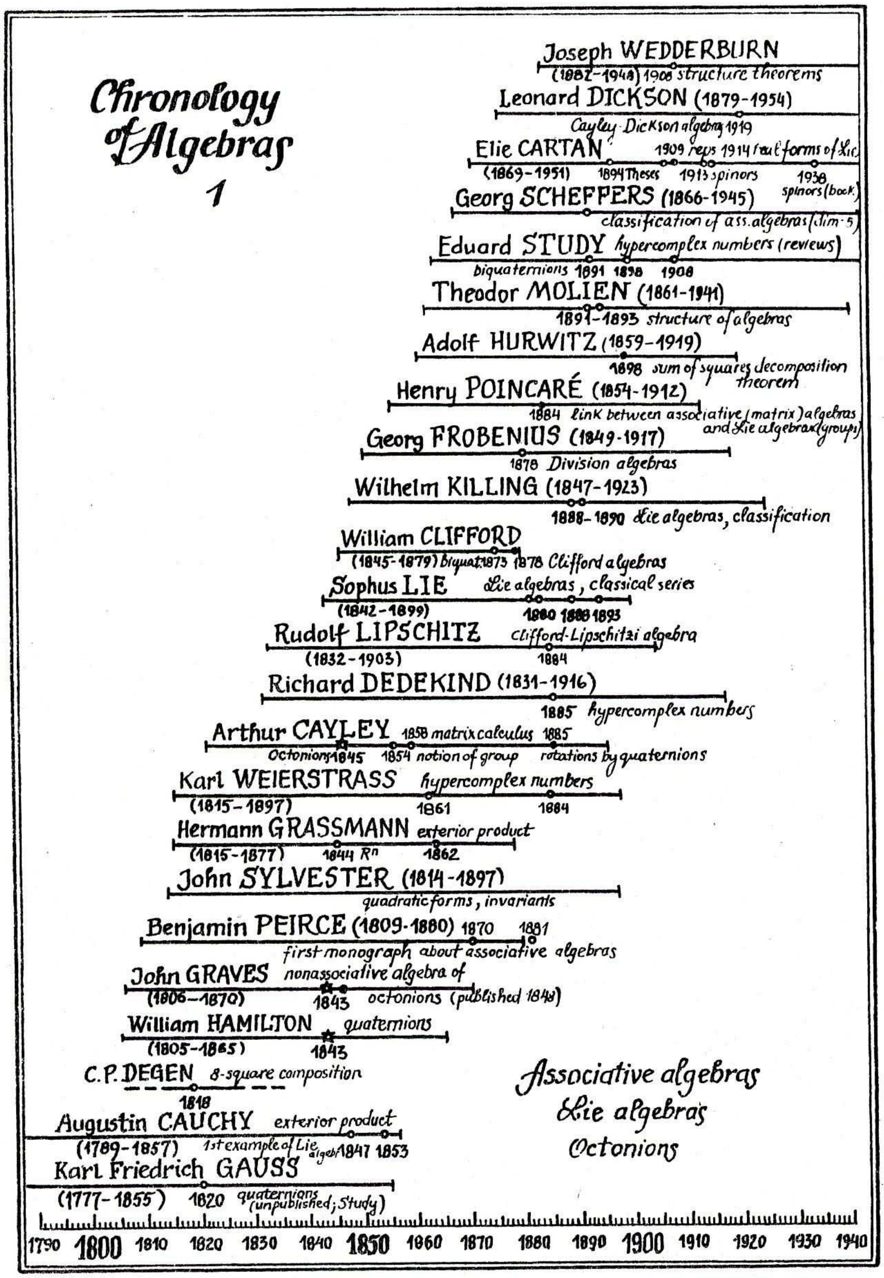

Figure 0.2. The second page of the nomination.

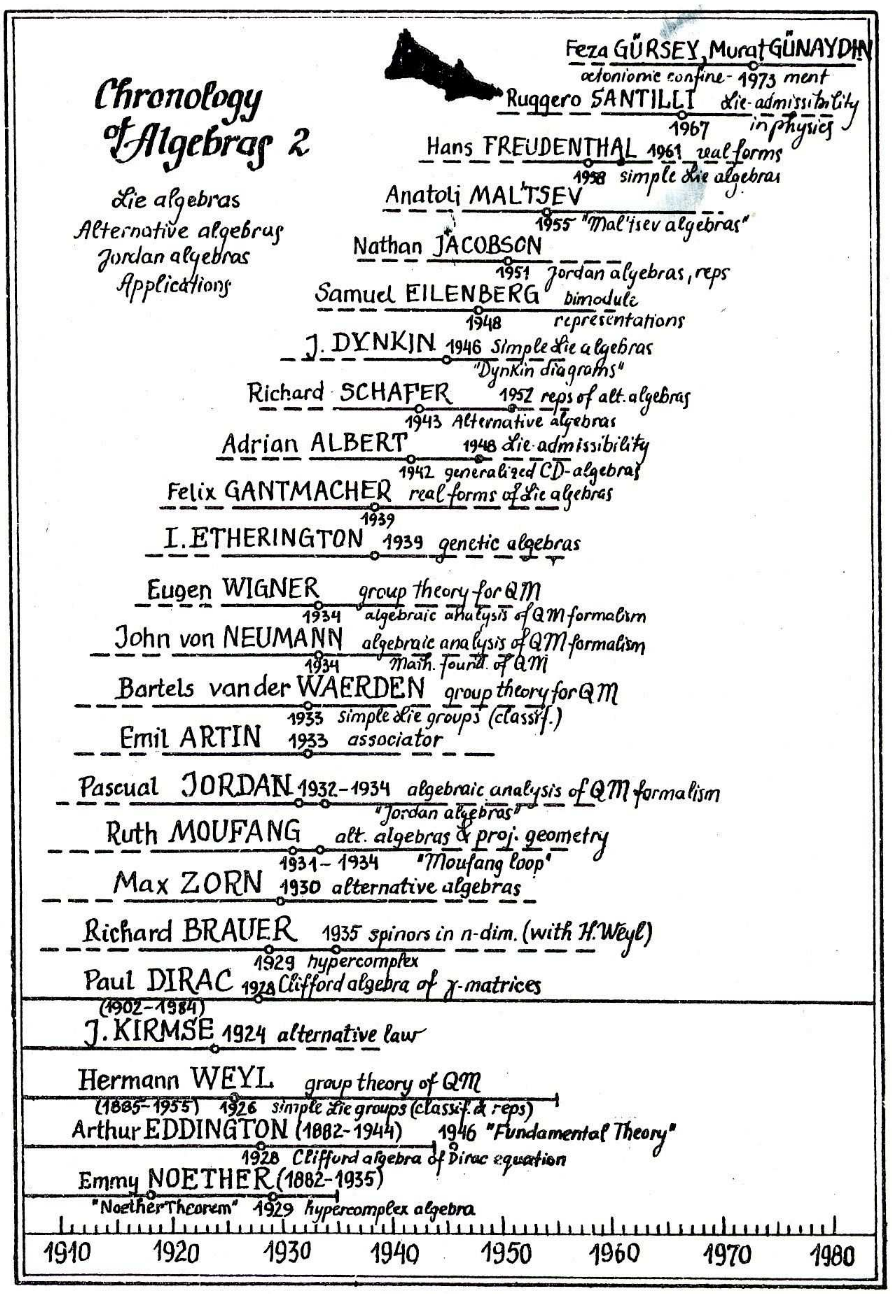

Figure 0.3. The second page of the nomination referring to a lifetime of research following the first article in the deformation of Lie algebras into Lie-admissible algebras appeared in a physics journal following only three articles in pure mathematics journals, R. M. Santilli, Nuovo Cimento **51**, 570 (1967).

Contents

Foreword

Mathematics is a subject which possibly finds itself in a unique position in academia in that it is viewed as both an Art and a Science. Indeed, in different universities, graduates in mathematics may receive Bachelor Degrees in Arts or Sciences. This probably reflects the dual nature of the subject. On the one hand, it may be studied as a subject in its own right. In this sense, its own beauty is there for all to behold; some as serene as da Vinci's "Madonna of the Rocks", other as powerful and majestic as Michelangelo's glorious ceiling of the Sistine Chapel, yet more bringing to mind the impressionist brilliance of Monet's Water Lily series. It is this latter example, with the impressionists interest in light, that links up with the alternative view of mathematics; that view which sees mathematics as the language of science, of physics in particular since physics is that area of science at the very hub of all scientific endeavour, all other branches being dependent on it to some degree. In this guise, however, mathematics is really a tool and any results obtained are of interest only if they relate to what is found in the real world; if results predict some effect, that prediction must be verified by observation and/or experiment. Again, it may be remembered that physics is really a collection of related theories. These theories are all manmade and, as such, are incomplete and imperfect. This is where the work of Ruggero Santilli enters the scientific arena.

Although "conventional wisdom" dictates otherwise, both the widely accepted theories of relativity and quantum mechanics, particularly quantum mechanics, are incomplete. The qualms surrounding both have been muted but possibly more has emerged concerning the inadequacies of quantum mechanics because of the people raising them. Notably, although it is not publicly stated too frequently, Einstein had grave doubts about various aspects of quantum mechanics. Much of the worry has revolved around the role of the observer and over the question of whether quantum mechanics is an objective theory or not. One notable contributor to the debate has been that eminent philosopher of science, Karl Popper. As discussed in my book, "Exploding a Myth", Popper preferred to refer to the experimentalist rather than observer, and expressed the view that that person played the same role in quantum mechanics as in classical mechanics. He felt, therefore, that such a person was there to test the theory. This is totally opposed to the Copenhagen Interpretation which claims that "objective reality has evaporated" and "quantum mechanics does not represent particles, but rather our knowledge, our observations, or our consciousness, of particles". Popper points out that, over the years, many eminent physicists have switched allegiance from the pro-Copenhagen view. In some ways, the most important of these people was David Bohm, a greatly respected thinker on scientific matters who wrote a book presenting the Copenhagen view of quantum mechanics in minute detail. However, later, apparently under Einstein's influence, he reached the conclusion that his previous view had been in error and also declared the total falsity of the constantly repeated dogma that the quantum theory is complete. It was, of course, this very question of whether or not quantum mechanics is complete which formed the basis of the disagreement between Einstein and Bohr; Einstein stating "No", Bohr "Yes".

However, where does Popper fit into anything to do with Hadronic Mechanics? Quite simply, it was Karl Popper who first drew public attention to the thoughts and ideas of Ruggero Santilli. Popper reflected on, amongst other things, Chadwick's neutron. He noted that it could be viewed, and indeed was interpreted originally, as being composed of a proton and an electron. However, again as he notes, orthodox quantum mechanics offered no viable explanation for such a structure. Hence, in time, it became accepted as a new particle. Popper then noted that, around his (Popper's) time of writing, Santilli had produced an article in which the "first structure model of the neutron" was revived by "resolving the technical difficulties which had led, historically, to the abandonment of the model". It is noted that Santilli felt the difficulties were all associated with the assumption that quantum mechanics applied within the neutron and disappeared when a generalised mechanics is used. Later, Popper goes on to claim Santilli to belong to a new generation of scientists which seemed to him to move on a different path. Popper identifies quite clearly how, in his approach, Santilli distinguishes the region of the arena of incontrovertible applicability of quantum mechanics from nuclear mechanics and hadronics. He notes also his most fascinating arguments in support of the view that quantum mechanics should not, without new tests, be regarded as valid in nuclear and hadronic mechanics.

Ruggero Santilli has devoted his life to examining the possibility of extending the theories of quantum mechanics and relativity so that the new more general theories will apply in situations previously excluded from them. To do this, he has had to go back to the very foundations and develop new mathematics and new mathematical techniques. Only after these new tools were developed was he able to realistically examine the physical situations which originally provoked this lifetime's work. The actual science is his, and his alone, but, as with the realization of all great endeavours, he has not been alone. The support and encouragement he has received from his wife Carla cannot be exaggerated. In truth, the scientific achievements of Ruggero Santiili may be seen, in one light, as the results of a team effort; a team composed of Ruggero himself and Carla Gandiglio in Santilli. The theoretical foundations of the entire work are contained in this volume; a volume which should be studied rigorously and with a truly open mind by the scientific community at large. This volume contains work which might be thought almost artistic in nature and is that part of the whole possessing the beauty so beloved of mathematicians and great artists. However, the scientific community should reserve its final judgement until it has had a chance to view the experimental and practical evidence which may be produced later in support of this elegant new theoretical framework.

Jeremy Dunning-Davies,
Physics Department,
University of Hull,
England.
September 8, 2007

Preface

Our planet is afflicted by increasingly cataclysmic climactic changes. The only possibility for their containment is the development of new, clean, energies and fuels. But, all possible energies and fuels that could be conceived with Einsteinian doctrines, quantum mechanics, and quantum chemistry had been discovered by the middle of the 20-th century, and they all resulted in being environmentally unacceptable either because of an excessive production of atmospheric pollutants, or because of the release of harmful waste.

Hence, the scientific community of the 21-st century is faced with the quite complex duties of, firstly, broadening conventional theories into forms permitting the prediction and quantitative study of new clean energies and fuels and, secondly, developing them up to the needed industrial maturity.

Due to organized interests in science, Einsteinian doctrines, quantum mechanics and quantum chemistry are generally depicted, particularly in Ph.D. schools in physics and chemistry, as being the final theories of nature.

In reality, it is known by experts to qualify as such, but rarely spoken, that *Einsteinian doctrines, quantum mechanics, and quantum chemistry cannot possibly be exactly valid for energy releasing processes because the said theories are invariant under time reversal, while all energy releasing processes are irreversible in time.*

As an illustration, it has been proved by graduate students in physics that, the insistent assumption of Einstein's special relativity and quantum mechanics as being exactly valid for the fusion of two nuclei into a third, $N_1 + N_2 \rightarrow N_3$ yields a finite probability of the *spontaneous* decay of the third nucleus into the original ones, $N_3 \rightarrow N_1 + n_2$, which prediction is nonscientific nonsense due to the irreversibility of the nuclear synthesis here considered. There is no need to repeat the calculations because the above inconsistency is a necessary consequence of the invariance of Einsteinian doctrines and quantum mechanics under time reversal.

Similarly, it has been proved by graduate students in chemistry that the insistent assumption of quantum chemistry as being exactly valid for an energy releasing chemical reaction, such as that of water, $2H + O \rightarrow H_2O$, yields a finite probability for the *spontaneous* disintegration of water into the original atomic constituents, $H_2O \rightarrow 2H + O$, that is also nonscientific nonsense. Again, there is no need to repeat the calculations because a given energy releasing chemical reaction and its time reversal image are statistically equivalent for quantum chemistry due to its invariance under time reversal.

The above unequivocal insufficiency of Einsteinian doctrines, quantum mechanics and quantum chemistry for energy releasing processes is amply sufficient, per se, to warrant systematic studies for their surpassing with structurally irreversible theories, namely, theories that are irreversible in time for all possible Hamiltonians, since the latter are known to be time reversal invariant. In turn, this task cannot possibly be accomplished without a broadening (called *lifting*) of the mathematics underlying orthodox theories.

The above insufficiency is also amply sufficient, per se, to denounce as scientific corruption for personal gains any objection, obstruction, or opposition to the broadening of Einsteinian doctrines, particularly when proffered by scientists at qualified institutions.

Besides the above incontrovertible limitations, orthodox theories have a number of limitations, insufficiencies or sheer inconsistencies that are well known to experts, but are not generally identified in the orthodox literature for the seemingly studious, or *de facto* implied intent of protecting organized interests on Einsteinian doctrines.

In this first volume, we shall identify in detail litany of insufficiencies, limitations or sheer inconsistencies of Einsteinian doctrines, quantum mechanics and quantum chemistry that have been generally suppressed in the technical literature by ascientific interests in science, let alone addressed and disproved. We shall also initiate the denunciation of said ascientific interests in science because, without their containment, no basic advance of human knowledge is conceivably possible, as well known by all scientists who dared to surpass Einsteinian doctrines.

The resolution of said limitations, insufficiencies or sheer inconsistencies will be presented in subsequent volumes via, firstly, the broadening of a 20-th century mathematics, then the construction of covering theories, and then their experimental verification and industrial applications.

Ruggero Maria Santilli
January 19, 2008

Legal Notice

The underwriter Ruggero Maria Santilli states the following:

1) To be the sole person responsible for the content of *Hadronic Mathematics, Mechanics and Chemistry,* Volumes I and II; to be the sole owner of the Copyrights on these two volumes; and to have recorded, beginning with 1992, the copyright ownership of a number of his main contributions in the field.

2) The undersigned hereby authorizes anybody to copy, and/or use, and/or study, and/or criticize and /or develop, and/or apply any desired part of these volumes without any advance authorization by the Copyrights owner under the sole condition of implementing known rules of scientific ethics, namely: 2A) The originating papers are clearly quoted in the initial parts; 2B) Scientific paternity are clearly identified and documented; and 2C) Any desired additional papers are additionally quoted at will, provided that they are directly relevant and quoted in chronological order. Violators of these known ethical rules will be notified with a request of immediate corrections essentially consisting publishing missed basic references. In the event of delays or undocumented excuses, authors who violate the above standard rules of scientific ethics will be prosecuted in the U. S. Federal Court jointly with their affiliations and funding sources.

3) There are insisting rumors that organized interests in science are waiting or the author's death to initiate premeditated and organized actions for paternity fraud via the known scheme, often used in the past, based on new papers in the field without the identification of the author's paternity, which papers are then quickly quoted as originating papers by pre-set accomplices and the fraud is then accepted by often naive or ignorant followers merely blinded by the academic credibility of the schemers. Members of these rumored rings should be aware that the industrial applications of hadronic mathematics, mechanics and chemistry have already provided sufficient wealth to set up a Paternity Protection Trust solely funded to file lawsuits against immoral academicians attempting paternity fraud, their affiliations and their funding agencies.

This legal notice has been made necessary because, as shown in Section 1.5, the author has been dubbed "the most plagiarized scientist of the 20-th century," as it is the case of the thousands of papers in deformations published without any quotation of their origination by the author in 1967. These, and other attempted paternity frauds, have forced the author to initiate legal action reported in web site [1].

In summary, honest scientists are encouraged to copy, and/or study, and/or criticize, and/or develop, and/or apply the formulations presented in these volumes in any way desired without any need of advance authorization by the copyrights owner, under the sole conditions of implementing standard ethical rules 2A, 2B, 2C. Dishonest academicians, paternity fraud dreamers, and other schemers are warned that legal actions to enforce scientific ethics are already under way [1], and will be continued after the author's death.

In faith

Ruggero Maria Santilli

U. S. Citizen acting under the protection of the First Amendment of the U. S. Constitution guaranteeing freedom of expression particularly when used to contain asocial misconducts.

Tarpon Springs, Florida, U. S. A.

October 11, 2007

[1] International Committee on Scientific Ethics and Accountability
http://www.scientificethics.org

Acknowledgments

The author expresses his deepest appreciation in memory of:

— The late Werner Heisenberg, for supporting in epistolary exchanges studies a nonlinear generalization of his celebrated equation (today known as Heisenberg-Santilli isotopic, genotopic and hyperstructural equations at the foundations of hadronic mechanics), with particular reference to their treatment via a new mathematics capable of reconstructing linearity on generalized spaces over generalized fields, since Heisenberg dedicated his last years to the evident nonlinear character of nature;;

— The late Paul A. M. Dirac, for supporting in a short but memorable meeting reviewed in Section 6.2.8, nonunitary liftings of his celebrated equation (today known as Dirac-Santilli isotopic, genotopic and hyperstructural equations) for the representation of an electron within the hyperdense medium inside the proton, with particular reference to the development of a new mathematics eliminating the vexing divergencies in particle physics, since Dirac spent his last years in attempting the elimination of divergencies amidst strong opposition by organized interests on quantum chromodynamical theologies;

— The late British philosopher Karl Popper, for his strong support in the construction of hadronic mechanics, as shown in the Preface of his last book *Quantum Theory and the Schism in Physics;*

— The late Ilya Prigogine, for pioneering the need of nonunitary broadening of quantum mechanics and statistics and his personal support for the organization of the *Hadronic Journal* since its inception;

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— The late American mathematician Robert Oehmke for pioneering work on the Lie-admissible structure of hadronic mechanics;

— The late Estonian mathematician Jaak Löhmus whose studies on nonassociative algebras, with particular reference to the octonion algebra, have been particularly inspiring for the construction of hadronic mechanics;

— and other scholars who will be remembered by the author until the end of his life.

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Thanks are finally due to Prof. Richard Koch of the University of Oregon for assistance in composing this monograph with TexShop, and to Dr. I. S. Gandzha for assistance in the LaTeX composition, without which help these volumes would not have been printed. Thanks are finally due to various colleagues for a technical control, including Drs. G. Mileto, M. Sacerdoti and others, and to Mrs. Dorte Zuckerman for proofreading assistance. Needless to say, the author is solely responsible for the content of this monograph due also to several additions and improvements in the final version.

Chapter 1

SCIENTIFIC IMBALANCES OF THE TWENTIETH CENTURY

1.1 THE SCIENTIFIC IMBALANCE CAUSED BY ANTIMATTER

1.1.1 Needs for a Classical Theory of Antimatter

The first large scientific imbalances of the 20-th century studied in this monograph is that caused by the treatment of *matter* at all possible levels, from Newtonian to quantum mechanics, while *antimatter* was solely treated at the level of *second quantization* [1].

Besides an evident lack of scientific democracy in the treatment of matter and antimatter, the lack of a consistent *classical* treatment of antimatter left open a number of fundamental problems, such as the inability to study whether a faraway galaxy or quasar is made up of matter or of antimatter, because such a study requires first a classical representation of the gravitational field of antimatter, as an evident pre-requisite for the quantum treatment (see Figure 1.1).

It should be indicated that classical studies of antimatter simply cannot be done by merely reversing the sign of the charge, because of inconsistencies due to the existence of only one quantization channel. In fact, the quantization of a classical antiparticle solely characterized by the reversed sign of the charge leads to a *particle* (rather than a charge conjugated antiparticle) with the wrong sign of the charge.

It then follows that the treatment of the gravitational field of suspected antimatter galaxies or quasars cannot be consistently done via the Riemannian geometry in which there is a simple change of the sign of the charge, as rather popularly done in the 20-th century, because such a treatment would be structurally inconsistent with the quantum formulation.

At any rate, the most interesting astrophysical bodies that can be made up of antimatter are *neutral.* In this case general relativity and its underlying Rieman-

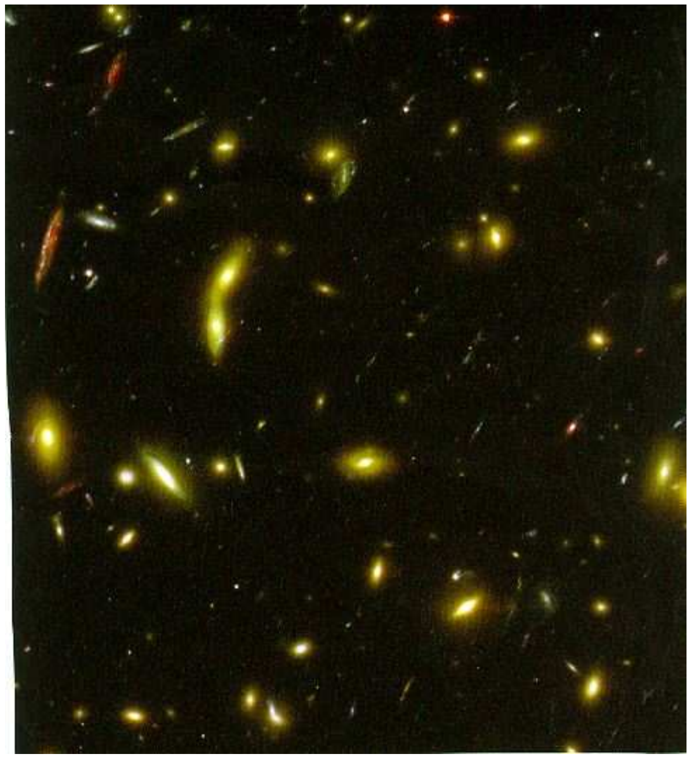

Figure 1.1. An illustration of the first major scientific imbalance of the 20-th century studied in this monograph, the inability to conduct classical quantitative studies as to whether faraway galaxies and quasars are made-up of matter or of antimatter. In-depth studies have indicated that the imbalance was not due to insufficient physical information, but instead it was due to the lack of a mathematics permitting the classical treatment of antimatter in a form compatible with charge conjugation at the quantum level.

nian geometry can provide no difference at all between matter and antimatter stars due to the null total charge. The need for a suitable new theory of antimatter then becomes beyond credible doubt.

As we shall see in Chapter 14, besides all the above insufficiencies, the biggest imbalance in the current treatment of antimatter occurs at the level of grand unifications, since all pre-existing attempts to achieve a grand unification of electromagnetic, weak and gravitational interactions are easily proved to be inconsistent under the request that the unification should hold not only for matter, as universally done until now, but also for antimatter. Hence, prior to venturing judgments on the need for a new theory of antimatter, serious scholars are suggested to inspect the entire scientific journey including the iso-grand-unification of Chapter 14.

1.1.2 The Mathematical Origin of the Imbalance

The origin of this scientific imbalance was not of physical nature, because it was due to the *lack of a mathematics suitable for the classical treatment of antimatter in such a way as to be compatible with charge conjugation at the quantum level.*

Charge conjugation is an *anti-homomorphism.* Therefore, a necessary condition for a mathematics to be suitable for the classical treatment of antimatter is that of being anti-homomorphic, or, better, anti-isomorphic to conventional mathematics.

Therefore, the classical treatment of antimatter requires *numbers, fields, functional analysis, differential calculus, topology, geometries, algebras, groups, symmetries, etc. that are anti-isomorphic to their conventional formulations for matter.*

The absence in the 20-th century of such a mathematics is soon established by the lack of a formulation of trigonometric, differential and other elementary functions, let alone complex topological structures, that are anti-isomorphic to the conventional ones.

In the early 1980s, due to the absence of the needed mathematics, the author was left with no other alternative than its construction along the general guidelines of hadronic mechanics, namely, the construction of the needed mathematics from the physical reality of antimatter, rather than adapting antimatter to pre-existing insufficient mathematics.[1]

After considerable search, the needed new mathematics for antimatter resulted in being characterized by the most elementary and, therefore, most fundamental possible assumption, that of a *negative unit,*

$$-1, \tag{1.1.1}$$

and then the reconstruction of the entire mathematics and physical theories of matter in such a way as to admit -1 as the correct left and right unit at all levels.

In fact, such a mathematics resulted in being anti-isomorphic to that representing matter, applicable at all levels of study, and resulting in being equivalent to charge conjugation after quantization.[2]

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[1]In the early 1980s, when the absence of a mathematics suitable for the classical treatment of antimatter was identified, the author was (as a theoretical physicist) a member of the Department of Mathematics at Harvard University. When seeing the skepticism of colleagues toward such an absence, the author used to suggest that colleagues should go to Harvard's advanced mathematics library, select any desired volume, and open any desired page at random. The author then predicted that the mathematics presented in that page resulted in being fundamentally inapplicable to the classical treatment of antimatter, as it did indeed result to be the case without exceptions. In reality, the entire content of advanced mathematical libraries of the early 1980s did not contain the mathematics needed for a consistent classical treatment of antimatter.

[2]In 1996, the author was invited to make a 20 minutes presentation at a mathematics meeting held in Sicily. The presentation initiated with a transparency solely containing the number -1 and the statement

1.1.3 Outline of the Studies on Antimatter

Recall that "science" requires a mathematical treatment producing numerical values that can be confirmed by experiments. Along these lines, Chapter 2 is devoted, first, to the presentation of the new mathematics suggested by the author for the classical treatment of antimatter under the name of *isodual mathematics* with Eq. (1.1.1) as its fundamental *isodual left and right unit.*

The first comprehensive presentation was made by the author in monograph [94]. The first is, however, in continuous evolution, thus warranting an update.

Our study of antimatter initiates in Chapter 2 where we present the classical formalism, proposed under the name of *isodual classical mechanics* that begins with a necessary reformulation of Newton's equations and then passes to the needed analytic theory.

The operator formulation turned out to be *equivalent,* but not identical, to the quantum treatment of antiparticles, and was submitted under the name of *isodual quantum mechanics.*

Following these necessary foundational studies, Chapter 2 includes the detailed verification that the new *isodual theory of antimatter* does indeed verify *all* classical and particle experimental evidence.

In subsequent chapters we shall then study some of the predictions of the new isodual theory of antimatter, such as antigravity, a causal time machine, the isodual cosmology in which the universe has null total characteristics, and other predictions that are so far reaching as to be at the true edge of imagination.

All these aspects deal with point-like antiparticles. The study of extended, nonspherical and deformable antiparticles (such as the antiproton and the antineutron) initiates in Chapter 3 for reversible conditions and continues in the subsequent chapters for broader irreversible and multi-valued conditions.

1.2 THE SCIENTIFIC IMBALANCE CAUSED BY NONLOCAL-INTEGRAL INTERACTIONS

1.2.1 Foundations of the Imbalance

The second large scientific imbalance of the 20-th century studied in this monograph is that caused by the *reduction of contact nonlocal-integral interactions among extended particles to pre-existing action-at-a-distance local-differential interactions among point-like particles* (see Figure 1.2).

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that such a number was assumed as the basic left and right unit of the mathematics to be presented. Unfortunately, this first transparency created quite a reaction by most participants who bombarded the author with questions advancing his presentation, questions often repeated with evident waste of precious time without the author having an opportunity to provide a technical answer. This behavior continued for the remaining of the time scheduled for the talk to such an extent that the author could not present the subsequent transparencies proving that numbers with a negative unit verify all axioms of a field (see Chapter 2). The case illustrates that the conviction of absolute generality is so engraved among most mathematicians to prevent their minds from admitting the existence of *new* mathematics.

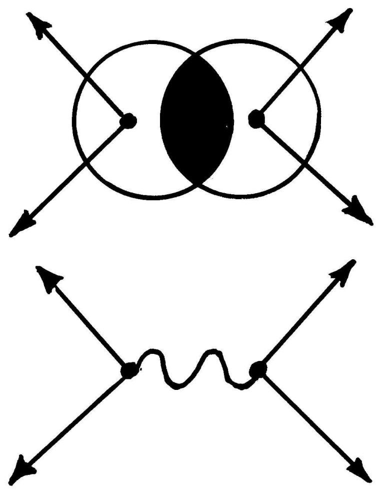

Figure 1.2. A first illustration of the second major scientific imbalance of the 20-th century studied in this monograph, the abstraction of extended hyperdense particles, such as protons and neutrons, to points, with consequential ignorance of the nonlocal and nonpotential effects caused by the deep overlapping of the hyperdense media in the interior of said particles. As we shall see, besides having major scientific implications, such as a necessary reformulation of Feynman's diagrams, the quantitative treatment of the nonlocal and nonpotential effects of this figure permits truly momentous advances, such as the conversion of divergent perturbative series into convergent forms, as well as the prediction and industrial development of basically new, clean energies and fuels.

It should be indicated that there exist numerous definitions of "nonlocality" in the literature, a number of which have been adapted to be compatible with pre-existing doctrines. The notion of nonlocality studied by hadronic mechanics is that specifically referred to *interactions of contact type not derivable from a potential and occurring in a surface, as for the case of resistive forces, or in a volume, as for the case of deep mutual penetration and overlapping of the wavepackets and/or charge distributions of particles.*

The imbalance was mandated by the fact (well known to experts to qualify as such) that *nonlocal-integral and nonpotential interactions are structurally incompatible with quantum mechanics and special relativity*, beginning with its local-differential topology, because the interactions here considered cause the catastrophic collapse of the mathematics underlying special relativity, let alone the irreconcilable inapplicability of the physical laws.

In fact, the local-differential topology, calculus, geometries, symmetries, and other mathematical methods underlying special relativity permit the sole consistent description of *a finite number of point-like particles moving in vacuum* *(empty space).* Since points have no dimension and, consequently, cannot experience collisions or contact effects, the only possible interactions are at-a-distance, thus being derivable from a potential. The entire machinery of special relativity then follows. For systems of particles at large mutual distances for which the above setting is valid, such as for the structure of the hydrogen atom, special relativity is then *exactly valid.*

However, classical point-like particles do not exist; hadrons are notoriously extended; and even particles with *point-like charge,* such as the electron, do not have "point-like wavepackets". As we shall see, the representation of particles and/or their wavepackets as they really are in nature, that is, extended, generally nonspherical and deformable, cause the existence of contact effects of nonlocal-integral as well as zero-range nonpotential type that are beyond any hope of quantitative treatment via special relativity.

This is the case for all systems of particles at short mutual distances, such as the structure of hadrons, nuclei and stars, for which special relativity is *inapplicable* (rather than "violated") because not conceived or intended for the latter systems. The understanding is that the *approximate character* remains beyond scientific doubt.

Well known organized academic interests on Einsteinian doctrines then mandated the abstraction of nonlocal-integral systems to point-like, local-differential forms as a necessary condition for the validity of special relativity. This occurrence caused a scientific distortion of simply historical proportions because, while the existence of systems for which special relativity is fully valid is beyond doubt, the assumption that all conditions in the universe verify Einsteinian doctrines is a scientific deception for personal gains.

In Section 1.1 and in Chapter 2, we show the structural inability of special relativity to permit a *classical* representation of antimatter in a form compatible with charge conjugation. In this section and in Chapter 3, we show the inability of special relativity to represent extended, nonspherical and deformable particles or antiparticles and/or their wavepackets under nonlocal-integral interactions at short distances.

In Section 1.3 and in Chapter 4, we show the irreconcilable inapplicability of special relativity for all possible, classical and operator irreversible systems of particles and antiparticles. The widely ignored theorems of catastrophic inconsistencies of Einstein's gravitation are studied in Section 1.4 and in Chapter 3.

A primary purpose of this monograph is to show that the political adaptation of everything existing in nature to special relativity, rather than constructing new relativities to properly represent nature, prevents the prediction and quantitative treatment of new clean energies and fuels so much needed by mankind. In fact, new clean energies are permitted precisely by contact, nonlocal-integral and nonpotential effects in hadrons, nuclei and stars that are beyond any dream of treatment via special relativity.

Therefore, *the identification of the limits of applicability of Einsteinian doctrines and the construction of new relativities are nowadays necessary for scientific accountability vis-a-vis society, let alone science.*

Needless to say, due to the complete symbiosis of special relativity and relativistic quantum mechanics, the inapplicability of the former implies that of the latter, and vice-versa. In fact, quantum mechanics will also emerge from our studies as being only *approximately valid* for system of particles at short mutual distances, such as for hadrons, nuclei and stars, for the same technical reasons implying the lack of exact validity of special relativity.

The resolution of the imbalance due to nonlocal interactions is studied in Chapter 3.

1.2.2 Exterior and Interior Dynamical Problems

The identification of the scientific imbalance here considered requires the knowledge of the following fundamental distinction:

DEFINITION 1.2.1: Dynamical systems can be classified into:

EXTERIOR DYNAMICAL SYSTEMS, consisting of particles at sufficiently large mutual distances to permit their point-like approximation under sole action-at-a-distance interactions, and

INTERIOR DYNAMICAL PROBLEMS, consisting of extended and deformable particles at mutual distances of the order of their size under action-at-a-distance interactions as well as contact nonpotential interactions.

Interior and exterior dynamical systems of antiparticles are defined accordingly.

Typical examples of exterior dynamical systems are given by planetary and atomic structures. Typical examples of interior dynamical systems are given by the structure of planets at the classical level and by the structure of hadrons, nuclei, and stars at the operator level.

The distinction of systems into exterior and interior forms dates back to Newton [2], but was analytically formulated by Lagrange [3], Hamilton [4], Jacobi[3][5] and others (see also Whittaker [6] and quoted references). The distinction was still assumed as fundamental at the beginning of the 20-th century, but thereafter the distinction was ignored.

[3]Contrary to popular belief, the celebrated Jacobi theorem was formulated precisely for the general analytic equations with external terms, while all reviews known to this author in treatises on mechanics of the 20-th century present the reduced version of the Jacobi theorem for the equations without external terms. Consequently, the reading of the original work by Jacobi [5] is strongly recommended over simplified versions.

For instance, Schwarzschild wrote two papers in gravitation, one of the *exterior gravitational problem* [7], and a second paper on the *interior gravitational problem* [8]. The former paper reached historical relevance and is presented in all subsequent treatises in gravitation of the 20-th century, but the same treatises generally ignore the second paper and actually ignore the distinction into gravitational exterior and interior problems.

The reasons for ignoring the above distinction are numerous, and have yet to be studied by historians. A first reason is due to the widespread abstraction of particles as being point-like, in which case all distinctions between interior and exterior systems are lost since all systems are reduced to point-particles moving in vacuum.

An additional reason for ignoring interior dynamical systems is due to the great successes of the planetary and atomic structures, thus suggesting the reduction of all structures in the universe to exterior conditions.

In the author's view, the primary reason for ignoring interior dynamical systems is that they imply the inapplicability of the virtual totality of theories constructed during the 20-th century, including classical and quantum mechanics, special and general relativities, etc., as we shall see.

The most salient distinction between exterior and interior systems is the following. Newton wrote his celebrated equations for a system of n point-particle under an arbitrary force not necessarily derivable from a potential,

$$m_a \times \frac{dv_{ak}}{dt} = F_{ak}(t, r, v), \tag{1.2.1}$$

where: $k = 1, 2, 3;\quad a = 1, 2, 3, ..., n$; t is the time of the observer; r and v represent the coordinates and velocities, respectively; and the conventional associative multiplication is denoted hereon with the symbol $\times$ to avoid confusion with numerous additional inequivalent multiplications we shall identify during our study.

Exterior dynamical systems occur when Newton's force F_{ak} is entirely derivable from a potential, in which case the system is entirely described by the sole knowledge of a Lagrangian or Hamiltonian and the *truncated Lagrange and Hamilton analytic equations, those without external terms*

$$\frac{d}{dt}\frac{\partial L(t, r, v)}{\partial v_a^k} - \frac{\partial L(t, r, v)}{\partial r_a^k} = 0, \tag{1.2.2a}$$

$$\frac{dr_a^k}{dt} = \frac{\partial H(t, r, p)}{\partial p_{ak}}, \quad \frac{dp_{ak}}{dt} = -\frac{\partial H(t, r, p)}{\partial r_a^k}, \tag{1.2.2b}$$

$$L = \frac{1}{2} \times m_a \times \mathbf{v}_a^2 - V(t, r, v), \tag{1.2.2c}$$

$$H = \frac{\mathbf{p}_a^2}{2 \times m_a} + V(t, r, p), \tag{1.2.2d}$$

$$V = U(t, r)_{ak} \times v_a^k + U_o(t, r); \tag{1.2.2e}$$

where: $\mathbf{v}$ and $\mathbf{p}$ represent three-vectors; and the convention of the sum of repeated indices is hereon assumed.

Interior dynamical systems when Newton's force F_{ak} is partially derivable from a potential and partially of contact, zero-range, nonpotential types thus admitting additional interactions that simply cannot be represented with a Lagrangian or a Hamiltonian. For this reason, Lagrange, Hamilton, Jacobi and other founders of analytic dynamics presented their celebrated equations with *external terms representing precisely the contact, zero-range, nonpotential forces among extended particles.* Therefore, the treatment of interior systems requires the *true Lagrange and Hamilton analytic equations, those with external terms*

$$\frac{d}{dt}\frac{\partial L(t, r, v)}{\partial v_a^k} - \frac{\partial L(t, r, v)}{\partial r_a^k} = F_{ak}(t, r, v), \tag{1.2.3a}$$

$$\frac{dr_a^k}{dt} = \frac{\partial H(t, r, p)}{\partial p_{ak}}, \quad \frac{dp_{ak}}{dt} = -\frac{\partial H(t, r, p)}{\partial r_a^k} + F_{ak}(t, r, p), \tag{1.2.3b}$$

$$L = \frac{1}{2} \times m_a \times \mathbf{v}_a^2 - V(t, r, v), \tag{1.2.3c}$$

$$H = \frac{\mathbf{p}_a^2}{2 \times m_a} + V(t, r, p), \tag{1.2.3d}$$

$$V = U(t, r)_{ak} \times v_a^k + U_o(t, r), \tag{1.2.3e}$$

$$F(t, r, v) = F(t, r, p/m). \tag{1.2.3f}$$

Comprehensive studies were conducted by Santilli in monographs [9] (including a vast historical search) on the necessary and sufficient conditions for the existence of a Lagrangian or a Hamiltonian known as the *conditions of variational selfadjointness.* These studies permitted a rigorous separation of all acting forces into those derivable from a potential, or variationally selfadjoint (SA) forces, and those not derivable from a potential, or variationally nonselfadjoint (NSA) forces according to the expression

$$F_{ak} = F_{ak}^{SA}(t, r, v) + F_{ak}^{NSA}(t, r, v, a, ...). \tag{1.2.4}$$

In particular, the reader should keep in mind that, while selfadjoint forces are of Newtonian type, *nonselfadjoint forces are generally non-Newtonian,* in the sense

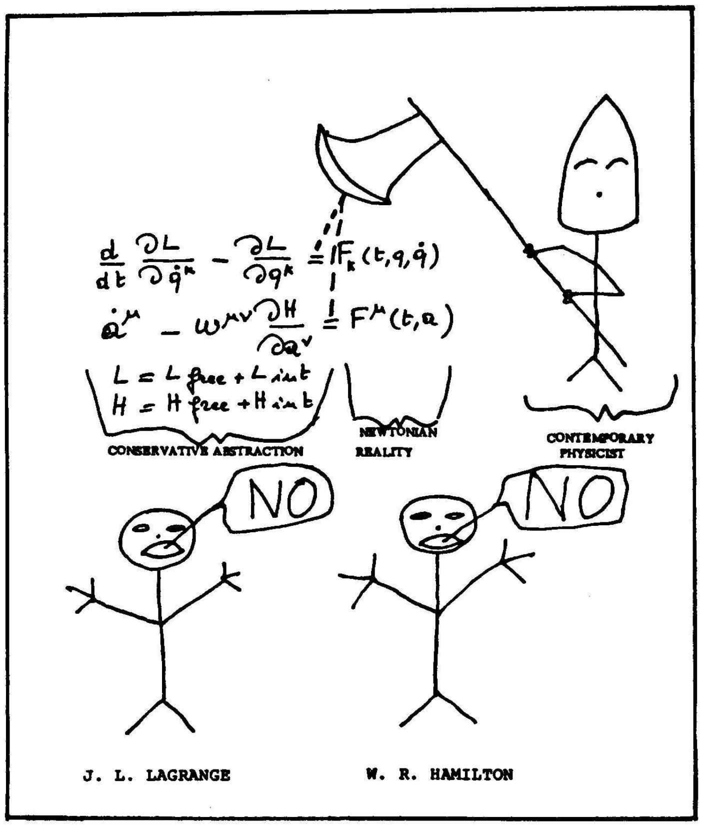

Figure 1.3. A reproduction of a “vignetta” presented by the author in 1978 to the colleagues at the Lyman Laboratory of Physics of Harvard University as part of his research under his DOE contract number DE-ACO2-80ER-10651.A001 to denounce the truncation of the external terms in Lagrange’s and Hamilton’s equations that was dominating physical theories of the time for the clear intent of maintaining compatibility with Einsteinian doctrines (since the latter crucially depend on the truncation depicted in this figure). The opposition by the Lyman colleagues at Harvard was so great that, in the evident attempt of tryinmg to discourage the author from continuing the research on the true Lagrange’s and Hamilton’s equations, the Lyman colleagues kept the author without salary for one entire academic year, even though the author was the recipient of a DOE grant and he had two children in tender age to feed and shelter. Most virulent was the opposition by the Lyman colleagues to the two technical memoirs [39,50] presented in support of the ”vignetta” of this figure, for the evident reason that they dealt with a broadening of Einsteinian doctrines beginning with their title, and then continuing with a broadening of algebras, symmetries, etc.. But the author had no interest in a political chair at Harvard University, was sole interested in pursuing *new* scientific knowledge, and continued the research by dismissing the fierce opposition by his Lyman colleagues as ascientific and asocial (the episode is reported with real names in book [93] of 1984 and in the 1,132 pages of documentation available in Ref. [94]). As studied in details in these two volumes, the proper mathematical treatment of the true, historical, analytic equations, those with external terms, permits indeed the advances opposed by the Lyman colleagues, namely, the achievement of coverings of Einsteinian doctrines, that, being invariant (as shown later on), will indeed resist the test of time, while permitting the prediction and industrial development of new clean energies and fuels, thus confirming a societal, let alone scientific need for their serious study (se Footnote 1 of Volume II and subsequent footnotes for details).

of having an unrestricted functional dependence, including that on accelerations a and other non-Newtonian forms.[4]

As we shall see, nonselfadjoint forces generally have a nonlocal-integral structure that is usually reduced to a local-differential form via power series expansions in the velocities.

For instance, the contact, zero-range, resistive force experienced by a missile moving in our atmosphere is characterized by an integral over the surface of the missile and it is usually approximated by a power series in the velocities, e.g. $F^{NSA} = k_1 \times v + k_2 \times v^2 + k_3 \times v^3 + \ldots$ (see Figure 1.3).

Moreover, the studies of monographs [9] established that, for the general case in three dimensions, *Lagrange's and Hamilton's equations without external terms can only represent in the coordinates of the experimenter exterior dynamical systems, while the representation of interior dynamical systems in the given coordinates (t, r) of the experimenter require the necessary use of the true analytic equations with external terms.*

Whenever exposed to dynamical systems not entirely representable via the sole knowledge of a Lagrangian or a Hamiltonian, a rather general attitude is that of transforming them into an equivalent purely Lagrangian or Hamiltonian form. these transformations are indeed mathematically possible, but they are physically insidious.

It is known that, under sufficient continuity and regularity conditions and under the necessary reduction of nonlocal external terms to local approximations such as that in Eq. (1.2.4), the *Darboux's theorem* of the symplectic geometry or, equivalently, the *Lie-Koening theorem* of analytic mechanics assure the existence of coordinate transformations

$$\{r, p\} \rightarrow \{r'(r, p), p'(r, p)\}, \tag{1.2.5}$$

under which nonselfadjoint systems (1.2.2) can be turned into a selfadjoint form (1.2.1), thus eliminating the external terms.

However, coordinate transforms (1.2.5) are *necessarily nonlinear.* Consequently, the new reference frames are *necessarily noninertial.* Therefore, the elimination of the external nonselfadjoint forces via coordinate transforms cause the necessary loss of Galileo's and Einstein's relativities.

Moreover, it is evidently impossible to place measuring apparata in new coordinate systems of the type $r' = exp(k \times p)$, where k is a constant. For these reasons, the use of Darboux's theorem or of the Lie-Koening theorem was strictly prohibited in monographs [9,10,11]. Thus, to avoid misrepresentations, the following basic assumption is hereon adopted:

[4] There are serious rumors that a famous physicist from a leading institution visited NASA in 1998 to propose a treatment of the trajectory of the space shuttle during re-entry via (the truncated) Hamiltonian mechanics, and that NASA engineers kindly pushed that physicist through the door.

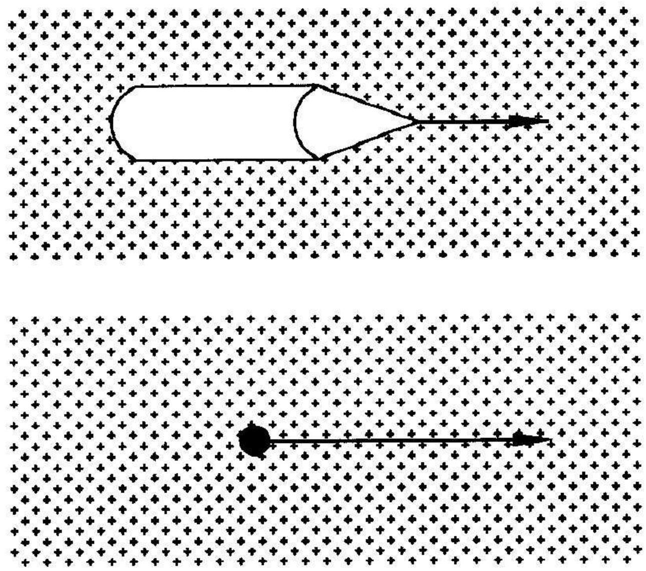

Figure 1.4. Another illustration of the major scientific imbalance studied in this monograph. The top view depicts a typical Newtonian system with nonlocal and nonpotential forces, such as a missile moving in atmosphere, while the bottom view depicts its reduction to point-like constituents conjectured throughout the 20-th century for the evident purpose of salvaging the validity of quantum mechanics and Einsteinian doctrines. However, the consistency of such a reduction has now been disproved by theorems, thus confirming the necessity of nonlocal and nonpotential interactions at the primitive elementary level of nature.

ASSUMPTION 1.2.1: The sole admitted analytic representations are those in the fixed references frame of the experimenter without the use of integrating factors, called direct analytic representations.

Only *after* direct representations have been identified, the use of the transformation theory may have physical relevance. Due to its importance, the above assumption will also be adopted throughout this monograph.

As an illustration, the admission of integrating factors within the fixed coordinates of the experimenter does indeed allow the achievement of an analytic representation without external terms of a restricted class of nonconservative systems, resulting in Hamiltonians of the type $H = e^{f(t,r,\ldots)} \times p^2/2 \times m$. This Hamiltonian has a fully valid *canonical meaning* of representing the time evolution. However, this Hamiltonian loses its meaning as representing the energy of the system. The quantization of such a Hamiltonian then leads to a plethora of illusions, such as the belief that the uncertainty principle for energy and time is still valid while, for the example here considered, such a belief has no sense because H does not represent the energy (see Refs. [9b] for more details).

Under the strict adoption of Assumption 1.2.1, all these ambiguities are absent because *H will always represent the energy,* irrespective of whether conserved or nonconserved, thus setting up solid foundations for correct physical interpretations.

1.2.3 General Inapplicability of Conventional Mathematical and Physical Methods for Interior Dynamical Systems

The impossibility of reducing interior dynamical systems to an exterior form within the fixed reference frame of the observer causes the loss for interior dynamical systems of all conventional mathematical and physical methods of the 20-th century.

To begin, the presence of irreducible nonselfadjoint external terms in the analytic equations causes the loss of their derivability from a variational principle. In turn, the lack of an action principle and related Hamilton-Jacobi equations causes the lack of any possible quantization, thus illustrating the reasons why the voluminous literature in quantum mechanics of the 20-th century carefully avoids the treatment of analytic equations with external terms.

By contrast, *one of the central objectives of this monograph is to review the studies that have permitted the achievement of a reformulation of Eqs. (1.2.3) fully derivable from a variational principle in conformity with Assumption 1.2.1, thus permitting a consistent operator version of Eqs. (1.2.3) as a covering of conventional quantum formulations.*

Recall that Lie algebras are at the foundations of all classical and quantum theories of the 20-th century. This is due to the fact that the brackets of the time evolution as characterized by Hamilton's equations,

$$\frac{dA}{dt} = \frac{\partial A}{\partial r_a^k} \times \frac{dr_a^k}{dt} + \frac{\partial A}{\partial p_{ak}} \times \frac{dp_{ak}}{dt} =$$

$$= \frac{\partial A}{\partial r_a^k} \times \frac{\partial H}{\partial p_{ak}} - \frac{\partial H}{\partial r_a^k} \times \frac{\partial A}{\partial p_{ak}} = [A, H], \tag{1.2.6}$$

firstly, verify the conditions to characterize an *algebra* as currently understood in mathematics, that is, the brackets $[A, H]$ verify the right and left scalar and distributive laws,

$$[n \times A, H] = n \times [A, H], \tag{1.2.7a}$$

$$[A, n \times H] = [A, H] \times n, \tag{1.2.7b}$$

$$[A \times B, H] = A \times [B, H] + [A, H] \times B, \tag{1.2.7c}$$

$$[A, H \times Z] = [A, H] \times Z + H \times [A, Z], \tag{1.2.7d}$$

and, secondly, the brackets $[A, H]$ verify the *Lie algebra axioms*

$$[A, B] = -[B, A], \tag{1.2.8a}$$

$$[[A, B], C] + [[B, C], A] + [[C, A], B] = 0. \tag{1.2.8b}$$

The above properties then persist following quantization into the operator brackets $[A, B] = A \times B - B \times A$, as well known.

When adding external terms, the resulting new brackets,

$$\begin{aligned} \frac{dA}{dt} &= \frac{\partial A}{\partial r_a^k} \times \frac{dr_a^k}{dt} + \frac{\partial A}{\partial p_{ak}} \times \frac{dp_{ak}}{dt} = \\ &= \frac{\partial A}{\partial r_a^k} \times \frac{\partial H}{\partial p_{ak}} - \frac{\partial H}{\partial r_a^k} \times \frac{\partial A}{\partial p_{ak}} + \frac{\partial A}{\partial r_a^k} \times F_a^k = \\ &= (A, H, F) = [A, H] + \frac{\partial A}{\partial r_a^k} \times F_a^k, \end{aligned} \tag{1.2.9}$$

violate the right scalar law (1.2.7b) and the right distributive law (1.2.7d) and, therefore, the brackets (A, H, F) do not constitute any algebra at all, let alone violate the basic axioms of the Lie algebras [9b].

The loss of the Lie algebras in the brackets of the time evolution of interior dynamical systems in their historical treatment by Lagrange, Hamilton, Jacobi and other founders of analytic dynamics, causes the loss of all mathematical and physical formulations built in the 20-th century.

The loss of basic methods constitutes the main reason for the abandonment of the study of interior dynamical systems. In fact, external terms in the analytic equations were essentially ignored through the 20-th century, by therefore adapting the universe to analytic equations (1.2.2) today known as the *truncated analytic equations.*

By contrast, *another central objective of this monograph is to review the studies that have permitted the achievement of a reformulation of the historical analytic equations with external terms,that is not only derivable from an action principle as indicated earlier, but also characterizes brackets in the time evolution that, firstly, constitute an algebra and, secondly, that algebra results in being a covering of Lie algebras.*

1.2.4 Inapplicability of Special Relativity for Dynamical Systems with Resistive Forces

The scientific imbalance caused by the reduction of interior dynamical systems to systems of point-like particles moving in vacuum, is indeed of historical proportion because it implied the belief of the exact applicability of special relativity and quantum mechanics for all conditions of particles existing in the universe, thus implying their applicability under conditions for which these theories were not intended for.

A central scope of this monograph is to show that the imposition of said theories to interior dynamical systems causes the suppression of new clean energies and fuels already in industrial, let alone scientific, development, thus raising serious problems of scientific ethics and accountability.

At the classical level, the "inapplicability" (rather then the "violation") of (the Galilean and) special relativities for the description of an interior system such as a missile in atmosphere (as depicted in Figure 1.4) is beyond credible doubt, as any expert should know to qualify as such, because said relativities can only describe systems with action-at-a-distance potential forces, while the force acting on a missile in atmosphere are of contact-zero-range nonpotential type.

Despite this clear evidence, the resiliency by organized academic interests on conventional relativities knows no boundaries. As indicated earlier, when faced with the above evidence, a rather general posture is, that the resistive forces are "illusory" because, when the missile in atmosphere is reduced to its elementary point-like constituents all resistive forces "disappear."

Such a belief is easily proved to be nonscientific by the following property that can be proved by a first year graduate student in physics:

THEOREM 1.2.1 [9b]: A classical dissipative system cannot be consistently reduced to a finite number of quantum particles under sole potential forces and, vice-versa, no ensemble of a finite number of quantum particles with only potential forces can reproduce a dissipative classical system under the correspondence or other principles.

Note that the above property causes the inapplicability of conventional relativities for the description of the *individual constituents* of interior dynamical systems, let alone their description as a whole.

Rather than adapting nature to pre-existing organized interests on Einsteinian doctrines, the scope of this monograph is that of adapting the theories to nature, as requested by scientific ethics and accountability.

1.2.5 Inapplicability of Special Relativity for the Propagation of Light within Physical Media

Another case of manipulation of scientific evidence to serve organized academic interests on conventional relativities is the propagation of light within physical media, such as water.

As it is well known, light propagates in water at a speed C much smaller than the speed c in vacuum and approximately given by the value

$$C = \frac{c}{n} = \frac{2}{3} \times c << c, \quad n = \frac{3}{2} >> 1. \tag{1.2.10}$$

It is well known that electrons can propagate in water at speeds bigger than the local speed of light, and actually approaching the speed of light in vacuum. In fact, the propagation of electrons faster than the local speed of light is responsible for the blueish light, called *Cerenkov light,* that can be seen in the pools of nuclear reactors.

It is well known that *special relativity was built to describe the propagation of light IN VACUUM, and certainly not within physical media.* In fact, the setting of a massive particle traveling faster than the local speed of light is in violation of the basic axioms of special relativity.

To salvage the principle of causality it is then often assumed that *the speed of light "in vacuum" is the maximal causal speed "within water".* However, in this case there is the violation of the axiom of relativistic addition of speeds, because *the sum of two speeds of light in water does not yield the speed of light,* as required by a fundamental axiom of special relativity,

$$V_{tot} = \frac{C + C}{1 + \frac{C^2}{c^2}} = \frac{12}{13} \times c \neq C. \tag{1.2.11}$$

Vice-versa, if one assumes that *the speed of light "in water" C is the maximal causal speed "in water",* the axiom of relativistic compositions of speeds is verified,

$$V_{tot} = \frac{C + C}{1 + \frac{C^2}{C^2}} = C, \tag{1.2.12}$$

but there is the violation of the principle of causality evidently due to the fact that ordinary massive particles such as the electron (and not hypothetical *tachyons*) can travel faster than the local causal speed.

Again, the resiliency by organized interests on established relativities has no boundaries. When faced with the above evidence, a general posture is that, *when light propagating in water is reduced to photons scattering among the atoms constituting water, all axioms of special relativities are recovered in full.* In fact, according to this belief, photons propagate in vacuum, thus recovering the conventional maximal causal speed c, while the reduction of the speed of light is due to the scattering of light among the atoms constituting water.

The nonscientific character of the above view is established by the following evidence known to experts to qualify as such:

1) Photons are neutral, thus having a high capability of penetration within electrons clouds, or, more technically, the scattering of photons on atomic electron

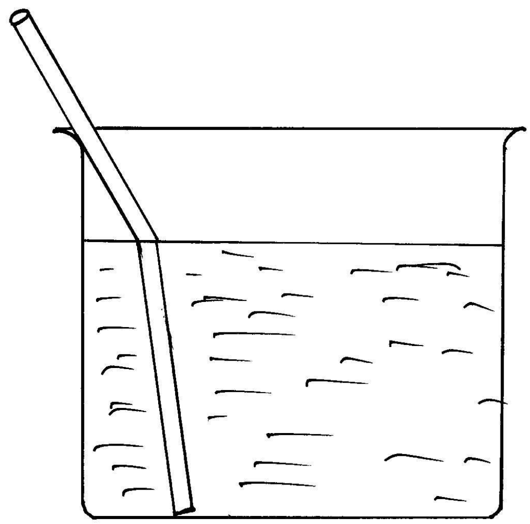

Figure 1.5. A further visual evidence of the lack of applicability of Einstein's doctrines within physical media, the refraction of light in water, due to the decrease of its speed contrary to the axiom of the "universal constancy of the speed of light". Organized academic interests on Einsteinian doctrines have claimed throughout the 20-th century that this effect is "illusory" because Einsteinian doctrines are recovered by reducing light to the scattering of photons among atoms. The political nature of the argument, particularly when proffered by experts, is established by numerous experimental evidence reviewed in the this section.

clouds (called *Compton scattering*) is rather small. Explicit calculations (that can be done by a first year graduate student in physics via quantum electrodynamics) show that, in the most optimistic of the assumptions and corrections, said scattering can account for only 3% of the reduction of the speed of light in water, thus leaving about 30% of the reduction quantitatively unexplained. Note that the deviation from physical reality is of such a magnitude that it cannot be "resolved" via the usual arbitrary parameters "to make things fit."

2) The reduction of speed occurs also for radio waves with one meter wavelength propagating within physical media, in which case the reduction to photons has no credibility due to the very large value of the wavelength compared to the size of atoms. The impossibility of a general reduction of electromagnetic waves to photon propagating within physical media is independently confirmed by the existence of vast experimental evidence on *non-Doppler's effects* reviewed in Chapter 9 indicating the existence of contributions outside the Doppler's law even when adjusted to the local speed.

3) There exist today a large volume of experimental evidence reviewed in Chapter 5 establishing that light propagates within hyperdense media, such as those in the interior of hadrons, nuclei and stars, at speed much bigger than the speed in vacuum,

$$C = \frac{c}{n} >> c, \quad n << 1. \tag{1.2.13}$$

in which case the reduction of light to photons scattering among atoms loses any physical sense (because such propagation can never reach the speed c, let alone speeds bigger than c).

In conclusion, experimental evidence beyond credible doubt has established that *the speed of light C is a local quantity dependent on the characteristics in which the propagation occurs, with speed $C = c$ in vacuum, speeds $C << c$ within physical media of low density and speeds $C >> c$ within media of very high density.*

The variable character of the speed of light then seals the lack of universal applicability of Einsteinian doctrines, since the latter are notoriously based on the philosophical assumption of "universal constancy of the speed of light".

1.2.6 Inapplicability of the Galilean and Poincaré symmetries for Interior Dynamical Systems

By remaining at the classical level, the inapplicability of Einsteinian doctrines within physical media is additionally established by the dramatic dynamical differences between the structure of a planetary system such as our Solar system, and the structure of a planet such as Jupiter.

The planetary system is a *Keplerian system,* that is, a system in which the heaviest component is at the center (actually in one of the two foci of elliptical orbits) and the other constituents orbit around it without collisions. By contrast, planets absolutely do not constitute a Keplerian system, because they do not have a Keplerian center with lighter constituents orbiting around it (see Figure 1.6).

Moreover, for a planetary system isolated from the rest of the universe, the total conservation laws for the energy, linear momentum and angular momentum are verified for each individual constituent. For instance, the conservation of the intrinsic and orbital angular momentum of Jupiter is crucial for its stability. On the contrary, for the interior dynamical problem of Jupiter, conservation laws hold only globally, while no conservation law can be formulated for individual constituents.

For instance, in Jupiter's structure we can see in a telescope the existence in Jupiter's atmosphere of *interior vortices with variable angular momentum,* yet always in such a way to verify total conservation laws. We merely have internal exchanges of energy, linear and angular momentum but always in such a way that they cancel out globally resulting in total conservation laws.

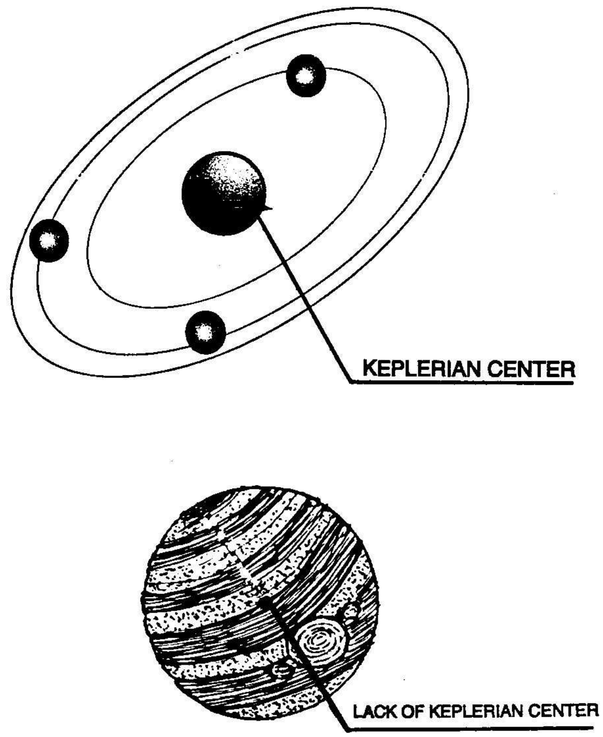

Figure 1.6. Another illustration of the second major scientific imbalance studied in this monograph, the dramatic structural differences between exterior and interior dynamical systems, here represented with the Solar system (top view) and the structure of Jupiter (bottom view). Planetary systems have a Keplerian structure with the exact validity of the Galilean and Poincaré symmetries. By contrast, interior systems such as planets (as well as hadrons, nuclei and stars) do not have a Keplerian structure because of the lack of the Keplerian center. Consequently, the Galilean and Poincaré symmetries cannot possibly be exact for interior systems in favor of covering symmetries and relativities studied in this monograph.

In the transition to particles the situation remains the same as that at the classical level. For instance, *nuclei do not have nuclei* and, therefore, nuclei are not Keplerian systems.

Similarly, the Solar system is a Keplerian system, but the Sun is not. At any rate, any reduction of the structure of the Sun to a Keplerian system directly implies the belief in the perpetual motion within a physical medium, because electrons and protons could move in the hyperdense medium in the core of a star with conserved angular momenta, namely, a belief exiting all boundaries of credibility, let alone of science.

The above evidence establishes beyond credible doubt the following:

THEOREM 1.2.2 [10b]: Galileo's and Poincaré symmetries are inapplicable for classical and operator interior dynamical systems due to the lack of Keplerian structure, the presence of contact, zero-range, non-potential interactions, and other reasons.

Note the use of the word "inapplicable", rather than "violated" or "broken". This is due to the fact that, as clearly stated by the originators of the basic spacetime symmetries (rather than their followers of the 20-th century), Galileo's and Poincaré symmetries were not built for interior dynamical conditions.

Perhaps the biggest scientific imbalance of the 20-th century has been the abstraction of hadronic constituents to point-like particles as a necessary condition to use conventional spacetime symmetries, relativities and quantum mechanics for interior conditions. In fact, such an abstraction is at the very origin of the conjecture that the undetectable *quarks* are the physical constituents of hadrons (see Section 1.2.7 for details)..

Irrespective of whether we consider quarks or other more credible particles, all particles have a wavepacket of the order of $1\,\mathrm{F} = 10^{-13}\,\mathrm{cm}$, that is, a wavepacket of the order of the size of all hadrons. Therefore, *the hyperdense medium in the interior of hadrons is composed of particles with extended wavepackets in conditions of total mutual penetration.* Under these conditions, the belief that Galileo's and Poincaré symmetries are *exactly* valid in the interior of hadrons implies the exiting from all boundaries of credibility, let alone of science.

The inapplicability of the fundamental spacetime symmetries then implies the inapplicability of Galilean and special relativities as well as of quantum nonrelativistic and relativistic mechanics. We can therefore conclude with the following:

COROLLARY 1.2.2A [10b]: Classical Hamiltonian mechanics and related Galilean and special relativities are not exactly valid for the treatment of interior classical systems such as the structure of Jupiter, while nonrelativistic and relativistic quantum mechanics and related Galilean and special relativities are not exactly valid for interior particle systems, such as the structure of hadrons, nuclei and stars.

Another important scope of this monograph is to show that the problem of the exact spacetime symmetries applicable to interior dynamical systems is not a mere academic issue, because it carries a direct societal relevance. In fact, we shall show that broader spacetime symmetries specifically built for interior systems predict the existence of new clean energies and fuels that are prohibited by the spacetime symmetries of the exterior systems.

As we shall see in Section 1.2.7, Chapter 6 and Chapter 12, the assumption that the undetectable quarks are physical constituents of hadrons *prohibits* possible new energy based on processes occurring in the interior of hadrons (rather than in the interior of their ensembles such as nuclei). On the contrary, the assumption of hadronic constituents that can be fully defined in our spacetime and can be produced free under suitable conditions, directly implies new clean energies.

1.2.7 The Scientific Imbalance Caused by Quark Conjectures

One of the most important objectives of this monograph, culminating in the presentation of Chapter 12, is to show that *the conjecture that quarks are physical particles existing in our spacetime constitutes one of the biggest threats to mankind because it prevents the orderly scientific process of resolving increasingly cataclysmic environmental problems.*

It should be clarified in this respect, as repeatedly stated by the author in his writings that *the unitary, Mendeleev-type, SU(3)-color classification of hadron into families can be reasonably considered as having a final character* (see e.g., Ref. [99] and papers quoted therein), in view of the historical capability of said classification to predict several new particles whose existence was subsequently verified experimentally. All doubts herein considered solely refer to the joint use of the same classification models as providing the structure of each individual element of a given hadronic family (for more details, see memoirs [100,101] and preprint [102] and Chapter 6).

Far from being alone, this author has repeatedly expressed the view that quarks cannot be physical constituents of hadrons existing in our spacetime for numerous independent reasons.

On historical grounds, the study of nuclei, atoms and molecules required *two different models,* one for the *classification* and a separate one for the *structure* of the individual elements of a given SU(3)-color family. Quark theories depart from this historical teaching because of their conception to represent with one single theory both the classification and the structure of hadrons.

As an example, the idea that the Mendeleev classification of atoms could jointly provide the structure of each individual atom of a given valence family is outside the boundary of science. The Mendeleev classification was essentially achieved via *classical theories,* while the understanding of the atomic structure required the construction of *a new theory,* quantum mechanics.

Independently from the above dichotomy classification vs structure, it is well known by specialists, but rarely admitted, that *quarks are purely mathematical quantities, being purely mathematical representations of a purely mathematical* *unitary symmetry defined in a purely mathematical complex-valued unitary space without any possibility, whether direct or implied, of being defined in our spacetime (representation technically prohibited by the O'Rafearthaigh theorem).*

It should be stressed that, *as purely mathematical objects, quarks are necessary for the consistency of SU(3)-color theories.* Again, quarks are the fundamental representations of said Lie symmetry and, as such, their existence is beyond doubt. All problems emerge when said mathematical representation of a mathematical symmetry in the mathematical unitary space is assumed as characterizing physical particles existing in our spacetime.

It follows that the conjecture that quarks are physical particles is afflicted by a plethora of major problematic aspects today known to experts as *catastrophic inconsistencies of quark conjectures,* such as:

1) No particle possessing the peculiar features of quark conjectures (fraction charge, etc.), has ever been detected to date in any high energy physical laboratory around the world. Consequently, a main consistency requirement of quark conjectures is that quarks cannot be produced free and, consequently, they must be "permanently confined" in the interior of hadrons. However, it is well known to experts that, despite half a century of attempts, *no truly convincing "quark confinement" inside protons and neutrons has been achieved,* nor can it be expected on serious scientific grounds by assuming (as it is the case of quark conjectures) that quantum mechanics is identically valid inside and outside hadrons. This is due to a pillar of quantum mechanics, Heisenberg's uncertainty principle, according to which, given any manipulated theory appearing to show confinement for a given quark, a graduate student in physics can always prove the existence of a *finite probability for the same quark to be free outside the hadron, in catastrophic disagreement with physical reality.* Hence, the conjecture that quarks are physical particles is afflicted by catastrophic inconsistencies in its very conception [100].

2) It is equally well known by experts to qualify as such that *quarks cannot experience gravity* because quarks cannot be defined in our spacetime, while gravity can only be formulated in our spacetime and does not exist in mathematical complex-unitary spaces. Consequently, if protons and neutrons were indeed formed of quarks, we would have the catastrophic inconsistency that all quark believers should float in space due to the absence of gravity [101].

3) It is also well known by experts that *"quark masses" cannot possess any inertia* since they are purely mathematical parameters that cannot be defined in our spacetime. A condition for any mass to be physical, that is, to have inertia, is that it has to be the eigenvalue of a Casimir invariant of the Poincaré symmetry, while quarks cannot be defined via said symmetry because of their hypothetical fractional charges and other esoteric assumptions. This aspect alone implies numerous catastrophic inconsistencies, such as the impossibility of having the

energy equivalence $E = mc^2$ for any particle composed of quarks, against vast experimental evidence to the contrary.

4) Even assuming that, because of some twist of scientific manipulation, the above inconsistencies are resolved, it is known by experts that quark theories have failed to achieve a representation of all characteristics of protons and neutron, with catastrophic inconsistencies in the representation of spin, magnetic moment, means lives, charge radii and other basic features [102].

5) It is also known by experts that the application of quark conjectures to the structure of nuclei has multiplied the controversies in nuclear physics, while resolving none of them. As an example, the assumption that quarks are the constituents of the protons and the neutrons constituting nuclei has failed to achieve a representation of the main characteristics of the simplest possible nucleus, the deuteron. In fact, quark conjectures are afflicted by the catastrophic inconsistencies of being unable to represent the spin 1 of the deuteron (since they predict spin zero in the ground state while the deuteron has spin 1), they are unable to represent the anomalous magnetic moment of the deuteron, they are unable to represent the deuteron stability, they are unable to represent the charge radius of the deuteron, and when passing to larger nuclei, such as the zirconium, the catastrophic inconsistencies of quark conjectures can only be defined as being embarrassing [102].

In summary, while the final character of the SU(3)-color classification of hadrons into families has reached a value beyond scientific doubt, the conjecture that quarks are the actual physical constituents of hadrons existing in our spacetime is afflicted by so many and so problematic aspects to raise serious issues of scientific ethics and accountability, particularly in view of the ongoing large expenditures of public funds in the field.

On a personal note the author remembers some of the seminars delivered by the inventor of quarks, Murray Gell Mann, at Harvard University in the early 1980s, at the end of which there was the inevitable question whether Gell Mann believed or not that quarks are physical particles. Gell Mann's scientific caution (denoting a real scientific stature) is still impressed in the author's mind because he routinely responded with essentially the viewpoint outlined here, namely, Gell Mann stressed the mathematical necessity of quarks, while avoiding a firm posture on their physical reality. It is unfortunate that such a serious scientific position by Murray Gell-Manns was replaced by his followers with nonscientific positions mainly motivated by money, power and prestige.

Subsequently, quark conjectures have become a real "scientific business", as established by claim proffered by large high energy physics laboratories to have "discovered that and that quark". while in reality they had discovered a new particle predicted by SU(3)-color classification.

The decay of scientific ethics in the field is so serious, and the implications for mankind so potentially catastrophic (due to the suppression by quark conjectures as physical particles of possible new clean energies studied in Volume II) that, in the author's view, quark conjectures have been instrumental in the creation of the current scientific obscurantism of potentially historical proportions (see the *Open Denunciation of the Nobel Foundation for Heading an Organized Scientific Obscurantism* available in the web site http://www.scientificethics.org/Nobel-Foundation.htm).

1.2.8 The Scientific Imbalance Caused by Neutrino Conjectures

Another central objective of this monograph is to show that *neutrino conjectures constitute a political obstacle of potentially historical proportions against the orderly prediction and development of much needed new clean energies of "hadronic type", that is, new energies originating in the structure of individual hadrons, rather than in their collection as occurring in nuclei.*

Moreover, we shall show that *neutrino conjectures constitute an additional political obstacle also of potentially historical proportions against the study of one of the most important scientific problems in history, the interplay between matter and the universal substratum needed for the existence and propagation of electromagnetic waves and elementary particles.*

To prevent misrepresentations by vociferous (yet self-destructing) organized interests in the field, it should be stressed up-front that, as it is the case for quark conjectures, *neutrino conjectures of are necessary for the "current" treatment of weak interactions.* Therefore, a large scientific imbalance emerges only for the *political use and interpretation* of neutrino conjectures that has been dominant in the 20-th century and remains dominant to this day, namely, the use and interpretation of neutrino conjectures conceived and implemented in a capillary way for the continuation of the dominance of Einsteinian doctrines for all of physics.

Most distressing are contemporary claims of "neutrino detections" (denounced technically in Volume II) when the originator of neutrinos, Enrico Fermi, is on record by stressing that "neutrinos cannot be detected." Hence, the scientifically correct steatment would be the "detection of physical particles predicted by neutrino conjectures." As it was the case for Murray Gell-M ann, it is unfortunate that the scientific caution by Enrico Fermi was replaced by his followers with political postures essentially aiming at money, prestige and power.

In this subsections we shall show the political character of neutrino conjectures via a review the historical objections against the belief that the current plethora of neutrinos constitute actual physical particles in our spacetime. Alternative theoretical interpretations can be presented only in Chapter 6 with

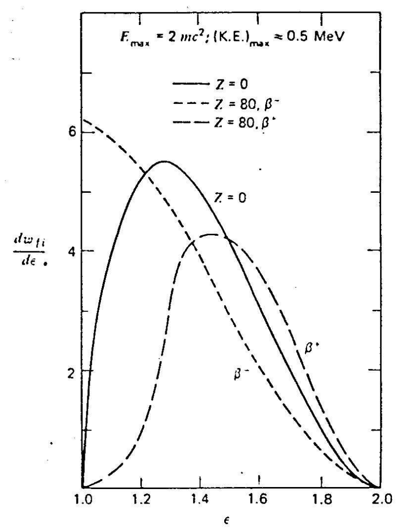

Figure 1.7. A view of the historical "bell shaped" curve representing the variation of the energy of the electron in nuclear beta decays (see, e.g., Ref. [13]). As soon as the apparent "missing energy" by the electron was detected in the early part of the 20-th century, it was claimed to be experimental evidence on the existence of a new particle with spin 1/2, charge zero and mass zero called by Fermi the "little neutron" or "neutrino".

industrial applications in Chapter 12 following the prior study and verification of *new mathematics* that is notoriously needed for true new vistas in science.

As it is well known, Rutherford [104] submitted in 1920 the conjecture that hydrogen atoms in the core of stars are compressed into a new particle he called the *neutron* according to the synthesis $(p^+, e^-) \rightarrow n$.

The existence of the neutron was subsequently confirmed experimentally in 1932 by Chadwick [105]. However, numerous objections were raised by the leading physicists of the time against Rutherford's conception of the neutron as a bound state of one proton p^+ and one electron e^-.

Pauli [106] first noted that Rutherford's synthesis violates the angular momentum conservation law because, according to quantum mechanics, a bound state of two particles with spin 1/2 (the proton and the electron) must yield a particle with integer spin and cannot yield a particle with spin 1/2 and charge zero such as the neutron. Consequently, Pauli conjectured the existence of a new neutral particle with spin 1/2 that is emitted in synthesis $(p^+, e^-) \rightarrow n$. or in similar radioactive processes so as to verify the angular momentum conservation law.

Fermi [107] adopted Pauli's conjecture, coined the name *neutrino* (meaning in Italian a "little neutron") and presented the first comprehensive theory of the underlying interactions (called "weak"), according to which the neutron synthesis should be written $(p^+, e^-) \rightarrow n + \nu$, where ν is the neutrino, in which case the inverse reaction (the spontaneous decay of the neutron) reads $n \rightarrow p^+ + e^- + \bar{\nu}$, where $\bar{\nu}$ is the *antineutrino.*

Despite the scientific authority of historical figures such as Pauli and Fermi, the conjecture on the existence of the neutrino and antineutrino as physical particles was never universally accepted by the entire scientific community because of: the impossibility for the neutrinos to be directly detected in laboratory; the neutrinos inability to interact with matter in any appreciable way; and the existence of alternative theories that do not need the neutrino conjecture (see Refs. [108-110] and literature quoted therein, plus the alternative theory presented in Chapter 6).

By the middle of the 20-th century there was no clear experimental evidence acceptable by the scientific community at large confirming the neutrino conjecture beyond doubt, except for experimental claims in 1959 that are known today to be basically flawed on various grounds, as we shall see below and in Chapter 6.

In the last part of the 20-th century, there was the advent of the so-called *unitary SU(3) theories* and related quark conjectures studied in the preceding subsection. In this way, neutrino conjectures became deeply linked to and their prediction intrinsically based on quark conjectures.

This event provided the first fatal blow to the credibility of the neutrino conjectures because serious physics cannot be done via the use of conjectures based on other conjectures.

In fact, the marriage of neutrino and quark conjectures within the standard model has requested the *multiplication of neutrinos,* from the neutrino and antineutrino conjectures of the early studies, to six different hypothetical particles, the so called *electron, muon and tau neutrinos and their antiparticles.* In the absence of these particles the standard model would maintain its meaning as classification of hadrons, but would lose in an irreconcilable way the joint capability of providing also the structure of each particle in a hadronic multiplet.

In turn, the multiplication of the neutrino conjectures has requested the *additional conjecture that the electron, muon and tau neutrinos have masses* and, since the latter conjecture resulted in being insufficient, there was the need for the *additional conjecture that neutrinos have different masses,* as necessary to salvage the structural features of the standard model. Still in turn, the lack of resolution of the preceding conjectures has requested the *yet additional conjecture that neutrinos oscillate,* namely, that "they change flavor" (transform among themselves back and forth).

In addition to this rather incredible litany of sequential conjectures, each conjecture being voiced in support of a preceding unverified conjecture, all conjectures being crucially dependent on the existence of quarks as physical particles despite their proved lack of gravity and physical masses, by far the biggest con-

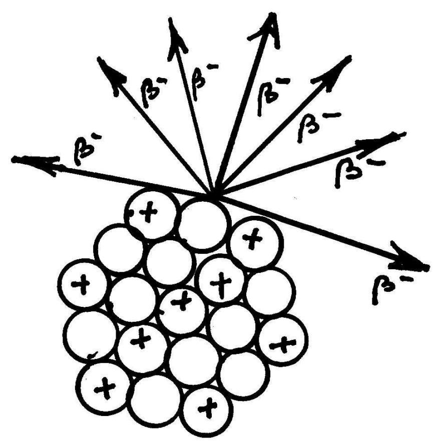

Figure 1.8. A schematic illustration of the fact that the electron in beta decays can be emitted in different directions. When the energy in the beta decay is computed with the inclusion of the Coulomb interactions between the expelled (negatively charged) electron and the (positively charged) nucleus at different expulsion directions, the nucleus acquires the "missing energy," without any energy left for the hypothetical neutrino. As we shall see in Chapter 6, rather than being a disaster, the occurrence is at the foundation of a possible basically new scientific horizon with implications sufficient to require studies over the entire third millennium.

troversies have occurred in regard to experimental claims of neutrino detection voiced by large collaborations.

To begin, both neutrinos and quarks cannot be directly detected as physical particles in our spacetime. Consequently, all claims on their existence are indirect, that is, based on the detection of actual physical particles predicted by the indicated theories. This occurrence is, per se, controversial. For instance, controversies are still raging following announcements by various laboratories to have "discovered" one or another quark, while in reality the laboratories discovered physical particles predicted by a Mendeleev-type classification of particles, the same classification being admitted by theories that require no quarks at all as physical particles, as we shall indicate in Chapter 6.

In the 1980s, a large laboratory was built deep into the Gran Sasso mountain in Italy to detect neutrinos coming from the opposite side of Earth (since the mountain was used as a shield against cosmic rays). Following the investment of large public funds and five years of tests, the Gran Sasso Laboratory released no evidence of clear detection of neutrino originated events.

Rather than passing to a scientific caution in the use of public funds, the failure of the Gran Sasso experiments to produce any neutrino evidence stimulated massive efforts by large collaborations involving hundred of experimentalists from various countries for new tests requiring public funds in the range of hundred of millions of dollars.

The increase in experimental research was evidently due to the scientific stakes, because, as well known by experts but studiously omitted, *the lack of verification of the neutrino conjectures would imply the identification of clear limits of validity of Einsteinian doctrines and quantum mechanics.*

These more recent experiments resulted in claims that, on strict scientific grounds, should be considered "experimental beliefs" by any serious scholars for numerous reasons, such as:

1) The predictions are based on a litany of sequential conjectures none of which is experimentally established on clear ground;

2) The theory contain a plethora of unrestricted parameters that can essentially fit any pre-set data (see next subsection);

3) The "experimental results" are based on extremely few events out of hundreds of millions of events over years of tests, thus being basically insufficient in number for any serious scientific claim;

4) In various cases the "neutrino detectors" include radioactive isotopes that can themselves account for the selected events;

5) The interpretation of the experimental data via neutrino and quark conjectures is not unique, since there exist nowadays other theories representing exactly the same events without neutrino and quark conjectures (including a basically new scattering theory of nonlocal type indicated in Chapter 3 and, more extensively, in monograph [10b]).

To understand the scientific scene, the serious scholar (that is, the scholar not politically aligned to the preferred "pet theories" indicated in the Preface) should note that *neutrino and quark conjectures have requested to date the expenditure of over one billion dollars of public funds in theoretical and experimental research with the result of increasing the controversies rather than resolving any of them.*

Therefore, it is now time for a moment of reflection: scientific ethics and accountability require that serious scholars in the field exercise caution prior to venturing claims of actual physical existence of so controversial and directly unverifiable conjectures.

Such a moment of reflection requires the re-inspection of the neutrino conjecture at its foundation. In fact, it is important to disprove the neutrino conjecture as originally conceived, and then disprove the flavored extension of the conjecture as requested by quark conjectures.

As reported in nuclear physics textbooks (see, e.g., Ref. [13]), the energy experimentally measured as being carried by the electron in beta decays is a bell-shaped curve with a maximum value of 0.782 MeV, that is the difference in value between the mass of the neutron and that of the resulting proton in the

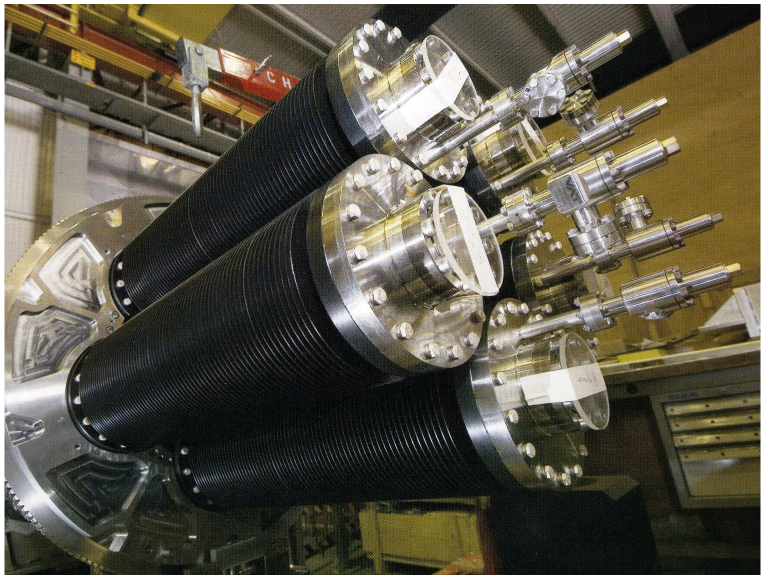

Figure 1.9. A picture of one of the "neutrino detectors" currently under construction at CERN for use to attempt "experimental measurements" of neutrinos (which one?) at the Gran Sasso Laboratory in Italy. The picture was sent to the author by a kind colleague at CERN and it is presented here to have an idea of the large funds now feverishly obtained from various governments by organized interests on Einsteinian doctrines in what can only be called their final frantic attempts at salvage the large litany of unverified and unverifiable quark, neutrino and other conjectures needed to preserve the dominance of Einstein doctrines in physics. For an understanding of the potential immense damage to mankind, we suggest the reader to study this monograph up to and including Chapter 12 on the necessity of abandoning these clearly sterile trends to achieve new clean energies.

neutron decay. As soon as the "missing energy" was identified, it was instantly used by organized interests in Einsteinian doctrines as evidence of the neutrino hypothesis for the unspoken yet transparent reasons that, in the absence of the neutrino conjectures, Einsteinian doctrines would be grossly inapplicable for the neutron decay.

As it is equally well known, the scientific community immediately accepted the neutrino interpretation of the "missing energy" mostly for academic gain, as it must be the case whenever conjectures are adopted without the traditional scientific process of critical examinations.

It is easy to see that the neutrino interpretation of the "missing energy" is fundamentally flawed. In fact, the electron in beta decays is negatively charged, while the nucleus is positively charged. Consequently, *the electron in beta decays experiences a Coulomb attraction from the original nucleus.*

Moreover, such an attraction is clearly dependent on the angle of emission of the electron by a decaying peripheral neutron. The maximal value of the energy occurs for radial emissions of the electron, the minimal value occurs for tangential emissions, and the intermediate value occur for intermediate directions of emissions, resulting in the experimentally detected bell-shaped curve of Figure 1.7.

When the calculations are done without political alignments on pre-existing doctrines, it is easy to see that the "missing energy" in beta decays is entirely absorbed by the nucleus via its Coulomb interaction with the emitted electron. Consequently, *in beta decays there is no energy at all available for the neutrino conjecture,* by reaching in this way a disproof of the conjecture itself at its historical origination.

Supporters of the neutrino conjecture are expected to present as counter-arguments various counter-arguments on the lack of experimental evidence for the nucleus to acquire said "missing energy." Before doing so, said supporters are suggested to exercise scientific caution and study the new structure models of the neutron without the neutrino conjecture (Chapter 6), as well as the resulting new structure models of nuclei (Chapter 7) and the resulting new clean energies (Chapter 12). Only then, depending on the strength of their political alignment, they may eventually realize that, in abusing academic authority to perpetrate unproved neutrino conjectures they may eventually be part of real crimes against mankind.

The predictable conclusion of this study is that theoretical and experimental research on neutrino and quark conjectures should indeed continue. However, theoretical and experimental research on theories without neutrino and quark conjectures and their new clean energies should be equally supported to prevent a clear suppression of scientific democracy on fundamental needs of mankind, evident problems of scientific accountability, and a potentially severe judgment by posterity.

For technical details on the damage caused to mankind by the current lack of serious scientific caution on neutrino conjectures, interested readers should study Volume Ii and inspect the *Open Denunciation of the Nobel Foundation for Heading an Organized Scientific Obscurantism* available in the web site http://www.-scientificethics.org/Nobel-Foundation.htm.

1.2.9 The Scientific Imbalance in Experimental Particle Physics

Another central objective of this monograph is to illustrate the *existence at the dawn of the third millennium of a scientific obscurantism of unprecedented proportions, caused by the manipulation of experimental data via the use of experimentally unverified and actually unverifiable quark conjectures, neutrino conjectures and other conjectures complemented by a variety of ad hoc parameters* *for the unspoken, but transparent and pre-meditated intent of maintaining the dominance of Einsteinian doctrines in physics.*

At any rate, *experimental data are elaborated via the conventional scattering theory that, even though impeccable for electromagnetic interactions among point-like particles, is fundamentally insufficient for a serious representation of the scattering among extended, nonspherical and hyperdense hadrons* (Figure 1.2 and Chapter 3).

As a matter of fact, serious scholars and, above all, future historians, should focus their main attention on the fact that the climax of unscientific conduct by organized interests on Einsteinian doctrines occurs primarily in the *manipulation of experiments,* beginning with the control of the conditions of funding, then following with the control of the conduction of the experiments and, finally, with the control of the theoretical elaboration of the data to make sure that the orchestrated compliance with Einsteinian doctrines occurs at all levels.

Among an unreassuringly excessive number of cases existing in the literature, some of which are reviewed in Chapter 6, a representative case is that of the *Bose-Einstein correlation* in which protons and antiprotons collide at high energy by annihilating each other and forming the so-called "fireball", that, in turn, emits a large number of unstable particles whose final product is a number of correlated mesons (see, e.g., review [7] and Figure 1.7).

The simplest possible case is that of the *two-points correlation function*

$$C_2 = \frac{P(p_1, p_2)}{P(p_1) \times P(p_2)}, \tag{1.2.14}$$

where p_1 and p_2 are the linear momenta of the two mesons and the P's represent their probabilities.

By working out the calculations via unadulterated axioms of relativistic quantum mechanics one obtains expressions of the type

$$C_2 = 1 + A \times e^{-Q_{12}} - B \times e^{-Q_{12}}, \tag{1.2.15}$$

where A and B are normalization parameters and Q_{12} is the momentum transfer. This expression is dramatically far from representing experimental data, as shown in Chapter 5.

To resolve the problem, supporters of the universal validity of quantum mechanics and special relativity then introduce *four arbitrary parameters of unknown physical origin and motivation* called "chaoticity parameters" c_μ, $\mu = 1, 2, 3, 4$, and expand expression (1.2.15) into the form

$$C_2 = 1 + A \times e^{-Q_{12}/c_1} + B \times e^{-Q_{12}/c_2} + C \times e^{-Q_{12}/c_3} - D \times e^{-Q_{12}/c_4}, \tag{1.2.16}$$

which expression does indeed fit the experimental data, as we shall see. However, the claim that quantum mechanics and special relativity are exactly valid is a scientific deception particularly when proffered by experts.

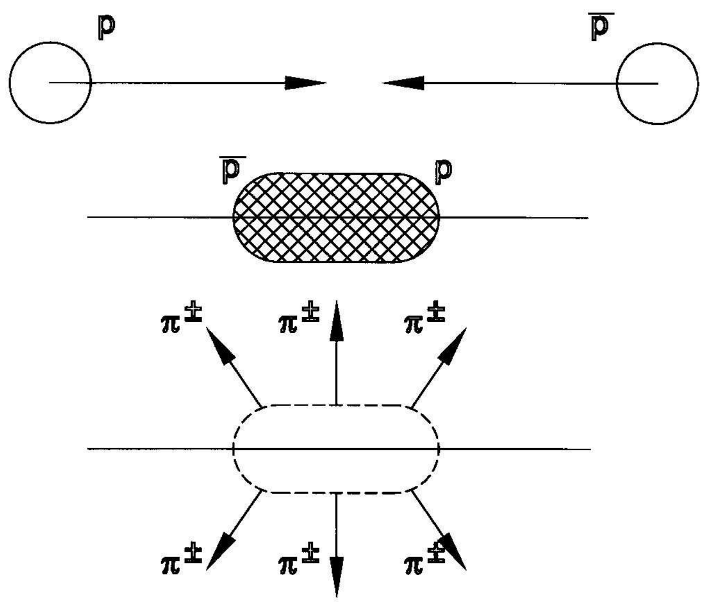

Figure 1.10. A schematic view of the Bose-Einstein correlation originating in proton-antiproton annihilations, for which the predictions of relativistic quantum mechanics are dramatically far from experimental data from unadulterated first principles. In order to salvage the theory and its underlying Einsteinian doctrines, organized interests introduce "four" ad hoc parameters deprived of any physical meaning or origin, and then claim the exact validity of said doctrines. The scientific truth is that these four arbitrary parameters are in reality a direct measurement of the deviation from the basic axioms of relativistic quantum mechanics and special relativity in particle physics.

As we shall see in technical details in Chapter 5, the quantum axiom of expectation values (needed to compute the probabilities) solely permit expression (1.2.15), since it deals with Hermitian, thus diagonalized operators of the type

$$< \psi_{\times}\psi_2| \times P \times |\psi_1 \times \psi_2 >= P_{11} + P_{22}, \tag{1.2.17}$$

while *the representation of a correlation between mesons 1 and 2 necessarily requires a structural generalization of the axiom of expectation value in such a form to admit off-diagonal elements for Hermitian operators,* for instance of the type

$$< \psi_{\times}\psi_2| \times T \times P \times T \times |\psi_1 \times \psi_2 >= P_{11} + P_{12} + P_{21} + P_{22}, \tag{1.2.18}$$

where T is a 2×2-dimensional nonsingular matrix with off-diagonal elements (and P remains diagonal).

The scientific deception occurs because quantum mechanics and special relativity are claimed to be exactly valid for the Bose-Einstein correlation when experts, to qualify as such, know that the representation requires a structural modification of the basic axiom of expectation values as well as for numerous additional reasons, such as:

1) The Bose-Einstein correlation is necessarily due to contact, nonpotential, nonlocal-integral effects originating in the deep overlapping of the hyperdense charge distributions of protons and antiprotons inside the fireball;

2) The mathematical foundations of quantum mechanics (such as its topology), let alone its physical laws, are inapplicable for a meaningful representation of said nonlocal and nonpotential interactions as outlined in preceding sections; and

3) Special relativity is also inapplicable, e.g., because of the inapplicability of the basic Lorentz and Poincaré symmetries due to lack of a Keplerian structure, the *approximate* validity of said theories remaining beyond scientific doubt.

Admittedly, there exist a number of semiphenomenological models in the literature capable of a good agreement with the experimental data. Scientific deception occurs when these models are used to claim the exact validity of quantum mechanics and special relativity since the representation of experimental data requires necessary structural departures from basic quantum axioms.

Of course, the selection of the appropriate generalization of quantum mechanics and special relativity for an exact representation of the Bose-Einstein correlation is open to scientific debate. Scientific deception occurs when the need for such a generalization is denied for personal gains.

As we shall see, relativistic hadronic mechanics provides an *exact and invariant* representation of the experimental data of the Bose-Einstein correlation at high and low energies via unadulterated basic axioms, by providing in particular a direct representation of the shape of the $p - \bar{p}$ fireball and its density, while recovering the basic invariant under a broader realization of the Poincaré symmetry.

An in depth investigation of all applications of quantum mechanics and special relativity at large reveals that they have provided an *exact* and*invariant* representation *from unadulterated basic axioms* of *all* experimental data of the hydrogen atom, as well as of physical conditions in which the mutual distances of particles is much bigger than the size of the charge distribution (for hadrons) or of the wavepackets of particles (for the case of the electron).

1.2.10 The Scientific Imbalance in Nuclear Physics

There is no doubt that quantum mechanics and special relativity permitted historical advances in also nuclear physics during the 20-th century, as illustrated, for instance, by nuclear power plants. However, any claim that quantum mechanics and special relativity are *exactly* valid in nuclear physics is a scientific deception, particularly when proffered by experts, because of the well known inability of these theories to achieve an exact and invariant representation of numerous nu-

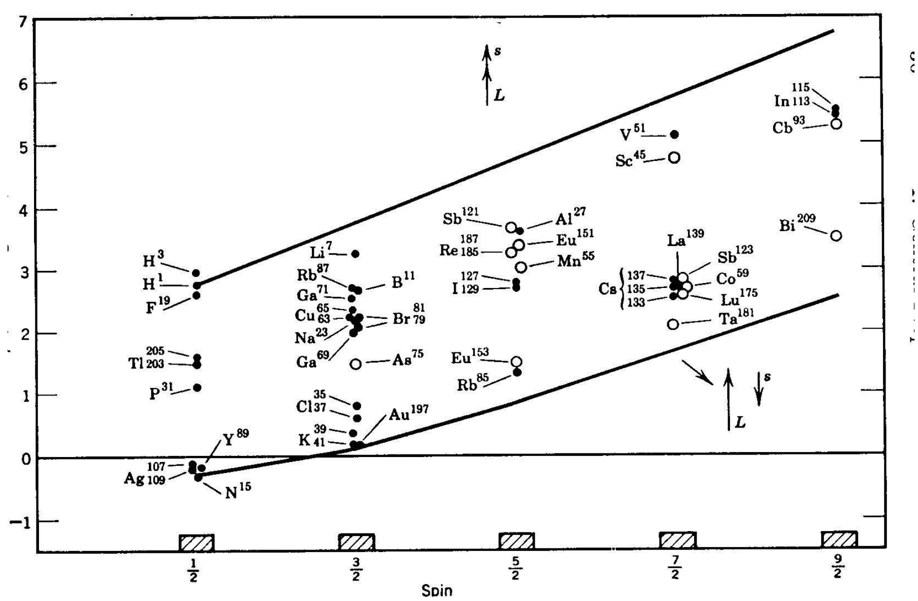

Figure 1.11. The first historical experimental evidence on the lack of exact validity of quantum mechanics in nuclear physics was given by data on nuclear magnetic moments that do not follow quantum mechanical predictions, and are instead comprised between certain minimal and maximal values, called the Schmidt Limits [13], without any possible quantum treatment. The additional suppression of the impossibility for the Galilean and Poincaré symmetries to be exact in nuclear physics due to the lack of a Keplerian center (see next figure), have essentially rendered nuclear physics a religion without a serious scientific process.

clear data despite one century of attempts and the expenditure of large public funds.

To resolve the insufficiencies, the use of arbitrary parameters of unknown physical origin and motivation was first attempted, semiphenomenological fits were reached and quantum mechanics and special relativity were again claimed to be exact in nuclear physics, while in the scientific reality the used parameters are a direct representation of *deviations* from the basic axioms of the theories as shown in detail in Chapter 5.

Subsequently, when the use of arbitrary parameters failed to achieve credible representations of nuclear data (such as nuclear magnetic moments as indicated below), organized academic interests claimed that "the deviations are resolved by deeper theories such as quark theories". At that point nuclear physics left the qualification of a true science to become a scientific religion.

Besides a plethora of intrinsic problematic aspects or sheer inconsistencies (such as the impossibility for quarks to have gravity mentioned earlier), quark theories failed to achieve any credible representation even of the spin of individual nucleons, let alone achieve exact representations of experimental data for their bound states.

Admittedly, the deviations here considered are at times small. Nevertheless, as we shall see in Chapter 6, small deviations directly imply new clean energies that cannot be even conceived, let alone treated, via quantum mechanics. Therefore, we have a societal duty to conduct serious investigations on broader mechanics specifically conceived for nuclear physics.

The first evidence on the lack of exact character of quantum mechanics in nuclear physics dates back to the birth of nuclear physics in the 1930s where it emerged that experimental values of nuclear magnetic moments could not be explained with quantum mechanics, because, starting with small deviations for small nuclei, the deviations then increased with mass, to reach deviations for large nuclei, such as the Zirconium so big to escape any use of unknown parameters "to fix things" (see Figure 1.8).

Subsequently, it became clear that quantum mechanics and special relativity could not explain the simplest possible nucleus, the deuteron, despite vast efforts. In fact, quantum mechanics missed about 1% of the deuteron magnetic moment despite all possible relativistic corrections, as well as the questionable assumptions that the ground state of the deuteron is a mixture of various states in a way manifestly against experimental evidence.

Next, quantum mechanics and special relativity were unable to represent the spin of the deuteron, an occurrence well known to experts in the field but carefully undisclosed. The axioms of quantum mechanics require that the ground state of two particles with spin 1/2 (such as the proton and the neutron) must have spin zero (*anti-parallel or singlet coupling*), while the case with spin 1 (*parallel spin or triplet coupling*) is unstable, as a first year graduate student in physics can prove.

By contrast, the deuteron has spin 1, thus remaining fundamentally unexplained by quantum mechanics and special relativity to this day.[5] Additionally, quantum mechanics has been unable to represent the stability of the neutron, its charge radius, and numerous other data.

Perhaps the most distressing, yet generally undisclosed, insufficiency of quantum mechanics and special relativity in nuclear physics has been the failure to understand and represent nuclear forces. Recall that a necessary condition for the applicability of quantum mechanics is that *all* interactions must be derivable from a potential.

The original concept that nuclear forces were of central type soon resulted in being disproved by nuclear reality, thus requiring the addition of non-central, yet still potential forces. The insufficiency of this addition requested the introduction

[5] As we shall see in Chapter 6, the correct interpretation of the spin 1 of the deuteron has implications so deep to require a revision of the very notion of neutron.

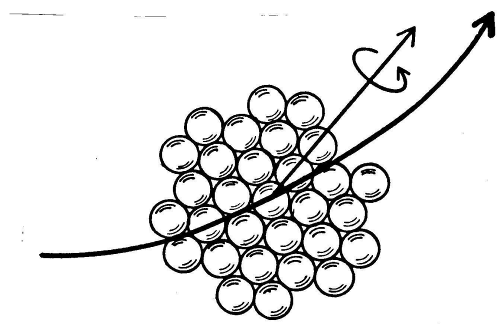

Figure 1.12. A visual evidence of the impossibility for quantum mechanics to be exactly valid in nuclear physics: the fact that "nuclei do not have nuclei." Consequently, the Galilean and Poincaré symmetries, as well as nonrelativistic and relativistic quantum mechanics, cannot possibly be exact for the nuclear structure since said symmetries demand the heaviest constituent at the center. The above occurrence establishes the validity of covering symmetries for interior systems without Keplerian centers, which symmetries are at the foundation of the covering hadronic mechanics.

of exchange, van der Waals, and numerous other potential forces. As of today, after about one century of adding new potentials to the Hamiltonian, we have reached the unreassuring representation of nuclear forces via some twenty or more different potentials in the Hamiltonian [13]

$$H = \Sigma_{k=1,2,\ldots,n} \frac{p_k^2}{2 \times m_k} + V_1 + V_2 + V_3 + V_4 + V_5 + V_6 +$$
$$+ V_7 + V_8 + V_9 + V_{10} + V_{11} + V_{12} + V_{13} + V_{14} +$$
$$+ V_{15} + V_{16} + V_{17} + V_{18} + V_{19} + V_{20} + \ldots\ldots\ldots \tag{1.2.19}$$

and we still miss a credible understanding and representation of the nuclear force!

It is evident that this process cannot be kept indefinitely without risking a major condemnation by posterity. The time has long come to stop adding potentials to nuclear Hamiltonians and seek fundamentally new approaches and vistas.

In the final analysis, an inspection of nuclear volumes establishes that nuclei are generally composed of nucleons in conditions of partial mutual penetration, as illustrated in Figure 1.9. By recalling that nucleons have the largest density measured in laboratory until now, the belief that all nuclear forces are of action-at-a-distance, potential type, as *necessary* to preserve the validity of quantum mechanics and special relativity, is pure academic politics deprived of scientific value.

As we shall see in Chapter 7, a central objective of hadronic mechanics is that of truncating the addition of potentials and re-examining instead the nuclear force from its analytic foundations, by first separating potential nonpotential forces, and then examining in details each of them.

In summary, the lack of exact character of quantum mechanics and special relativity in nuclear physics is beyond scientific doubt. The open scientific issue is the selection of the appropriate generalization, but not its need.

As we shall see in Chapter 6, the covering hadronic mechanics and isospecial relativity resolve the fundamental open problems of nuclear physics by permitting the industrial development of new clean energies based on light natural and stable elements without the emission of dangerous radiations and without the release of radioactive waste.

1.2.11 The Scientific Imbalance in Superconductivity

The condition of superconductivity in the 20-th century can be compared to that of atomic physics prior to the representation of the structure of the atom.

Recall that individual electrons cannot achieve a superconducting state because their magnetic fields interact with electromagnetic fields of atoms by creating in this way what we call *electric resistance.* Superconductivity is instead reached by deeply correlated-bonded pairs of electrons in singlet couplings, called *Cooper pairs.* In fact, these pairs have an essentially null total magnetic field (due to the opposite orientations of the two fields), resulting in a substantial decrease of electric resistance.

There is no doubt that quantum mechanics and special relativity have permitted the achievement of a good description of an "ensemble" of Cooper pairs, although each Cooper pair is necessarily abstracted as a point, the latter condition being necessary from the very structure of the theories.

However, it is equally well known that quantum mechanics and special relativity have been unable to reach a final understanding and representation of the structure of *one* Cooper pair, trivially, because electrons repel each other according to the fundamental Coulomb law.

The failure of basic axioms of quantum mechanics and special relativity to represent the *attractive* force between the two *identical* electrons of the Cooper pairs motivated the hypothesis that the attraction is caused by the exchange of a new particle called *phonon.* However, phonons certainly exist in sounds, but they have found no verification at all in particle physics, thus remaining purely conjectural to this day.

In reality, as we shall see in Chapter 7, the interactions underlying the Cooper pairs are of purely contact, nonlocal and integral character due to the mutual penetration of the wavepackets of the electrons, as depicted in Figure 1.10. As such, they are very similar to the interactions responsible for Pauli's exclusion principle in atomic structures.

Under these conditions, the granting of a potential energy, as necessary to have phonon exchanges, is against physical evidence, as confirmed by the fact that any representation of Pauli's exclusion principle via potential interactions cause sizable deviations from spectral lines.

Therefore, the belief that quantum mechanics and special relativity provide a complete description of superconductivity is pure academic politics deprived of scientific content.

Superconductivity is yet another field in which the exact validity of quantum mechanics and special relativity has been stretched in the 20-th century well beyond its limit for known political reasons. At any rate, superconductivity has exhausted all its predictive capacities, while all advances are attempted via empirical trials and errors without a guiding theory.

As it was the case for particle and nuclear physics, the lack of exact character of quantum mechanics and special relativity in superconductivity is beyond doubt. Equally beyond doubt is the need for a deeper theory.

As we shall see in Chapter 7, the covering hadronic mechanics and isospecial relativity provide a quantitative representation of the structure of the Cooper pair in excellent agreement with experimental data, and with basically novel predictive capabilities, such as the industrial development of a new electric current, that is characterized by correlated electron pairs in single coupling, rather than electrons.

1.2.12 The Scientific Imbalance in Chemistry

There is no doubt that quantum chemistry permitted the achievement of historical discoveries in the 20-th century. However, there is equally no doubt that the widespread assumption of the exact validity of quantum chemistry caused a large scientific imbalance with vast implications, particularly for the alarming environmental problems.

After about one century of attempts, quantum chemistry still misses a historical 2% of molecular binding energies when derived from axiomatic principles without *ad hoc* adulterations (see below). Also, the deviations for electric and magnetic moments are embarrassing not only for their numerical values, but also because they are wrong even in their sign [14], not to mention numerous other insufficiencies outlined below.

It is easy to see that the reason preventing quantum chemistry from being exactly valid for molecular structures is given by contact, nonlocal-integral and nonpotential interactions due to deep wave-overlappings in valence bonds that, as such, are beyond any realistic treatment by local-differential-potential axioms, such as those of quantum chemistry (Figure 1.10).

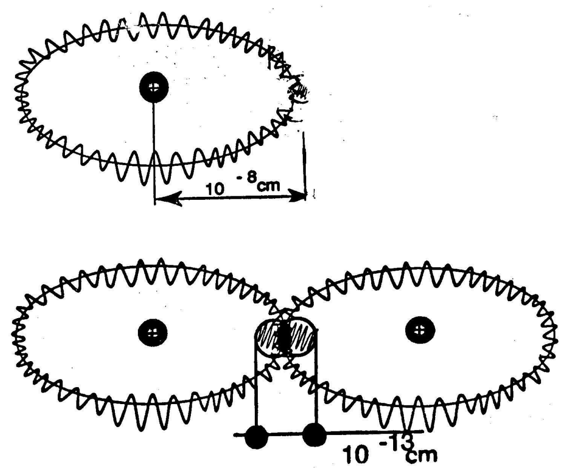

Figure 1.13. A schematic view of the fundamental conditions studied in this monograph, the deep overlapping of the extended wavepackets of electrons in valence bonds and Cooper pairs according to a singlet coupling as required by Pauli's principle. Recall that, for quantum mechanics and special relativity, electrons are points and, therefore, the conditions of this figure have no meaning at all. However, said point character can only be referred to the charge structure of the electron, since "point-like wavepackets" do not exist in nature. For the covering hadronic mechanics, superconductivity and chemistry, the point-like charge structure of the electrons remains, with the additional presence of the contact nonpotential interactions due to the overlapping of the extended wavepackets represented via a nonunitary structure. As shown in Chapters 8, 9 and 11, the treatment of the latter interactions via hadronic mechanics and chemistry has permitted the achievement, for the first time in scientific history, of an "exact and invariant" representations of molecular data from first axioms without ad hoc adulterations.

Recall that quantum mechanics achieved an exact and invariant representation of all experimental data of *one* hydrogen atom. Nevertheless, quantum mechanics and chemistry miss 2% of the binding energy of *two* hydrogen atoms coupled into the hydrogen molecule (Figure 1.11).

The only possible explanation is that in the hydrogen atom all interactions are of action-at-a-distance potential type due to the large mutual distances of the constituents with respect to the size of their wavepackets. By contrast, in the hydrogen molecule we have the mutual penetration of the wavepackets of valence electrons with the indicated contact, nonlocal-integral and nonpotential interactions at short mutual distances that are absent in the structure of the hydrogen atom.

Alternatively and equivalently, the nuclei of the two hydrogen atoms of the H_2 molecule cannot possibly be responsible for said 2% deviation. Therefore, the deviation from basic axioms can only originate in the valence bond.

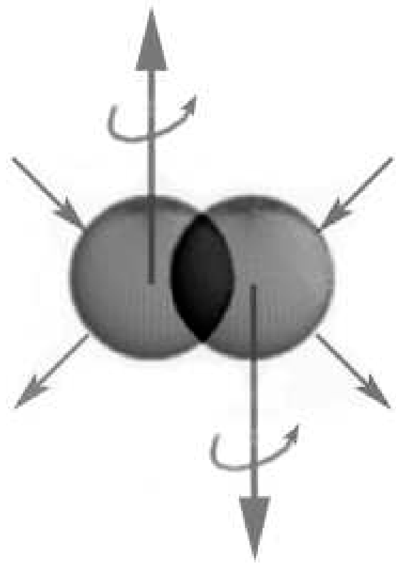

Figure 1.14. A first clear evidence of the lack of exact validity of quantum chemistry. The top view depicts one hydrogen atom for which quantum mechanics resulted in being exactly valid. The bottom view depicts two hydrogen atoms coupled into the H_2 molecule in which case quantum chemistry has historically missed a 2% of the binding energy when applied without adulteration of basic axioms "to fix things" (such as via the used of the screening of the Coulomb law and then claim that quantum chemistry is exact). Since nuclei do not participate in the molecular bond, the origin of the insufficiency of quantum mechanics and chemistry rests in the valence bond.

By no means the above insufficiencies are the only ones. Quantum chemistry is afflicted by a true litany of limitations, insufficiencies or sheer inconsistencies that constitute the best kept secret of the chemistry of the 20-th century because known to experts (since they have been published in refereed journals), but they remain generally ignored evidently for personal gains.

We outline below the insufficiencies of quantum chemistry for the simplest possible class of systems, those that are *isolated from the rest of the universe*, thus verifying conventional *conservation laws* of the total energy, total linear momentum, etc., and are *reversible* (namely, their time reversal image is as physical as the original system).

The most representative systems of the above class are given by *molecules,* here generically defined as aggregates of atoms under a valence bond. Despite undeniable achievements, quantum chemical models of molecular structures have the following fundamental insufficiencies studied in detail in monograph [11]:

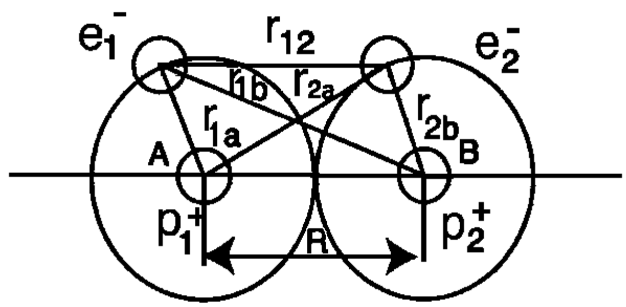

Figure 1.15. A schematic view of the fact that the total Coulomb force among the atoms of a molecular structure is identically null. As a consequence, conventional Coulomb interactions cannot provide credible grounds for molecular bonds. At the same time, existing chemical conjectures, such as the exchange and van der Waals forces, are weak, as known from nuclear physics. These facts establish that the chemistry of the 20-th century is like nuclear physics before the discovery of the strong interactions, because chemistry missed the identification of an attractive force sufficiently strong to represent molecular structure. As we shall see in Chapter 8, hadronic chemistry will indeed provide, for the first time in scientific history, the numerical identification of the missed "attractive strong attractive valence force" as being precisely of contact, nonlocal and nonpotential type. The achievement of an exact representation of molecular data is then consequential.

1: Quantum chemistry lacks a sufficiently strong molecular binding force. After 150 years of research, chemistry has failed to identify to this day the *attractive force* needed for a credible representation of valence bonds. In the absence of such an attractive force, names such as "valence" are pure nomenclatures without quantitative meaning.

To begin, the average of all Coulomb forces among the atoms constituting a molecule is identically null. As an example, the currently used Schrödinger equation for the H_2 molecule is given by the familiar expression [15],

$$(-\frac{\hbar^2}{2\mu_1}\nabla_1^2 - \frac{\hbar^2}{2\mu_2}\nabla_2^2 - \frac{e^2}{r_{1a}} - \frac{e^2}{r_{2a}} - \frac{e^2}{r_{1b}} - \frac{e^2}{r_{2b}} + \frac{e^2}{R} + \frac{e^2}{r_{12}})|\psi >= E|\psi >, \quad (1.2.20)$$

which equation contains the Coulomb attraction of each electron by its own nucleus, the Coulomb attraction of each electron from the nucleus of the other atom, the Coulomb repulsion of the two electrons, and the Coulomb repulsion of the two protons.

It is easy to see that, in semiclassical average, the two attractive forces of each electron from the nucleus of the other atom are compensated by the average of the two repulsive forces between the electrons themselves and those between the protons, under which Eq. (1.2.20) reduces to two independent *neutral* hydrogen atoms *without* attractive interaction, as depicted in Fig. 1.2.12,

$$\left[\left(-\frac{\hbar^2}{2\mu_1}\nabla_1^2 - \frac{e^2}{r_{1a}}\right) + \left(-\frac{\hbar^2}{2\mu_2}\nabla_2^2 - \frac{e^2}{r_{2a}}\right)\right]|\psi\rangle = E|\psi\rangle. \tag{1.2.21}$$

In view of the above occurrence, quantum chemistry tries to represent molecular bonds via *exchange, van der Waals and other forces* [15]. However, the latter forces were historically introduced for *nuclear structures* in which they are known to be *very weak*, thus being insufficient to provide a true representation of molecular bonds.

It is now part of history that, due precisely to the insufficiencies of exchange, van der Waals and other forces, nuclear physicists were compelled to introduce the *strong nuclear force*. As an illustration, calculations show that, under the currently assumed molecular bonds, the molecules of a three leaf should be decomposed into individual atomic constituents by a weak wind of the order of 10 miles per hour.

To put it in a nutshell, after about one century of research, *quantum chemistry still misses in molecular structures the equivalent of the strong force in nuclear structures.*

As we shall see in Chapter 8, one of the objectives of hadronic chemistry is precisely to introduce the missing force, today known as the *strong valence force,* that is, firstly, ATTRACTIVE, secondly, sufficiently STRONG, and, thirdly, INVARIANT. The exact and invariant representation of molecular data will then be a mere consequence.

2: Quantum chemistry admits an arbitrary number of atoms in the hydrogen, water and other molecules. This inconsistency is proved beyond scientific doubt by the fact that the exchange, van der Waals, and other forces used in current molecular models were conceived in nuclear physics for the primary purpose of admitting a large number of constituents.

When the same forces are used for molecular structures, they also admit an arbitrary number of constituents. As specific examples, when applied to the structure of the hydrogen or water molecule, any graduate student in chemistry can prove that, under exchange, van der Waals and other forces of nuclear type, the hydrogen, water and other molecules admit an *arbitrary* number of hydrogen atoms (see Figure 1.13).

Rather than explaining the reason why nature has selected the molecules H_2 and H_2O as the sole possible, current molecular models admit "molecules" of the type H_5, H_{23}, H_7O, H_2O_{121}, $H_{12}O_{15}$, etc., in dramatic disagreement with experimental evidence.

3: Quantum chemistry has been unable to explain the correlation of valence electrons solely into pairs. Experimental evidence clearly establishes that the valence correlations only occur between *electron pairs* in singlet coupling. By contrast, another known insufficiency of quantum chemistry is the intrinsic inability to restrict correlations to valence pairs.

This insufficiency is then passed to orbital theories, that work well at semi-empirical levels but remain afflicted by yet unresolved problems, eventually resulting in deviations of the prediction of the theory from experimental data that generally grow with the complexity of the molecule considered.

The inability to restrict correlations to valence pairs also provides an irrefutable additional confirmation that quantum chemistry predicts an arbitrary number of constituents in molecular structures.

As we shall see in Chapter 8, thanks to the advent of the new strong valence bond, the covering quantum chemistry does indeed restrict valence bonds strictly and solely to electron pairs. The resolution of inconsistency 2 will then be a mere consequence.

4: The use in quantum chemistry of "screened Coulomb potentials" violates basic quantum principles. The inability by quantum chemistry to achieve an exact representation of binding energies stimulated the adulteration of the basic Coulomb law into the so-called *screened Coulomb law* of the type

$$F = \pm f(r) \times \frac{e^2}{r}, \tag{1.2.22}$$

that did indeed improve the representation of experimental data.

However, the Coulomb law is a fundamental invariant of quantum mechanics, namely, the law remains invariant under all possible unitary transforms

$$F = \pm\frac{e^2}{r} \rightarrow U \times (\pm\frac{e^2}{r}) \times U^\dagger = \pm\frac{e^2}{r}, \tag{1.2.23a}$$

$$U \times U^\dagger = I. \tag{1.2.23b}$$

Therefore, any structural deviation from the Coulomb law implies deviations from the basic quantum axioms.

It then follows that the only possibility of achieving screened Coulomb laws is via the use of *nonunitary transforms* of the type

$$F = \pm\frac{e^2}{r} \rightarrow W \times (\pm\frac{e^2}{r}) \times W^\dagger = \pm e^{A\times r} \times \frac{e^2}{r}, \tag{1.2.24a}$$

$$W \times W^\dagger = e^{A\times r} \neq I. \tag{1.2.24b}$$

Therefore, by their very conception, *the use of screened Coulomb laws implies the exiting from the class of equivalence of quantum chemistry.* Despite that,

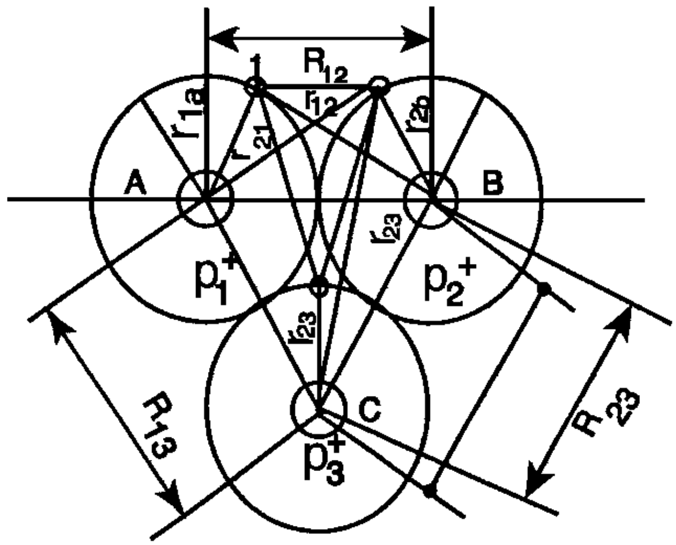

Figure 1.16. A schematic view of the fact that quantum chemistry predicts an arbitrary number of atoms in molecules because the exchange, van der Waals, and other bonding forces used in chemistry were identified in nuclear physics for an arbitrary number of constituents. Consequently, quantum chemistry is basically unable to explain the reasons nature has selected the molecules H_2, H_2O, CO_2, etc. as the sole possible molecular structures, and other structures such as H_5, H_{23}, H_7O, HO_{21}, $H_{12}O_{15}$, etc. cannot exist. As we shall see in Chapter 8, the "strong valence force" permitted by hadronic chemistry can only occur among "pairs" of valence electrons, thus resolving this historical problem in a quantitative way.

organized academic interests have continued to claim that screened Coulomb laws belong to quantum chemistry, thus exiting from the boundaries of science.

Irrespective from the above, a first year graduate student in chemistry can prove that *screened Coulomb laws cause the abandonment of the very notion of quantum in favor of the continuous emission or absorption of energy.* In fact, quantized emissions and absorptions of photons crucially depend on the existence of quantized orbits that, in turn, solely exist for unadulterated Coulomb potentials, as well known.

This insufficiency establishes the need to generalize quantum chemistry into a covering theory since the Coulomb law is indeed insufficient to represent molecular data. Rather than adapting a theory to adulterated basic axioms, it is scientifically more appropriate to build a new theory based on the needed broader axioms.

As we shall see in Chapter 8, the covering hadronic chemistry has been conceived to have a *nonunitary structure* as an evident necessary condition for novelty. In so doing, quantum chemistry naturally admits all infinitely possible screened Coulomb laws of type (1.2.22). However, such screenings are solely admitted in the nonlocal-integral region of deep wave-overlappings of valence electrons that are of the order of $1\,\mathrm{F} = 10^{-13}\,\mathrm{cm}$, while recovering the conventional Coulomb law automatically for all distances greater that 1 F.

This conception permits the achievement of an exact representation of molecular binding energies while preserving in full the quantum structure of the individual atoms.

5: Quantum chemistry cannot provide a meaningful representation of thermodynamical reactions. The missing 2% in the representation of binding energies is misleadingly small, because it corresponds to about 1,000 Kcal/mole while an ordinary thermodynamical reaction (such as that of the water molecule) implies an average of 50 Kcal/mole. No scientific calculation can be conducted when the error is of about twenty times the quantity to be computed.[6]

As we shall see in Chapter 8, our covering hadronic chemistry does indeed permit exact thermochemical calculations because it has achieved exact representations of molecular characteristics.

6: Computer usage in quantum chemical calculations requires excessively long periods of time. This additional, well known insufficiency is notoriously due to the slow convergence of conventional quantum series, an insufficiency that persists to this day despite the availability of powerful computers.

As we shall also see in Chapter 8, our covering hadronic chemistry will also resolve this additional insufficiency because the mechanism permitting the exact representation of molecular characteristics implies a fast convergent lifting of conventional slowly convergent series.

7: Quantum chemistry predicts that all molecules are paramagnetic. This inconsistency is a consequence of the most rigorous discipline of the 20-th century, quantum electrodynamics, establishing that, under an external magnetic field, the orbits of peripheral atomic electrons must be oriented in such a way to offer a magnetic polarity opposite to that of the external field (a polarization that generally occurs via the transition from a three-dimensional to a toroidal distribution of the orbitals).

According to quantum chemistry, atoms belonging to a molecule preserve their individuality. Consequently, quantum electrodynamics predicts that the periph-

[6]The author received a request from a U. S. public company to conduct paid research on certain thermochemical calculations. When discovering that the calculations had to be based on quantum chemistry due to political needs by the company to be aligned with organized academic interests, the author refused the research contract on grounds that it would constitute a fraud of public funds, due to the excessively large error of all thermochemical calculations when based on quantum chemistry.

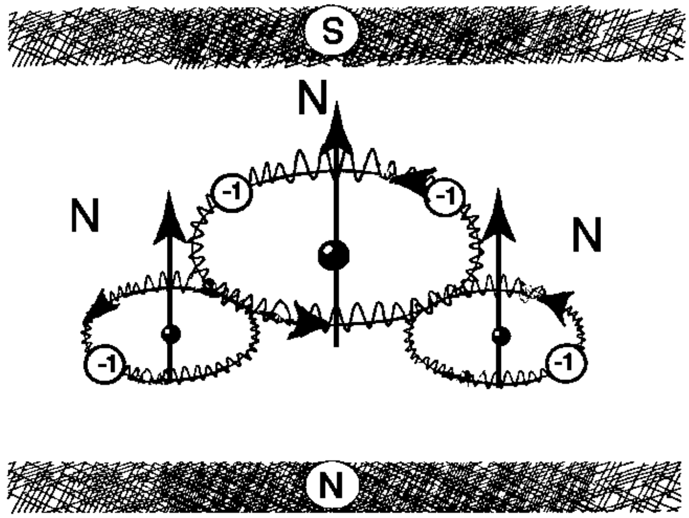

Figure 1.17. A schematic view of the prediction by quantum chemistry that water is paramagnetic, in dramatic disagreement with experimental evidence. In fact, quantum chemistry does not restrict the correlation of valence bonds to pairs. As a result, the individual valence electrons of the water molecule remain essentially independent. Quantum electrodynamics then demands the capability to polarize all valence electrons under an external magnetic field, resulting in the net magnetic polarity of this figure, and the consequential paramagnetic character of the water (as well as of all) molecules. As we shall see in Chapter 8, hadronic chemistry resolves this additional historical problem because our "strong valence force" deeply correlates valence electron pairs, thus permitting a global polarization of a molecule only in special cases, such as those with unbounded electrons.

eral atomic electrons of a molecule must acquire polarized orbits under an external magnetic field.

As a result, quantum chemistry predicts that the application of an external magnetic field, to hydrogen $H - H$, water $H - O - H$ and other molecules imply their acquisition of a net total, opposite polarity, $H_\uparrow - H_\uparrow$, $H_\uparrow - O_\uparrow - H_\uparrow$, etc., which polarization is in dramatic disagreement with experimental evidence.

The above inconsistency can also be derived from its inability to restrict the correlation solely to valence pairs. By contrast, the strong valence bond of the covering hadronic chemistry eliminates the independence of individual atoms in a molecular structure, by correctly representing the diamagnetic or paramagnetic character of substances.

No serious advance in chemistry can occur without, firstly, the admission of the above serious insufficiencies and/or inconsistencies, secondly, their detailed study, and, thirdly, their resolution via a covering theory.

Most importantly, we shall show in Chapter 10 that no resolution of the now alarming environmental problems is possible without a resolution of the above serious inconsistencies of quantum chemistry.

1.2.13 Inconsistencies of Quantum Mechanics, Superconductivity and Chemistry for Underwater Electric Arcs

Submerged electric arcs among carbon-base electrodes are known to permit the production of cost competitive and clean burning gaseous fuels via a highly efficient process since the primary source of energy is carbon combustion by the arc, the electric current used by the arc being a comparatively smaller energy. As such, submerged electric arcs have particular relevance for the main objectives of hadronic mechanics, as studied in Chapter 10 (see also monograph [11]).

An understanding of the motivations for the construction of hadronic mechanics, superconductivity and chemistry requires a knowledge of the fact that, contrary to popular beliefs, submerged electric arcs provide undeniable evidence of the following deviations from established doctrines:

1) When the liquid feedstock is distilled water and the electrodes are given by essentially pure graphite, quantum mechanics and chemistry predict that the produced gas is composed of 50% H_2 and 50% CO. However, CO is combustible in atmosphere and its exhaust is given by CO_2. Therefore, in the event said prediction was correct, the combustion exhaust of the gas should contain about 42% of CO_2. Numerous measurements conducted by an EPA accredited automotive laboratory [11] have established that the combustion exhaust contains about 4%-5% CO_2 without an appreciable percentage of unburned CO. Consequently, *the error of quantum mechanics and chemistry is of about ten times the measured value,* the error being in defect.

2) For the same type of gas produced from distilled water and carbon electrodes, quantum mechanics and chemistry predict that the thermochemical processes underlying the formation of the gas release about 2,250 British Thermal Units (BTU) per standard cubic feet (scf) (see Ref. [11]). In reality, systematic measurements have established that the heat produced is of the order of 250 BTU/scf. Therefore, *the error of quantum mechanics and chemistry is again of the order of ten times the measured quantity,* the error being this time in excess. Note that deviation 1) is fully compatible with deviation 2). In fact, the primary source of heat is the production of CO. Therefore, the production of 1/10-th of the heat predicted confirms that the CO is about 1/10-th the value predicted by quantum mechanics and chemistry.

3) Again for the case of the gas produced from distilled water and graphite electrodes, quantum mechanics and chemistry predict that no oxygen is present in the combustion exhaust, since the prediction is that, under the correct stochio-

metric ratio between atmospheric oxygen and the combustible gas, the exhaust is composed of 50% H_2O and 50% CO_2. In reality, independent measurements conducted by an EPA accredited automotive laboratory have established that, under the conditions here considered, the exhaust contains about 14% of breathable oxygen. Therefore, in this case the error of quantum mechanics and chemistry if about fourteen times the measured value.

4) Quantum mechanics and chemistry predict that the H_2 component of the above considered gas has the conventional specific weight of 2.016 atomic mass units (amu). Numerous measurements conducted in various independent laboratories have established instead that the hydrogen content of said gas has the specific weight of 14.56 amu, thus implying it a seven-fold deviation from the prediction of conventional theories.

5) Numerous additional deviations from the prediction of quantum mechanics and chemistry also exist, such as the fact that the gas has *a variable energy content, a variable specific weight, and a variable Avogadro number* as shown in Chapters 8 and 10, while conventional gases have *constant energy content, specific weight and Avogadro number,* as it is well known.

Above all *the most serious deviations in submerged electric arc occurs for Maxwell's electrodynamics,* to such an extent that any industrial or governmental research in the field based on Maxwell's electrodynamics is a misuse of corporate or public funds. At this introductory level we restrict ourselves to the indication of the axial attractive force between the electrodes and other features structurally incompatible with Maxwell's electrodynamics.

Needless to say, structural incompatibilities with Maxwell's electrodynamics automatically imply structural incompatibilities with special relativity due to the complete symbiosis of the two theories.

Note the re-emergence of the distinction between exterior and interior problems also in regard to Maxwell's electrodynamics. In fact, an arc in vacuum constitutes an exterior problem, while an arc within a liquid constitutes an interior problem. The impossibility of conducting serious industrial research via Maxwell's electrodynamics for submerged electric arcs can then be derived from the inapplicability of special relativity in the conditions considered.

The departures also extend to quantum superconductivity because the initiation of submerged electric arcs causes the collapse of the electric resistance, from very high value (as it is the case for distilled water) down to fractional Ohms. As a consequence, a submerged electric arc has features reminiscent of superconductivity. But the arc occurs at about 10,000 times the maximal temperature predicted by quantum superconductivity. The limitations of the theory is then beyond credible doubt, the only open scientific issues being the selection of the appropriate generalization.

In summary, under the above deviations, any use of quantum mechanics, superconductivity and chemistry for the study of submerged electric arcs exits the boundaries of scientific ethics and accountability. The departures of experimental evidence from old doctrines are just too big to be removed via arbitrary parameters "to fix things", thus mandating the construction of suitable covering theories.

1.3 THE SCIENTIFIC IMBALANCE CAUSED BY IRREVERSIBILITY

1.3.1 The Scientific Imbalance in the Description of Natural Processes

Numerous basic events in nature, including particle decays, such as

$$n \rightarrow p^{+} + e^{-} + \bar{\nu}, \tag{1.3.1}$$

nuclear transmutations, such as

$$C(6,12) + H(1,2) \rightarrow N(7,14), \tag{1.3.2}$$

chemical reactions, such as

$$H_2 + \frac{1}{2}O_2 \rightarrow H_2O, \tag{1.3.3}$$

and other processes are called *irreversible* when their images under time reversal, $t \rightarrow -t$, are prohibited by causality and other laws. Systems are instead called *reversible* when their time reversal images are as causal as the original ones, as it is the case for planetary and atomic structures when considered isolated from the rest of the universe.

Yet another large scientific imbalance of the 20-th century has been the treatment of *irreversible* systems via the formulations developed for *reversible* systems, such as Lagrangians and Hamiltonian mechanics, quantum mechanics and chemistry and special relativity. In fact, all these formulations are strictly reversible, in the sense that all their basic axioms are fully reversible in time, by causing in this way limitations in virtually all branches of science.

The imbalance was compounded by use of the *truncated Lagrange and Hamilton equations* (see Section 1.2.2) based on conventional Lagrangians or Hamiltonians,

$$L = \Sigma_{k=1,2,...,n} \frac{1}{2} \times m_k \times v_k^2 - V(r), \tag{1.2.4a}$$

$$H = \Sigma_{a=1,2,..,n} \frac{\mathbf{p}_a^2}{2 \times m_a} + V(r), \tag{1.3.4b}$$

under the full awareness that *all known potentials (such as those for electric, magnetic, gravitational and other interactions), and therefore, all known Hamiltonians, are reversible.*

This additional scientific imbalance was dismissed by academicians with vested interests in reversible theories with unsubstantiated statements, such as "irreversibility is a macroscopic occurrence that disappears when all bodies are reduced to their elementary constituents".

The underlying belief is that mathematical and physical theories that are so effective for the study of one electron in a reversible orbit around a proton are tacitly believed to be equally effective for the study of the same electron when in irreversible motion in the core of a star with the local *nonconservation* of energy, angular momentum, and other characteristics.

Along these lines a vast literature grew during the 20-th century on the dream of achieving compatibility of quantum mechanics with the evident irreversibility of nature at all levels, most of which studies were of manifestly political character due to the strictly reversibility of all methods used for the analysis.

These academic beliefs have been disproved by the following:

THEOREM 1.3.1 [10b]: A classical irreversible system cannot be consistently decomposed into a finite number of elementary constituents all in reversible conditions and, vice-versa, a finite collection of elementary constituents all in reversible conditions cannot yield an irreversible macroscopic ensemble.

The property established by the above theorems dismisses all nonscientific beliefs on irreversibility, and identify the real needs, the construction of formulations that are *structurally irreversible,* that is, irreversible for all known reversible potentials, Lagrangians or Hamiltonians, and are applicable at all levels of study, from Newtonian mechanics to second quantization.

The historical origin of the above imbalance can be outlined as follows. One of the most important teaching in the history of science is that by Lagrange [2], Hamilton [3], and Jacobi [4] who pointed out that *irreversibility originates from contact nonpotential interactions not representable with a potential,* for which reason they formulated their equations with *external terms,* as in Eqs. (1.2.3).

In the planetary and atomic structures, there is no need for external terms, since all acting forces are of potential type. In fact, these systems admit an excellent approximation as being made-up of *massive points moving in vacuum without collisions* (exterior dynamical problems). In these cases, the historical analytic equations were "truncated" with the removal of the external terms.

In view of the successes of the planetary and atomic models, the main scientific development of the 20-th century was restricted to the "truncated analytic equa-

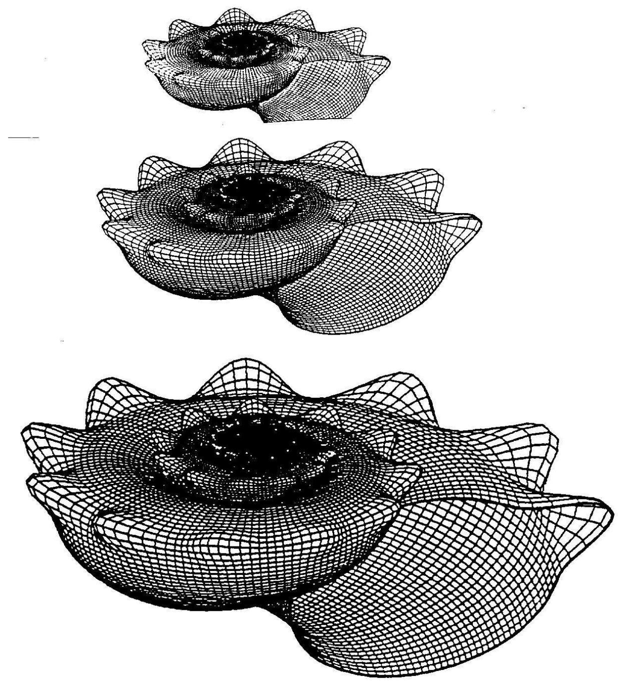

Figure 1.18. A pictorial view of the impossibility for quantum mechanics to be exactly valid in nature: the growth of a seashell. In fact, quantum mechanics is structurally irreversible, in the sense that all its axioms, geometries and symmetries, potentials, etc., are fully reversible in time, while the growth of a seashell is structurally irreversible. The need for an irreversible generalization of quantum mechanics is then beyond credible doubt, as studied in detail in Chapter 4.

tions", without any visible awareness that they are not the equations conceived by the founders of analytic mechanics.

Therefore, the origin of the scientific imbalance on irreversibility is the general dismissal by scientists of the 20-th century of the historical teaching by Lagrange, Hamilton and Jacobi, as well as academic interests on the truncated analytic equations, such as quantum mechanics and special relativity. In fact, as outlined earlier, the use of external terms in the basic analytic equations cause the inapplicability of the mathematics underlying said theories.

It then follows that no serious scientific advance on irreversible processes can be achieved without first identifying a structurally irreversible mathematics and then the compatible generalizations of conventional theories, a task studied in details in Chapter 4.

As we shall see, contrary to popular beliefs, the origin of irreversibility results in being at the ultimate level of nature, that of elementary particles in interior conditions. irreversibility then propagates all the way to the macroscopic level so as to avoid the inconsistency of Theorem 1.3.1.

1.3.2 The Scientific Imbalance in Astrophysics and Cosmology

Astrophysics and cosmology are new branches of science that saw their birth in the 20-th century with a rapid expansion and majestic achievements. Yet, these new fields soon fell pray to organized interests in established doctrines with particular reference to quantum mechanics, special relativity and gravitation, resulting in yet another scientific imbalance of large proportions.

To begin, all interior planetary or astrophysical problems are *irreversible,* as shown by the very existence of *entropy,* and known thermodynamical laws studiously ignored by supporters of Einsteinian doctrines. This feature, alone, is sufficient to cause a scientific imbalance of historical proportions because, as stressed above, irreversible systems cannot be credibly treated with reversible theories.

Also, quantum mechanics has been shown in the preceding sections to be inapplicable to all interior astrophysical and gravitational problems for reasons other than irreversibility. Any reader with an independent mind can then see the limitations of astrophysical studies for the interior of stars, galaxies and quasars based on a theory that is intrinsically inapplicable for the problems considered.

The imposition of special relativity as a condition for virtually all relativistic astrophysical studies of the 20-th century caused an additional scientific imbalance. To illustrate its dimensions and implications, it is sufficient to note that all calculations of astrophysical energies have been based on the relativistic mass-energy equivalence

$$E = m \times c^2, \tag{1.3.5}$$

namely, on the philosophical belief that the speed of light c is the same for all conditions existing in the universe (this is the well known "universal constancy of the speed of light").

As indicated earlier, this belief has been disproved by clear experimental evidence, particularly for the case of interior astrophysical media in which the maximal causal speed has resulted to be $C = c/n >> c$, $n << 1$, in which case the correct calculation of astrophysical energies is given by the equivalence principle of the isospecial relativity (see Chapter 3)

$$E = m \times C^2 = m \times c^2/n^2 >> m \times c^2, \ n << 1, \tag{1.3.6}$$

thus invalidating current view on the "missing mass", and others.

A further large scientific imbalance in astrophysics and cosmology was caused by the imposition of general relativity, namely, by one of the most controversial theories of the 20-th century because afflicted by problematic aspects and sheer inconsistencies so serious called catastrophic, as outlined in the next section.

It is hoped these preliminary comments are sufficient to illustrate the weakness of the scientific foundations of astrophysical studies of the 20-th century.

1.3.3 The Scientific Imbalance in Biology

By far one of the biggest scientific imbalances of the 20-th century occurred in biology because biological structures were treated via quantum mechanics in full awareness that the systems described by that discipline are dramatically different than biological structures.

To begin, quantum mechanics and chemistry are strictly *reversible,* while all biological structures and events are structurally *irreversible,* since biological structures such as a cell or a complete organism, admit a birth, then grow and then die.

Moreover, quantum mechanics and chemistry can only represent *perfectly rigid systems*, as well known from the fundamental rotational symmetry that can only describe "rigid bodies".

As a consequence, the representation of biological systems via quantum mechanics and chemistry implies that our body should be perfectly rigid, without any possibility of introducing deformable-elastic structures, because the latter would cause catastrophic inconsistencies with the basic axioms.

Moreover, another pillar of quantum mechanics and chemistry is the verification of total conservation laws, for which Heisenberg's equation of motion became established. In fact, the quantum time evolution of an arbitrary quantity A is given by

$$i \times \frac{dA}{dt} = [A, H] = A \times H - H \times A, \tag{1.3.7}$$

under which expression we have the conservation law of the energy and other quantities, e.g.,

$$i \; dH/dt = H \times H - H \times H \equiv 0. \tag{1.3.8}$$

A basic need for a scientific representation of biological structures is instead the representation of *the time-rate-of-variations of biological characteristics*, such as size, weight, density, etc. This identifies another structural incompatibility between quantum mechanics and biological systems.

When passing to deeper studies, the insufficiencies of quantum mechanics and chemistry emerge even more forcefully. As an example, quantum theories can well represent the *shape* of sea shells, but not their *growth in time*.

In fact, computer visualizations [16] have shown that, when the geometric axioms of quantum mechanics and chemistry (those of the Euclidean geometry) are imposed as being *exactly* valid, sea shells first grow in a deformed way, and then crack during their growth.

Finally, the ideal systems described with full accuracy by quantum mechanics, such as an isolated hydrogen atom or a crystal, are *eternal.* Therefore, the description via quantum theories implies that biological systems are eternal.

These occurrences should not be surprising to inquisitive minds, because the birth and growth, e.g., of a seashell is strictly *irreversible and nonconservative,* while the geometric axioms of quantum theories are perfectly *reversible and conservative*, as indicated earlier, thus resulting in a structural incompatibility, this time, at the geometric level without any conceivable possibility of reconciliation, e.g., via the introduction of unknown parameters "to fix things".

Additional studies have established that the insufficiencies of quantum mechanics and chemistry in biology are much deeper than the above, and invest the *mathematics* underlying these disciplines. In fact, Illert [16] has shown that a minimally correct representation of the growth in time of sea shells requires the *doubling of the Euclidean axes.*

However, sea shells are perceived by the human mind (via our three Eustachian tubes) as growing in our *three-dimensional* Euclidean space. As we shall see in Chapter 8, the only known resolution of such a dichotomy is that via *multi-valued irreversible mathematics*, that is, mathematics in which operations such as product, addition, etc., produce a *set of values*, rather than one single value as in quantum mechanics and chemistry.

At any rate, the belief that the simplistic mathematics underlying quantum mechanics and chemistry can explain the complexity of the DNA code, has no scientific credibility, the only serious scientific issue being the search for broader mathematics.

In conclusion, science will never admit "final theories". No matter how valid any given theory may appear at any point in time, its structural broadening for the description of more complex conditions is only a matter of time.

This is the fate also of quantum mechanics and chemistry, as well as special and general relativities that cannot possibility be considered as "final theories" for all infinitely possible conditions existing in the universe.

After all, following only a few centuries of research, rather than having reached a "final stage", science is only at its infancy.

1.4 THE SCIENTIFIC IMBALANCE CAUSED BY GENERAL RELATIVITY AND QUANTUM GRAVITY

1.4.1 Consistency and Limitations of Special Relativity

As it is well known, thanks to historical contributions by Lorentz, Poincaré, Einstein, Minkowski, Weyl and others, *special relativity* achieved a majestic axiomatical consistency.[7]

After one century of studies, we can safely identify the origins of this consistency in the following crucial properties:

1) Special relativity is formulated in the Minkowski spacetime over the field of real numbers;

2) All laws of special relativity are *invariant* (rather than covariant) under the fundamental *Poincaré symmetry*;

3) The Poincaré transformations and, consequently, all times evolutions of special relativity, are *canonical* at the classical level and *unitary* at the operator level with implications crucial for physical consistency.

Consequently, since canonical or unitary transforms conserve the unit by their very definition, *special relativity admits basic units and numerical predictions that are invariant in time.* After all, the quantities characterizing the dynamical equations are the *Casimir invariants* of the Poincaré symmetry.

As a result of the above features, special relativity has been and can be confidently applied to experimental measurements because the units selected by the experimenter do not change in time, and the numerical predictions of the theory can be tested at any desired time under the same conditions without fear of internal axiomatic inconsistencies.

It is well established at this writing that special relativity is indeed "compatible with experimental evidence" for the arena of its original conception, the classical and operator treatment of "point-like" particles and electromagnetic waves moving in vacuum. Despite historical results, it should be stressed that, as is the fate for all theories, *special relativity has numerous well defined limits of applicability,* whose identification is crucial for any serious study on gravitation, since

[7] It should be indicated that the name "Einstein's special relativity" is political, since a scientifically correct name should be "Lorentz-Poincaré-Einstein relativity." Also, it is appropriate to recall (as now reviewed in numerous books under testimonials by important eyewitnesses) that Einstein ended up divorcing his first wife Mileva Maric because she was instrumental in writing the celebrated paper on special relativity of 1905 and, for that reason, she had been originally listed as a co-author of that article, co-authorship that was subsequently removed when the article appeared in print. In fact, Einstein awarded his Nobel Prize money on that article to Mileva. Similarly, it should be recalled that Einstein avoided quoting Poincaré in his 1905 article following his consultation, and in documented knowledge that Poincaré had preceded him in various features of special relativity (see, e.g., the historical account by Logunov [96] or the instructive books [97,98]).

general relativity is known to be an extension of the special. Among the various limitations, we quote the following:

INAPPLICABILITY # 1: Special relativity is *inapplicable* for the *classical* treatment of antiparticles as shown in Section 1.1 and Chapter 2. This is essentially due to the existence of only one quantization channel. Therefore, the quantization of a *classical antiparticle* characterized by special relativity (essentially via the sole change of the sign of the charge) clearly leads to a quantum mechanical *particle* with the wrong sign of the charge, and definitely not to the appropriate charge conjugated antiparticle, resulting in endless inconsistencies.

INAPPLICABILITY # 2: Special relativity has also been shown to be inapplicable (rather than violated) for the treatment of both, particles and antiparticles when represented as they are in the physical reality, extended, generally nonspherical and deformable particles (such as protons or antiprotons), particularly when interacting at very short distances. In fact, these conditions imply the mutual penetration of the wavepackets and/or the hyperdense media constituting the particles, resulting in nonlocal, integro-differential and nonpotential interactions that cannot be entirely reduced to potential interactions among point-like constituents.

INAPPLICABILITY # 3: Special relativity is also afflicted by the historical inability to represent irreversible processes. This inapplicability has been identified in Section 1.3 in the reversibility of the mathematical methods used by special relativity, under which conditions the reversibility in time of its basic axioms is a mere consequence.

INAPPLICABILITY # 4: An additional field of clear inapplicability of special relativity is that for all biological entities, since the former can only represent perfectly rigid and perfectly reversible, thus eternal structures, while biological entities are notoriously deformable and irreversible, having a finite life.

INAPPLICABILITY # 5: In addition, serious scholars should keep in mind that the biggest limitation of special relativity may well result to be the forgotten universal medium needed for the characterization and propagation not only of electromagnetic waves, but also of elementary particles, since truly elementary particles such as the electron appear to be pure oscillations of said universal medium. Rather than being forgotten, the issue of the *privileged reference frame* and its relationship to reference frames of our laboratory settings appears to be more open than ever.

1.4.2 The Scientific Imbalance Caused by General Relativity on Antimatter, Interior Problems, and Grand Unifications

As indicated above, special relativity has a majestic axiomatic structure with clear verifications in the field of its original conception. By contrast, it is safe to state that *general relativity* (see, e.g., monograph [17]) has been the most controversial theory of the 20-th century for a plethora of inconsistencies that have grown in time, rather than being addressed and resolved.

We now address some of the inconsistencies published by numerous scholars in refereed technical journals, yet generally ignored by organized interests on Einsteinian doctrines, which inconsistencies are so serious to be known nowadays as being "catastrophic". The apparent resolution of the inconsistencies will be presented in Chapters 3, 4, 5, 13, and 14.

Let us begin with the following basic requirement for any *classical* theory of gravitation to be consistent:

REQUIREMENT 1: Any consistent classical theory of antimatter must allow a consistent representation of the *gravitational field of antimatter.* General Relativity does not verify this first requirement because, in order to attempt a compatibility of classical and quantum formulations, antimatter requires negative-energies, while general relativity solely admit positive-definite energies, as well known.

Even assuming that this insufficiency is somewhat bypassed, general relativity can only represent antimatter via the reversal of the sign of the charge. But the most important astrophysical bodies expected to be made up of antimatter are neutral. This confirms the structural inability of general relativity to represent antimatter in a credible way.

REQUIREMENT 2: Any consistent classical theory of antimatter must be able to represent *interior gravitational problems.* General relativity fails to verify this second requirement for numerous reasons, such as the inability to represent the *density* of the body considered, its *irreversible* condition, e.g., due to the increase of entropy, the *locally varying speed of light,* etc.

REQUIREMENT 3: Any consistent classical theory of gravitation must permit a grand unifications with other interactions. It is safe to state that this requirement too is not met by general relativity since all attempts to achieve a grand unification have failed to date since Einstein times (see Chapter 12 for details).

REQUIREMENT 4: Any consistent classical theory of gravitation must permit a consistent operator formulation of gravity. This requirement too has not been met by general relativity, since its operator image, known as *quantum gravity* [18] is afflicted by additional independent inconsistencies mostly originating from its unitary structure as studied in the next section.

REQUIREMENT 5: Any consistent classical theory of gravitation must permit the representation of the *locally varying nature of the speed of light.* This requirement too is clearly violated by general relativity.

The above insufficiencies are not of marginal character because they caused serious imbalances in most branches of quantitative sciences.

As an illustration, the first insufficiency prevented any study whatever as to whether a far-away galaxy or quasar is made up of matter or of antimatter. The second insufficiency created a form of religion related to the so-called "black holes", since before claiming their existence, gravitational singularities must evidently come out of *interior* gravitational problems and definitely not from theoretical abstractions solely dealing with exterior gravitation. The third insufficiency has been responsible for one of the longest list of failed attempts in grand unification without addressing the origin of the failures in the gravitational theory itself. The fourth insufficiency prevented throughout the entire 20-th century a consistent quantum formulation of gravity with large implications in particle physics. The fifth insufficiency cause cosmological models that can only be qualified as scientific beliefs, rather than quantitative theories based on sound physical foundations.

It is hoped that even the most representative members of organized interests on Einsteinian doctrines will admit that any additional support for said interests is now counterproductive, since it has already passed the mark for a severe condemnation by posterity.

It is time to provide a scientific identification of the basic insufficiencies of general relativity and initiate systematic studies for their resolution.

1.4.3 Catastrophic Inconsistencies of General Relativity due to Lack of Sources

There exist subtle distinctions between "general relativity", "Einstein's Gravitation", and "Riemannian" formulation of gravity. For our needs, we here define *Einstein's gravitation* of a body with null electric and magnetic moments as the reduction of exterior gravitation in vacuum to pure geometry, namely, gravitation is solely represented via curvature in a Riemannian space $\mathcal{R}(x, g, R)$ with spacetime coordinates $x = \{x^\mu\}$, $\mu = 1, 2, 3, 0$ and nowhere singular real-valued and symmetric metric $g(x)$ over the reals R, with field equations [19,20][8]

$$G_{\mu\nu} = R_{\mu\nu} - g_{\mu\nu} \times R/2 = 0, \tag{1.4.1}$$

[8]The dubbing of Eqs. (1.4.1) as "Einstein's field equations" is political since it is known, or it should be known by "expert" in the field to qualify as such, that Hilbert independently published the same equations, and that Einstein consulted Hilbert without quotation his work in his gravitational paper of 1916, as done by Einstein in other cases.

It is also appropriate to recall that the publication of his 1916 paper on gravitation caused Einstein the divorce from his second wife, Elsa Loewenstein, for essentially the same reason of his first divorce. In fact, unlike Einstein, Elsa was a true mathematician, had trained Einstein on the Riemannian geometry (a topic only for very few pure mathematics at that time), and was supposed to be a co-author of Einstein's 1916 paper, a co-authorship denied as it was the case for the suppression of co-authorship of his first wife Mileva for his 1905 paper on special relativity (see the instructive books [97,98]).

To avoid a scandal for the 1905 paper, Einstein donate to Mileva the proceeds of his Nobel Prize. However, he did not receive a second Nobel Prize to quite down his second wife Elsa. A scandal was then in which, as a central condition to have Einstein's gravitation, *there are no sources for the exterior gravitational field in vacuum for a body with null total electromagnetic field (null total charge and magnetic moment).*

For our needs, we define as *general relativity* any description of gravity on a Riemannian space over the reals with Einstein-Hilbert field equations with a source due to the presence of electric and magnetic fields,

$$G_{\mu\nu} = R_{\mu\nu} - g_{\mu\nu} \times R/2 = k \times t_{\mu\nu}, \tag{1.4.2}$$

where k is a constant depending on the selected unit whose value is here irrelevant. For the scope of this section it is sufficient to assume that the *Riemannian description of gravity* coincides with general relativity according to the above definition.

In the following, we shall first study the inconsistencies of Einstein gravitation, that is, the inconsistencies in the entire reduction of gravity to curvature without source, and then study the inconsistency of general relativity, that is, the inconsistencies caused by curvature itself even in the presence of sources.

It should be stressed that a technical appraisal of the content of this section can only be reached following the study of the axiomatic inconsistencies of grand

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avoided for the 1916 paper via the complicity of the Princeton community, complicity that is in full force and effect to this day. Hence, Princeton can indeed be considered as being an academic community truly leading in new basic advances during Einstein's times. By contrast, Princeton is nowadays perceived as a "scientific octopus" with kilometric tentacles reaching all parts of our globe for the studious suppression, via the abuse of academic credibility, of any spark of advance over Einsteinian doctrines. In fact, no truly fundamental advance came out of Princeton since Einstein's times, thus leaving Einstein as the sole source of money, prestige and power.

The documentation of the actions by Princeton academicians to oppose, jeopardize and disrupt research beyond Einstein is vast and includes hundreds of researchers in all developed countries. It is their ethical duty, if they really care for scientific democracy and the human society, to come out and denounce publicly the serious misconducts by Princeton academicians they had to suffer (for which denunciations I am sure that the *International Committee on Scientific Ethics and Accountability* will offer its website http://www.scientificethics.org).

In regard to the author's documented experiences, it is sufficient to report here for the reader in good faith the rejection by the Princeton academic community with offensive language of *all* requests by the author (when still naive) for delivering an informal seminar on the isotopic lifting of special relativity for the intent of receiving technical criticisms. There is also documentation that, when the unfortunate session chairman of the second *World Congress in Mathematics* of the new century, the president of the Institute for Advanced Studies in Princeton prohibited presentations on Lie-isotopic and Lie-admissible algebras not only by the author, but also by the late Prof. Grigorios Tsagas, then Chairman of the Mathematics Department of Aristotle University in Thessaloniki, Greece. This volume has been dedicated to the memory of Prof. Gr. Tsagas also in view of the vexations he had to suffer for his pioneering mathematical research from decaying U. S. academia.

The climax of putrescence in the Princeton academic community is reached by the mumbo-jambo research in the so called "controlled hot fusion" under more than one billion of public funds, all spent under the condition of compatibility with Einsteinian doctrines, and under clear the technical proofs of the impossibility of its success (see Volume II for technical details).

The author spares the reader the agony of additional documented episodes of scientific misconducts because too demeaning, and expresses the view that, with a few exceptions, the Princeton academic community is nowadays an enemy of mankind.

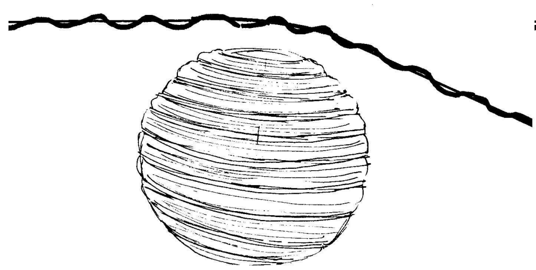

Figure 1.19. When the "bending of light" by astrophysical bodies was first measured, organized interests in Einsteinian doctrines immediately claimed such a bending to be an "experimental verification" of "Einstein's gravitation", and the scientific community accepted that claim without any critical inspection (for evident academic gains), according to an unreassuring trend that lasts to this day by being at the foundation of the current scientific obscurantism of potentially historical proportions. It can be seen by first year physics students that the measured bending of light is that predicted by the NEWTONIAN attraction. The representation of the same "bending of light" as being entirely due to curvature, as necessary in "Einstein's gravitation", implies its formulation in such a way to avoid any Newtonian contribution, with catastrophic inconsistencies in other experiments (see, e.g., next figure).

unified theories of electroweak and gravitational interactions whenever gravity is represented with curvature on a Riemannian space irrespective of whether with or without sources, as studied in Chapter 12.

THEOREM 1.4.1 [22]: Einstein's gravitation and general relativity at large are incompatible with the electromagnetic origin of mass established by quantum electrodynamics, thus being inconsistent with experimental evidence.

Proof. Quantum electrodynamics has established that the mass of all elementary particles, whether charged or neutral, has a primary electromagnetic origin, that is, all masses have a first-order origin given by the volume integral of the 00-component of the energy-momentum tensor $t_{\mu\nu}$ of electromagnetic origin,

$$m = \int d^4x \times t_{oo}^{elm}. \tag{1.4.3a}$$

$$t_{\alpha\beta} = \frac{1}{4\pi}(F_{\alpha}^{\mu}F_{\mu\beta} + \frac{1}{4}g_{\alpha\beta}F_{\mu\nu}F^{\mu\nu}), \tag{1.4.3b}$$

where $t_{\alpha\beta}$ is the *electromagnetic tensor,* and $F_{\alpha\beta}$ is the *electromagnetic field* (see Ref. [11a] for explicit forms of the latter with retarded and advanced potentials).

Therefore, quantum electrodynamics requires the presence of a *first-order source tensor* in the *exterior field equations* in vacuum as in Eqs. (1.4.2). Such a source tensor is absent in Einstein's gravitation (1.4.1) by conception. Consequently, Einstein's gravitation is incompatible with quantum electrodynamics.

The incompatibility of general relativity with quantum electrodynamics is established by the fact that the source tensor in Eqs. (1.4.2) is of *higher order in magnitude*, thus being ignorable in first approximation with respect to the gravitational field, while according to quantum electrodynamics said source tensor is of first order, thus not being ignorable in first approximation.

The inconsistency of both Einstein's gravitation and general relativity is finally established by the fact that, for the case when the total charge and magnetic moment of the body considered are null, Einstein's gravitation and general relativity allows no source at all. By contrast, as illustrated in Ref. [21], quantum electrodynamics requires a first-order source tensor even when the total charge and magnetic moments are null due to the charge structure of matter. **q.e.d.**

The first consequence of the above property can be expressed via the following:

COROLLARY 1.4.1A [21]: Einstein's reduction of gravitation in vacuum to pure curvature without source is incompatible with physical reality.

A few comments are now in order. As is well known, the mass of the electron is entirely of electromagnetic origin, as described by Eq. (3.3), therefore requiring a first-order source tensor in vacuum as in Eqs. (3.2). Therefore, Einstein's gravitation for the case of the electron is inconsistent with nature. Also, the electron has a point charge. Consequently, *the electron has no interior problem at all, in which case the gravitational and inertial masses coincide,*

$$m_{Electron}^{Grav.} \equiv m_{Electron}^{Iner}. \tag{1.4.4}$$

Next, Ref. [21] proved Theorem 1.4.1 for the case of a neutral particle by showing that the π^o meson also needs a first-order source tensor in the exterior gravitational problem in vacuum since its structure is composed of one charged particle and one charged antiparticle in high dynamical conditions.

In particular, the said source tensor has such a large value to account for the entire *gravitational mass* of the particle [21]

$$m_{\pi^o}^{Grav.} = \int d^4x \times t_{00}^{Elm}. \tag{1.4.5}$$

For the case of the interior problem of the π^o , we have the additional presence of short range weak and strong interactions representable with a new tensor $\tau_{\mu\nu}$. We, therefore, have the following:

COROLLARY 1.4.1B [22]: In order to achieve compatibility with electromagnetic, weak and strong interactions, any gravitational theory must admit two source tensors, a traceless tensor for the representation of the electromagnetic origin of mass in the exterior gravitational problem, and a second tensor to represent the contribution to interior gravitation of the short range interactions according to the field equations

$$G^{Int.}_{\mu\nu} = R_{\mu\nu} - g_{\mu\nu} \times R/2 = k \times (t^{Elm}_{\mu\nu} + \tau^{ShortRange}_{\mu\nu}). \qquad (1.4.6)$$

A main difference of the two source tensors is that the electromagnetic tensor $t^{Elm}_{\mu\nu}$ is notoriously traceless, while the second tensor $\tau^{ShortRange}_{\mu\nu}$ is not. A more rigorous definition of these two tensors will be given shortly.

It should be indicated that, for a possible solution of Eqs. (1.4.6), various explicit forms of the electromagnetic fields as well as of the short range fields originating the electromagnetic and short range energy momentum tensors are given in Ref. [21].

Since both source tensors are positive-definite, Ref. [21] concluded that the interior gravitational problem characterizes the *inertial mass* according to the expression

$$m^{Iner} = \int d^4x \times (t^{Elm}_{00} + \tau^{ShortRange}_{00}), \qquad (1.4.7)$$

with consequential general law

$$m^{Inert.} \geq m^{Grav.}, \qquad (1.4.8)$$

where the equality solely applies for the electron.

Finally, Ref. [22] proved Theorem 1.4.1 for the exterior gravitational problem of a neutral massive body, such as a star, by showing that the situation is essentially the same as that for the π^o. The sole difference is that the electromagnetic field requires the sum of the contributions from *all* elementary constituents of the star,

$$m^{Grav.}_{Star} = \Sigma_{p=1,2,\ldots} \int d^4x \times t^{Elem.}_{p00}. \qquad (1.4.9)$$

In this case, Ref. [21] provided methods for the approximate evaluation of the sum that resulted in being of first-order also for stars with null total charge.

When studying a charged body, there is no need to alter equations (3.6) since that particular contribution is automatically contained in the indicated field equations.

Once the incompatibility of general relativity at large with quantum electrodynamics has been established, the interested reader can easily prove the incompatibility of general relativity with quantum field theory and quantum chromodynamics, as implicitly contained in Corollary 1.4.1B.

An important property apparently first reached in Ref. [11a] in 1974 is the following:

COROLLARY 1.4.1C [22]: The exterior gravitational field of a mass originates entirely from the total energy-momentum tensor of the electromagnetic field of all elementary constituents of said mass.

In different terms, a reason for the failure to achieve a "unification" of gravitational and electromagnetic interactions initiated by Einstein himself is that the said interactions can be "identified" with each other and, as such, they cannot be unified. In fact, in all unifications attempted until now, the gravitational and electromagnetic fields preserve their identity, and the unification is attempted via geometric and other means resulting in redundancies that eventually cause inconsistencies.

Note that conventional electromagnetism is represented with the tensor $F_{\mu\nu}$ and related Maxwell's equations. When electromagnetism is identified with exterior gravitation, it is represented with the energy-momentum tensor $t_{\mu\nu}$ and related equations (1.4.6).

In this way, *gravitation results as a mere additional manifestation of electromagnetism.* The important point is that, besides the transition from the field tensor $F_{\mu\nu}$ to the energy-momentum tensor $T_{\mu\nu}$, there is no need to introduce a new interaction to represent gravity.

Note finally the irreconcilable alternatives emerging from the studies herein considered [22]:

ALTERNATIVE I: Einstein's gravitation is assumed as being correct, in which case quantum electrodynamics must be revised in such a way to avoid the electromagnetic origin of mass; or

ALTERNATIVE II: Quantum electrodynamics is assumed as being correct, in which case Einstein's gravitation must be irreconcilably abandoned in favor of a more adequate theory.

By remembering that quantum electrodynamics is one of the most solid and experimentally verified theories in scientific history, it is evident that the rather widespread assumption of Einstein's gravitation as having final and universal character is non-scientific.

THEOREM 1.4.2 [75,110]: Einstein's gravitation is physically incompatible with the Freud identity of the Riemannian geometry for bodies with non-null electromagnetic fields, and mathematically as well as physically inconsistent with the

Freud identify for bodies with null electromagnetic fields, thus being inconsistent on geometric grounds.

Proof. the Freud identity of the Riemannian geometry requires the presence of a *first order* source tensor in the r.h.s. of the field equations, thus prohibiting Einstein attempt of reducing gravitation to sole curvature without source. In fact, the Freud identity [23] can be written in the following, as well as numerous equivalent forms:

$$R^\alpha_\beta - \frac{1}{2} \times \delta^\alpha_\beta \times R - \frac{1}{2} \times \delta^\alpha_\beta \times \Theta \ = \ U^\alpha_\beta + \partial V^{\alpha\rho}_\beta / \partial x^\rho \ = \ k \times (t^\alpha_\beta + \tau^\alpha_\beta), \quad (1.4.10)$$

where

$$\Theta \ = \ g^{\alpha\beta} g^{\gamma\delta} (\Gamma_{\rho\alpha\beta} \Gamma^\rho_{\gamma\beta} - \Gamma_{\rho\alpha\beta} \Gamma^\rho_{\gamma\delta}), \quad (1.4.11a)$$

$$U^\alpha_\beta \ = \ -\frac{1}{2} \frac{\partial \Theta}{\partial g^{\rho\alpha}_{|\rho}} g^{\gamma\beta} \uparrow_\gamma, \quad (1.4.11b)$$

$$V^{\alpha\rho}_\beta \ = \ \frac{1}{2} [g^{\gamma\delta} (\delta^\alpha_\beta \Gamma^\rho_{\alpha\gamma\delta} - \delta^\rho_\beta \Gamma^\rho_{\alpha\delta}) +$$
$$+ (\delta^\rho_\beta g^{\alpha\gamma} - \delta^\alpha_\beta g^{\rho\gamma}) \Gamma^\delta_{\gamma\delta} + g^{\rho\gamma} \Gamma^\alpha_{\beta\gamma} - g^{\alpha\gamma} \Gamma^\rho_{\beta\gamma}]. \quad (1.4.11c)$$

Therefore, the Freud identity requires two *first order* source tensors for the exterior gravitational problems in vacuum as in Eqs. (1.4.6) reproduced from Ref. [22]. Of course, the field equations have the general form (1.4.2) in which there is indeed a source tensor in the r.h.s. Hence, for *bodies with a non-null electromagnetic fields,* there is no mathematical incompatibility between Einstein gravitation and the Fred identity.

However, it is well known that the contribution of electromagnetic fields to the gravitational field is extremely minute and definitely not of the *first order* in magnitude requested by the Freud identity, from which the first part of Theorem 1.4.2 follows.

For *bodies with null electromagnetic fields* (that is, null charge and null magnetic moments) no tensor of any type can be placed in the r.h.s. of the field equation, thus establishing the second part of Theorem 1.4 .2. **q.e.d.**

By noting that trace terms can be transferred from one tensor to the other in the r.h.s. of Eqs. (1.4.10), it is easy to prove the following:

COROLLARY 1.4.2A [75,110]: Except for possible factorization of common terms, the t- and τ-tensors of Theorem 3.2 coincide with the electromagnetic and short range tensors, respectively, of Corollary 1.4.1B.

A few historical comments regarding the Freud identity are in order. It has been popularly believed throughout the 20-th century that the Riemannian geometry possesses only *four identities* (see, e.g., Ref. [17]). In reality, Freud

[22] identified in 1939 a *fifth identity* that, unfortunately, was not aligned with Einstein's doctrines and, as such, the identity was ignored in virtually the entire literature on gravitation of the 20-th century, as it was also the case for Schwarzschild's interior solution [8].

However, as repeatedly illustrated by scientific history, structural problems simply do not disappear with their suppression, and actually grow in time. In fact, the Freud identity did not escape Pauli who quoted it in a footnote of his celebrated book of 1958 [24]. Santilli became aware of the Freud identity via an accurate reading of Pauli's book (including its important footnotes) and assumed the Freud identity as the geometric foundation of the gravitational studies presented in Ref. [10b].

Subsequently, in his capacity as Editor in Chief of *Algebras, Groups and Geometries,* Santilli requested the mathematician Hanno Rund, a known authority in Riemannian geometry [24], to inspect the Freud identity for the scope of ascertaining whether the said identity was indeed a new identity. Rund kindly accepted Santilli's invitation and released paper [26] of 1991 (the last paper prior to his departure) in which Rund confirmed indeed the character of Eqs. (3.10) as a genuine, independent, fifth identity of the Riemannian geometry.

The Freud identity was also rediscovered by Yilmaz (see Ref. [27] and papers quoted therein) who used the identity for his own broadening of Einstein's gravitation via an external *stress-energy tensor* that is essentially equivalent to the source tensor with non-null trace of Ref. [11a], Eqs. 1.4.6).

Despite these efforts, the presentation of the Freud identity to various meetings and several personal mailings to colleagues in gravitation, the Freud identity continues to remain vastly ignored, with rare exceptions (the indication by colleagues of additional studies on the Freud identity not quoted herein would be gratefully appreciated.)

Theorems 1.4.1 and 1.4.2 complete our presentation on the catastrophic inconsistencies of Einstein's gravitation due to the lack of a first-order source in the exterior gravitational problem in vacuum. These theorems, by no means, exhaust all inconsistencies of Einstein's gravitation, and numerous additional inconsistencies do indeed exist.

For instance, Yilmaz [27] has proved that Einstein's gravitation explains the 43" of the precession of Mercury, but cannot explain the basic Newtonian contribution. This result can also be seen from Ref. [21] because the lack of source implies the impossibility of importing into the theory the basic Newtonian potential. Under these conditions the representation of the Newtonian contribution is reduced to a religious belief, rather than a serious scientific statement.

For these and numerous additional inconsistencies of general relativity we refer the reader to Yilmaz [27], Wilhelm [28-30], Santilli [31], Alfvén [32,33], Fock [34], Nordensen [35], and large literature quoted therein.

1.4.4 Catastrophic Inconsistencies of General Relativity due to Curvature

We now pass to the study of the structural inconsistencies of general relativity caused by the very use of the Riemannian *curvature*, irrespective of the selected field equations, including those fully compatible with the Freud identity.

THEOREM 1.4.3 [36]: Gravitational theories on a Riemannian space over a field of real numbers do not possess time invariant basic units and numerical predictions, thus having serious mathematical and physical inconsistencies.

Proof. The map from Minkowski to Riemannian spaces is known to be *non-canonical,*

$$\eta = Diag.(1,1,1,-1) \ \rightarrow \ g(x) = U(x) \times \eta \times U(x)^{\dagger}, \tag{1.4.12a}$$

$$U(x) \times U(x)^{\dagger} \neq I. \tag{1.4.12b}$$

Thus, the time evolution of Riemannian theories is necessarily noncanonical, with consequential lack of invariance in time of the basic units of the theory, such as

$$I_{t=0} = Diag.(1cm, 1cm, 1cm, 1sec) \rightarrow I'_{t>0} = U_t \times I \times U_t^{\dagger} \ \neq I_{t=0}. \tag{1.4.13}$$

The lack of invariance in time of numerical predictions then follows from the known "covariance", that is, lack of time invariance of the line element. **q.e.d.**

As an illustration, suppose that an experimentalist assumes at the initial time $t = 0$ the units 1 cm and 1 sec. Then, all Riemannian formulations of gravitation, including Einstein's gravitation, predict that at the later time $t > 0$ said units have a different numerical value.

Similarly, suppose that a Riemannian theory predicts a numerical value at the initial time $t = 0$, such as the 43" for the precession of the perihelion of Mercury. One can prove that the same prediction at a later time $t > 0$ is numerically different precisely in view of the "covariance", rather than invariance as intended in special relativity, thus preventing a serious application of the theory to physical reality. We therefore have the following:

COROLLARY 1.4.3A [36]: Riemannian theories of gravitation in general, and Einstein's gravitation in particular, can at best describe physical reality at a fixed value of time, without a consistent dynamical evolution.

Interested readers can independently prove the latter occurrence from the *lack of existence of a Hamiltonian in Einstein's gravitation.* It is known in analytic mechanics (see, e.g., Refs. [17,24]) that Lagrangian theories not admitting an equivalent Hamiltonian counterpart, as is the case for Einstein's gravitation, are inconsistent under time evolution, unless there are suitable subsidiary constraints that are absent in general relativity.

It should be indicated that the inconsistencies are much deeper than that indicated above. For consistency, the Riemannian geometry must be defined on the field of numbers $R(n, +, \times)$ that, in turn, is fundamentally dependent on the basic unit I. But the Riemannian geometry does not leave time invariant the basic unit I due to its noncanonical character. The loss in time of the basic unit I then implies the consequential loss in time of the base field R, with consequential catastrophic collapse of the entire geometry [36].

In conclusion, not only is Einstein's reduction of gravity to pure curvature inconsistent with nature because of the lack of sources, but also the ultimate origin of the inconsistencies rests in the curvature itself when assumed for the representation of gravity, due to its inherent noncanonical character at the classical level with consequential nonunitary structure at the operator level.

Serious mathematical and physical inconsistencies are then unavoidable under these premises, thus establishing the impossibility of any credible use of general relativity, for instance, as an argument against the test on antigravity predicted for antimatter in the field of matter [5], as well as establishing the need for a profound revision of our current views on gravitation.

THEOREM 1.4.4. Gravitational experimental measurements do not verify general relativity uniquely.

Proof. All claimed "experimental verifications" of Einstein's gravitation are based on the PPN "expansion" (or linearization) of the field equations (such as the post-Newtonian approximation), that, as such, is not unique. In fact, Eqs. (1.4.1) admit a variety of inequivalent expansions depending on the selected parameter, the selected expansion and the selected truncation. It is then easy to show that the selection of an expansion of the same equations (3.1) but different from the PPN approximation leads to dramatic departures from experimental values. **q.e.d.**

THEOREM 1.4.5: General relativity is incompatible with experimental evidence because it does not represent the bending of light in a consistent, unique and invariant way.

Proof. Light carries energy, thus being subjected to a bending due to the conventional Newtonian gravitational attraction, while, general relativity predicts that the bending of light is entirely due to curvature (see, e.g., Ref. [17], Section 40.3). In turn, the absence of the Newtonian contribution causes other catastrophic inconsistencies, such as the inability to represent the free fall where curvature does not exist (Theorem 1.4.6 below). Assuming that consistency is

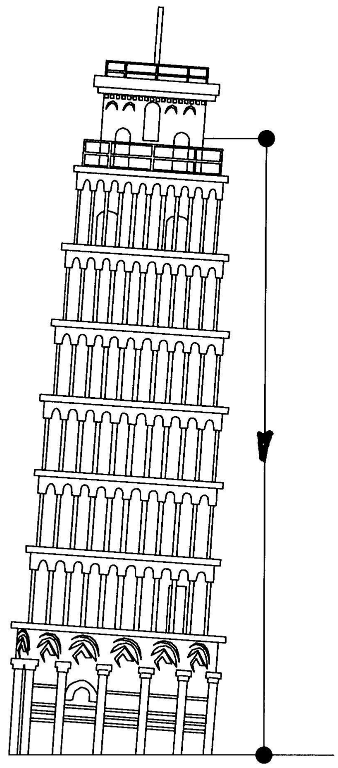

Figure 1.20. A conceptual rendering of the reason the author was unable to accept "Einstein's gravitation" as a correct theory since the time of his *high school studies,* the free fall of bodies under gravity that has to occur necessarily along a straight radial line, thus without any possible curvature. On technical terms, the free fall establishes the consistency need for any gravitational theory not only to incorporate the NEWTONIAN attraction in a clear and unambiguous way, but also in such a way that all contributions from curvature should disappear for the free fall in favor of the pure Newtonian attraction. The fact that evidence so incontrovertible continues to be denied by organized interests on Einsteinian doctrines and their vast followers, most holding chairs of high academic fame, confirm the existence of a scientific obscurantism of potentially historical proportions.

achieved with yet unknown manipulations, the representation of the bending of light is not unique because bases on a nonunique PPN approximation having different parameters for different expansions. Finally, assuming that consistency and uniqueness are somewhat achieved, the representation is not invariant in time due to the noncanonical structure of general relativity.

THEOREM 1.4.6 [110]: General relativity is incompatible with experimental evidence because of the lack of consistent representation with curvature of the free fall of test bodies along a straight radial line.

Proof. A consistent representation of the free fall of a test body along a straight radial line requires that the Newtonian attraction be represented by the field equations necessarily without curvature, thus disproving the customary belief needed to avoid Corollary 1.4.2.A that said Newtonian attraction emerges at the level of the post-Newtonian approximation. **q.e.d.**

The absence in general relativity at large, thus including Einstein's gravitation, of well defined contributions due to the Newtonian attraction and to the assumed curvature of spacetime, and the general elimination of the former in favor of the latter, causes other catastrophic inconsistencies, such as the inability to represent the base Newtonian contribution in planetary motion as shown by Yilmaz [47], and other inconsistencies [48-52].

A comparison between special and general relativities is here in order. Special relativity can be safely claimed to be "verified by experiments" because the said experiments verify numerical values uniquely and unambiguously predicted by special relativity. By contrast, no such statement can be made for general relativity since the latter does not uniquely and unambiguously predict given numerical values due, again, to the variety of possible expansions and linearization.

The origin of such a drastic difference is due to the fact that *the numerical predictions of special relativity are rigorously controlled by the basic Poincaré "invariance". By contrast, one of the several drawbacks of the "covariance" of general relativity is precisely the impossibility of predicting numerical values in a unique and unambiguous way, thus preventing serious claims of true "experimental verifications" of general relativity.*

By no means the above analysis exhausts all inconsistencies of general relativity, and numerous additional ones do indeed exist, such as that expressed by the following:

THEOREM 1.4.7 [36]: Operator images of Riemannian formulations of gravitation are inconsistent on mathematical and physical grounds.

Proof. As established by Theorem 1.4.3, classical formulations of Riemannian gravitation are noncanonical. Consequently, all their operator counterparts must be nonunitary for evident reasons of compatibility. But nonunitary theories are known to be inconsistent on both mathematical and physical grounds [36]. In fact, on mathematical grounds, nonunitary theories of quantum gravity (see, e.g., Refs. [2j,2k]) do not preserve in time the basic units, fields and spaces, while, on physical grounds, the said theories do not possess time invariant numerical predictions, do not possess time invariant Hermiticity (thus having no acceptable observables), and violate causality. **q.e.d**

The reader should keep in mind the additional well known inconsistencies of quantum gravity, such as the historical incompatibility with quantum mechanics, the lack of a credible PCT theorem, etc.

By no means, the inconsistencies expressed by Theorems 1.4.1 through 1.4.7 constitute all inconsistencies of general relativity. In the author's opinion, additional deep inconsistencies are caused by the fact that *general relativity does not possess a well defined Minkowskian limit,* while the admission of the Minkowski space as a tangent space is basically insufficient on dynamical grounds (trivially, because on said tangent space gravitation is absent). For two additional inconsistency theorems one may consult paper [111].

As an illustration, we should recall the controversy on conservation laws that raged during the 20-th century [75]. Special relativity has rigidly defined total conservation laws because they are the Casimir invariants of the fundamental Poincaré symmetry. By contrast, there exist several definitions of total conservation laws in a Riemannian representation of gravity due to various ambiguities evidently caused by the absence of a symmetry in favor of covariance.

Moreover, none of the gravitational conservation laws yields the conservation laws of special relativity in a clear and unambiguous way, precisely because of the lack of any limit of a Riemannian into the Minkowskian space. Under these conditions, the compatibility of general relativity with the special reduces to personal beliefs outside a rigorous scientific process.

In the author view, the most serious inconsistencies of general relativity are those of *experimental* character, such as the structural impossibility for the Riemannian geometry to permit unique and unambiguous numerical predictions due to the known large degrees of freedom in all PPN expansions; the necessary *absence* of curvature to represent consistently the free fall of bodies along a straight radial line; the gravitational deflection of light measured until now being purely *Newtonian* in nature; and others.

These inconsistencies are such to prevent serious attempts in salvaging general relativity. For instance, if the deflection of the speed of light is re-interpreted as being solely due to curvature without any Newtonian contribution, then general relativity admits other catastrophic inconsistencies, such as the inability to represent the Newtonian contribution of planetary motions pointed out by Yilmaz [27] and other inconsistencies such as those identified by Wilhelm [28-30] and other researchers.

When the inconsistencies of general relativity with experimental evidence are combined with the irreconcilable incompatibility of general relativity with unified field theory and the catastrophic axiomatic inconsistencies due to lack of invariance [11m], time has indeed arrived for the scientific community to admit the need for fundamentally new vistas in our representation of gravitation, without which research is turned from its intended thrilling pursue of “new” knowledge to a sterile fanatic attachment to “past” knowledge.

1.4.5 Organized Scientific Corruption on Einstein Gravitation

An indication of the greatness of Albert Einstein is that he repeatedly expressed serious doubts on his gravitational theory, with particular reference to the r.h.s. of the field equations. By comparison, organized interests on Einstein have essentially suppressed any serious scientific process in the field via the abuse of academic credibility and public funds.

On one side, authoritative criticisms on Einstein gravitation (published in serious refereed journals around the world) have increased exponentially during the 20-th century. On the other side, said organized interests have completely ignored these qualified dissident views, let alone address and disprove them also in refereed journals as required by scientific ethics and accountability.

By recalling that the latter behavior is generally perpetrated under public financial support, we see the emergence of one of the most ascientific scenario in scientific history because, jointly with the lack of serious scientific work due to lack of dismissal of catastrophic inconsistencies, we have the violation of U. S. Federal Laws due to transparent misuse of public funds.

In view of the above, Santilli suggests the conduction of a senatorial investigation on all public funds spend for research in gravitation during the past fifty years. In the event this is not possible due to potential backing by (some) politicians to their academic brothers, Santilli recommends the filing of class actions in U. S. Federal Court against federal funding agencies, such as the National Science Foundation and the Department of Energy, jointly with representative institutions abusing public funds without proper scientific process.

At any rate, the current condition of research in gravitation should not be permitted to continued by any civilized society, while such a condition will continue indefinitely in the absence of a senatorial and/or judicial intervention due to the power and capillary organization of said interests on Einstein.

To begin some indication on the gravity of the problem, it should be indicated that the rejections of dissident papers on Einstein gravitation by orthodox technical journals the world over can only be qualified as being shameful for the physics community, because perpetrated without any serious objection or disproof, thus confirming the existence of an organized corruption on Einstein gravitation (see documentations in the footnotes of Volume IV).

Some of the rejections are done with extreme studious professionalism in implementing what amount to a real scientific crime. For instance, the journals of the America Physical Society (APS) have issued a 'final rejection" for Santilli's dissident papers. Instead, they have issued ordinary rejections that, per APS statute, allow resubmissions. The anti-scientific aspect is that such rejections are continued for years and years for the studious intent of tiring the author (see also documentations in the footnotes of Volume IV).

The rejections of dissident papers on Einstein doctrines by the journals controlled by the British Institute of Physics (IOP) are even more insidious, because perpetrated with a higher degrees of sophistication in opposing undesired physical knowledge while dreaming to portray the opposite.

The rejections of dissident papers on Einstein doctrines by orthodox journals in France, Italy, Sweden, and other countries can only be dubbed as being pathetic by comparison with the preceding ones because expressing in a transparent way their strictly political and nonscientific motivation.

The above suppression of due scientific process establishes beyond credible doubt that research in gravitation are based on academic power and political schemes all over the world, and definitely not on scientific truth. Whether intentional or not, this behavior clearly serves organized, academic, financial and ethnic interests on Einsteinian doctrines. Other views are left to naive persons or accomplices.

It is then necessary to give some indication of other forms of "dismissals" by said organized interests of the inconsistencies of Einstein's gravitation

As a general rule, said interests have no credible technical argument to oppose the catastrophic inconsistencies here considered, all published in refereed journals (of which Santilli is not an editor). Consequently, said organized interests are left with equivocal attempts to discredit Santilli, such as the dubbing of doing "fringe science" by Wikipedia (while studies ignoring the catastrophic inconsistencies are serious science in Wikipedia view).

Others, such as Dimitri Rabounski, retort to other forms of dismissal beyond credibility. In fact, following the appearance of paper [111], Rabounski released in the internet a "Review of the paper *Inconsistencies of general relativity* by R. M. Santilli" in which he claims that "Santilli is a nuclear physicist" (sic!), the evident dream being to suggest that santilli is not qualified to discuss mathematically advanced issues based on the Riemannian geometry.

In reality, far from being a nuclear physicist,Santilli is an applied mathematician who has been a *member of the Department of Mathematics at Harvard University,* as everybody can see by inspecting Santilli's CV available in the internet following an easy search at google.com. Hence, Santilli is indeed fully qualified to identify inconsistencies of Einstein gravitation.

Following these inspiring introductory lines, Rabounski passes to truly ephemeral touches of the inconsistencies, claiming misrepresentations of the theory by Santilli, yet by carefully avoiding the addressing of the main ones, such as the impossibility of representing free fall with curvature, the impossibility to predict the same numbers under the same conditions at different times due to the noncanonical structure of the theory, etc. Hence, Rabounski "objections" to the catastrophic inconsistencies of Einstein gravitation identified by Santilli are purely political and without any substantive scientific content.

On the pseudo-technical side, the reader in good faith will be amused to know a seemingly technical rebuttal by Eduardo A. Notte-Cuello and Waldyr A. Rodrigues, jr., who recently released a "paper" in the arXiv with an extensive and detailed review of the derivation of the Freud identity, something well known to experts, and conclude with the statment

In this paper we proved that, contrary to the claims in [29,30] (our references [95,110) *there is no incompatibility from the mathematical point of view between the Freud identity and the Einstein-Hilbert field equations of GR.*

The "paper" then passes to claim of rebuttal of other inconsistencies of Einstein gravitation due to problems with conservation laws, that have not been addressed by Santilli due to the large dissident literature by Yilmaz and numerous other authors.

The evident dream by Notte-Cuelo and Rodrigues is that of discrediting the inconsistencies of general relativity identified by Santilli, this time, with a smoke-screen of mathematics. in fact, the above quoted "main scope" of the "paper" is scientifically vacuous because every graduate student in physics knows that, *for a body with non-null electromagnetic fields,* Einstein's field equations do have a tensor source in the r.h.s, Eq. (1.4.2), in which case there is indeed no mathematical inconsistency between the field equations and the Freud identity as stated in Theorem 1.4.2.

However, in their detailed derivation of the Freud identity by Notte-Cuelo and Rodrigues carefully avoids quoting, let alone reviewing, Rund [26] main result, namely, that the tensor in the r.h.s. of the Freud identity is of *first order in magnitude.* By comparison, the tensor in the r.h.s. of Eqs. (1.4.2) is of lilliputian value. Hence, we have the *physical* inconsistencies between Einstein gravitation and the Freud identity of Theorem 1.4.2.

The collapse of scientific value of the "paper" by Notte-Cuelo and Rodrigues is then given by Einstein's gravitation for *bodies with null charge and null magnetic moments* for which it is]it prohibited to put any tensor in the r.h.s. of the field equations, in which Notte-Cuelo and Rodrigues mimic lack of knowledge, in which case we have a *mathematical and physical* incompatibility of Einstein gravitation with the Fred identiy,

The purely political character of the "paper" by Notte-Cuelo and Rodrigues emerges when one notes that, in the event these authors did not read carefully Refs. [95,110], Santilli did notified them of the above clarifications, but, as typically the case in the field, the clarifications were ignored in the arXiv upload

(Rodrigues was then terminated as editor of Algebras, Groups and Geometries for unethical conduct in this and other cases).

The intellectual dishonestly emerges rather forcefully from the fact that Santilli studies (such as paper [110]) present *nine* different theorems of catastrophic inconsistencies of Einstein gravitation, each one being sufficient to depenn Einstein gravitation from the list of serious *physical* theories. Notte-Cuelo and Rodrigues do quote Theorem 1.4.2 based on the Freud identity, but carefully avoid the quotation of the other *eight* theorems of catastrophic inconsistencies.

Whether intentional or not, the dishonest implication that may be perceived by the naive or uneducated reader of Notte-Cuelo and Rodrigues arXiv paper on the Freud identity is that "Santilli theorem 1.4.2 is wrong and, therefore, Einstein gravitation is correct," while in the scientific reality, even assuming that Theorem 1.4.2 might be wrong (contrary to all serious evidence), Einstein gravitation remains afflicted by *eight* remaining theorems of catastrophic inconsistencies.

It is hoped the above cases illustrate the reason for Santilli suggestions to have senatorial investigations or judicial proceedings on research in gravitation. In fact, it is absolutely certain that, when under oath in front of a jury, Rabounski would have indeed documented himself before venturing that Santilli is a "nuclear physicist," and, in front of a jury for judicial proceedings, Notte-Cuelo and Rodrigues vociferous posturing would turn into anguish and positively they would state that their results confirm fully, rather than dismiss, Santilli Theorem 1.4.2.

1.5 THE SCIENTIFIC IMBALANCE CAUSED BY NONCANONICAL AND NONUNITARY THEORIES

1.5.1 Introduction

When facing the limitations of special relativity and quantum mechanics for the representation of extended, nonspherical, deformable and hyperdense particles and antiparticles under linear and nonlinear, local and nonlocal as well as potential and nonpotential forces, a rather general attitude is that of attempting their generalization via the broadening into noncanonical and nonunitary structures, while preserving the mathematics of their original formulation.

Despite the widespread publication of papers on theories with noncanonical or nonunitary structures in refereed journals, including those of major physical societies, it is not generally known that these broader theories are afflicted by inconsistencies so serious to be also known as catastrophic.

Another basic objective of this monograph is the detailed identification of these inconsistencies because their only known resolution is that presented in the next chapters, that permitted by *new mathematics* specifically constructed from the physical conditions considered.

In fact, the broadening of special relativity and quantum mechanics into noncanonical and nonunitary forms, respectively, is necessary to exit form the class of equivalence of the conventional formulations. The resolution of the catastrophic inconsistencies of these broader formulations when treated via the mathematics of canonical and unitary theories, then leaves no other possibility than that of *broadening the basic mathematics.*

To complete the presentation of the foundations of the covering hadronic mechanics, in the next two sections we shall review the inconsistencies of noncanonical and nonunitary theories. The remaining sections of this chapter are devoted to an outline of hadronic mechanics so as to allow the reader to enter in a progressive way into the advanced formulations presented in the next chapters.

1.5.2 Catastrophic Inconsistencies of Noncanonical Theories

As recalled in Section 1.2, the research in classical mechanics of the 20-th century has been dominated by *Hamiltonian systems,* that is, systems admitting their complete representation via the *truncated Hamilton equations* (1.2.2), namely, the historical equations proposed by Hamilton in which the external terms have been cut out.

For the scope of this section, it is best to rewrite Eqs. (1.2.2) in the following unified form (see monographs [9] for details)[9]

$$b = (b^\mu) = (r, p) = (r^k, p_k), \tag{1.5.1a}$$

$$\frac{db^\mu}{dt} = \omega^{\mu\nu} \times \frac{\partial H(t, b)}{\partial b^\nu}, \tag{1.5.1b}$$

$$H = K(p) + V(t, r, p), \tag{1.5.1c}$$

$$\mu = 1, 2, 3, ..., 6, \quad k = 1, 2, 3,$$

where H is the Hamiltonian, K is the kinetic energy, V is the potential energy, $\omega^{\mu\nu}$ is the canonical Lie tensor with explicit form

$$\omega^{\mu\nu} = \begin{pmatrix} 0 & I_{3\times3} \\ -I_{3\times3} & 0 \end{pmatrix} \tag{1.5.2}$$

and $I_{3\times3} = Diag(1, 1, 1)$ is the unit matrix.

[9] We continue to denote the conventional associative multiplication of numbers, vector fields, operators, etc. with the notation $A \times B$ rather than the usual form AB, because the new mathematics necessary to resolve the catastrophic inconsistencies studied in this chapter is based on various different generalizations of the multiplication. As a consequence, the clear identification of the assumed multiplication will soon be crucial for the understanding of the equations of this monograph.

In the above unified notation, the brackets of the time evolution can be written

$$\frac{dA}{dt} = [A, H] = \frac{\partial A}{\partial b^\mu} \times \omega^{\mu\nu} \times \frac{\partial H}{\partial b^\nu}, \tag{1.5.3}$$

and they characterize a *Lie algebra,* as well known.

The above equations have a *canonical structure,* namely, their time evolution characterizes a *canonical transformation*[10],

$$b^\mu \rightarrow b'^\mu(b), \tag{1.5.4a}$$

$$\omega^{\mu\nu} \rightarrow \frac{\partial b'^\mu}{\partial b^\rho} \times \omega^{\rho\sigma} \times \frac{\partial b'^\nu}{\partial b^\sigma} \equiv \omega^{\mu\nu}; \tag{1.5.4b}$$

and the theory possesses the crucial property of predicting the same numbers under the same conditions at different times, a property generically referred to as *invariance,* such as the invariance of the basic analytic equations under their own time evolution

$$\begin{gathered} \frac{db^\mu}{dt} - \omega^{\mu\nu} \times \frac{\partial H(t, b)}{\partial b^\nu} = 0 \rightarrow \\ \rightarrow \frac{db'^\mu}{dt} - \omega^{\mu\nu} \times \frac{\partial H(t', b')}{\partial b'^\nu} = 0. \end{gathered} \tag{1.5.5}$$

where the invariance is expressed by the preservation of the Lie tensor $\omega^{\mu\nu}$ and of the Hamiltonian H.

It is easy to predict that future research in classical mechanics will be dominated by *non-Hamiltonian systems,* that is, systems that cannot be entirely described by the Hamiltonian and require at least a second quantity for their complete description.

Alternatively, we are referring to systems with internal forces that are partly of potential type, represented by V, and partly of nonpotential type, thus requiring new quantities for their representation.

We are also referring to the transition from *exterior dynamical systems* recalled in Section 1.3 (systems of point-like particles moving in vacuum without collisions under sole action-at-a-distance potential interactions) to *interior dynamical systems* (extended, nonspherical and deformable particles moving within a resistive medium with action-at-a-distance potential forces plus contact, nonpotential, nonlocal, and integral forces).

As also recalled in Section 1.2, exterior dynamical systems can be easily represented with the truncated Hamilton equations, while the first representation of the broader non-Hamiltonian systems is given precisely by the historical analytic

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[10]For several additional different but equivalent definitions of canonical transformations one may consult Ref. [54a], pages 187-188.

equations with external terms, Eqs. (1.3.2) that we now rewrite in the unified form

$$\frac{db^\mu}{dt} = \omega^{\mu\nu} \times \frac{\partial H(t,b)}{\partial b^\nu} + F^\mu(t,b,\dot{b},...), \tag{1.5.6a}$$

$$F^\mu = (0, F_k), \quad \mu = 1,2,...,6, \quad k = 1,2,3. \tag{1.5.6b}$$

Nevertheless, as also recalled in Section 1.3, the addition of the external terms creates serious structural problems since the brackets of the new time evolution

$$\frac{dA}{dt} = (A,H,F) = \frac{\partial A}{\partial b^\mu} \times \omega^{\mu\nu} \times \frac{\partial H}{\partial b^\nu} + \frac{\partial A}{\partial b^\mu} \times F^\mu, \tag{1.5.7}$$

violate the conditions to characterize an algebra (since they violate the right distributive and scalar laws), let alone violate all possible Lie algebras, thus prohibiting the studies of basic aspects, such as spacetime symmetries under nonpotential forces.

As experienced by the author, when facing the latter problems, a rather natural tendency is that of using coordinate transforms $b \to b'(b)$ to turn a systems that is non-Hamiltonian in the b-coordinates into a Hamiltonian form in the b'-coordinates,

$$\frac{db^\mu}{dt} - \omega^{\mu\nu} \times \frac{\partial H(t,b)}{\partial b^\nu} - F^\mu(t,b,\dot{b},...) = 0 \to$$
$$\to \frac{db'^\mu}{dt} - \omega^{\mu\nu} \times \frac{\partial H'(t,b')}{\partial b^\nu} = 0. \tag{1.5.8}$$

These transformations always exist under the necessary continuity and regularity conditions, as guaranteed by *Lie-Koening theorem* of analytic mechanics or the *Darboux Theorem* of the symplectic geometry) [9b].

This first attempt has no physical value because of excessive problems identified in Section 1.2, such as: the lack of physical meaning of quantum formulations in the b'-coordinates; the impossibility of placing a measuring apparatus in the transformed coordinates; the loss of all known relativities due to the necessarily nonlinear character of the transforms with consequential mapping of inertial into noninertial frames; and other problems.

The above problems force the restriction of analytic representations of non-Hamiltonian systems within the fixed coordinates of the experimenter, the so-called *direct analytic representations* of Assumption 1.2.1 [9].

Under the latter restriction, the second logical attempt for quantitative treatments of non-Hamiltonian systems is that of broadening conventional canonical theories into a noncanonical form at least admitting a consistent algebra in the brackets of the time evolution, even though the resulting time evolution of the broader equations cannot characterize a canonical transformation.

As an illustration of these second lines of research, in 1978 the author wrote for Springer-Verlag his first volume of *Foundations of Theoretical Mechanics* [9a] devoted to the integrability conditions for the existence of a Hamiltonian representation (the so-called *Helmholtz's conditions of variational selfadjointness*). The evident scope was that of identifying the limits of applicability of the theory within the fixed coordinates of the experimenter.

A main result was the proof that *the truncated Hamilton equations admit a direct analytic representation in three space dimensions only of systems with potential (variationally selfadjoint) forces,*[11] thus representing only a small part of what are generally referred to as *Newtonian systems.*

In this way, monograph [9a] confirmed the need to enlarge conventional Hamiltonian mechanics within the fixed frame of the experimenter in such a way to admit a direct representation of all possible Newtonian systems verifying the needed regularity and continuity conditions.

Along the latter line of research, in 1982 the author published with Springer-Verlag his second volume of *Foundations of Theoretical Mechanics* [9b] for the specifically stated objective of broadening conventional Hamiltonian mechanics in such a way to achieve *direct universality,* that is, the capability of representing *all* Newtonian systems (universality) in the fixed frame of the experimenter (direct universality), while jointly preserving not only an algebra, but actually the *Lie algebra* in the brackets of the time evolution.

These efforts gave birth to a broader mechanics called by the author *Birkhoffian mechanics* in honor of the discoverer of the basic equations, G. D. Birkhoff [37], which equations can be written in the unified form

$$\frac{db^\mu}{dt} = \Omega^{\mu\nu}(b) \times \frac{\partial B(t,b)}{\partial b^\nu}, \tag{1.5.9}$$

where $B(t,b)$ is called the *Birkhoffian* in order to distinguish it from the Hamiltonian (since B does not generally represent the total energy), and $\Omega^{\mu\nu}$ is a *generalized Lie tensor,* in the sense that the new brackets

$$\frac{dA}{dt} = [A,B]^* = \frac{\partial A}{\partial b^\mu} \times \Omega^{\mu\nu} \times \frac{\partial B}{\partial b^\nu}, \tag{1.5.10}$$

still verify the Lie algebra axioms (see Ref. [9b] for details).

Stated in different terms, the main efforts of monograph [54b] were to show that, under the necessary continuity and regularity properties, the historical Hamilton's equations with external terms always admit a reformulation within the fixed frame of the experimenter with a consistent Lie algebra in the brackets of the time evolution,

$$\frac{db^\mu}{dt} = \omega^{\mu\nu} \times \frac{\partial H(t,b)}{\partial b^\nu} + F^\mu(t,b,...) \equiv \Omega^{\mu\nu}(b) \times \frac{\partial B(t,b)}{\partial b^\nu}. \tag{1.5.11}$$

[11] The truncated Hamilton equations admit analytic representations of nonconservative systems but only *in one dimension,* which systems are essentially irrelevant for serious physical applications.

In this case, rather than being represented with H and F, non-Hamiltonian systems are represented with B and Ω.

Monograph [9b] achieved in full the intended objective with the proof that *Birkhoffian mechanics is indeed directly universal for all possible well behaved local-differential Newtonian systems,* and admits the following *generalized canonical transformations,*

$$\Omega^{\mu\nu}(b) \to \frac{\partial b'^{\mu}}{\partial b^{\rho}} \times \Omega^{\rho\sigma}(b(b')) \times \frac{\partial b'^{\nu}}{\partial b^{\sigma}} \equiv \Omega^{\mu\nu}(b'). \tag{1.5.12}$$

Monograph [9b] concluded with the indication of the apparent full equivalence of the Birkhoffian and Hamiltonian mechanics, since the latter is admitted as a particular case of the former (when the generalized Lie tensor acquires the canonical form), both theories are derivable from a variational principle, and both theories admit similar transformation properties.

Since the generalized Lie tensor $\Omega^{\mu\nu}$ and related brackets $[A, B]^*$ are antisymmetric, we evidently have conservation laws of the type

$$\frac{dB}{dt} = [B, B]^* \equiv 0, \tag{1.5.13}$$

Consequently, Birkhoffian mechanics was suggested in monograph [54b] for the representation of *closed-isolated non-Hamiltonian systems* (such as Jupiter).

The representation of *open-nonconservative non-Hamiltonian systems* required the identification of a yet broader mechanics with a consistent algebra in the brackets of the time evolution, yet such that the basic brackets are not antisymmetric. The solution was reached in monographs [38] via the *Birkhoffian-admissible mechanics* with basic analytic equations

$$\frac{db^{\mu}}{dt} = \omega^{\mu\nu} \times \frac{\partial H(t,b)}{\partial b^{\nu}} + F^{\mu}(t, b, ...) \equiv S^{\mu\nu}(b) \times \frac{\partial B(t,b)}{\partial b^{\nu}}, \tag{1.5.14}$$

where the tensor $S^{\mu\nu}$ is *Lie-admissible* According to Santilli's [39] realization of Albert [40] abstract formulation, namely, in the sense that the generalized brackets of the time evolution

$$\frac{dA}{dt} = (A, B) = \frac{\partial A}{\partial b^{\mu}} \times S^{\mu\nu}(b) \times \frac{\partial B}{\partial b^{\nu}}, \tag{1.5.15}$$

verify all conditions to characterize an algebra, and their attached antisymmetric brackets

$$[A, B]^* = (A, B) - (B, A), \tag{1.5.16}$$

characterize a generalized Lie algebra as occurring in Birkhoffian mechanics.

The representation of the open-nonconservative character of the equations was then consequential, since the lack of antisymmetry of the brackets yields the correct *time rate of variation of the energy* $E = B$

$$\frac{dE}{dt} = (E, E) = F_k \times v^k, \tag{1.5.17}$$

and the same occurs for all other physical quantities.

Monographs [38] then proved the direct universality of Birkhoffian-admissible mechanics for all open-nonconservative systems, identified its transformation theory and provided the following elementary, yet universal realization of the Lie-admissible tensor S for $B = H$ representing the total *nonconserved* energy

$$S^{\mu\nu} = \begin{pmatrix} 0 & I \\ -I & F/(\partial H/\partial p) \end{pmatrix}. \tag{1.5.18}$$

Note that *the Birkhoffian-admissible mechanics is structurally irreversible,* in the sense of being irreversible for all possible energies and Birkhoffian functions since the basic Lie-admissible tensor is itself irreversible, $S(t, b) \neq S(-t, b)$, thus being particularly suited to represent irreversible systems.

However, studies conducted after the publication of monographs [9,38] revealed the following seemingly innocuous feature:

LEMMA 1.5.1 [11b]: *Birkhoffian and Birkhoffian-admissible mechanics are noncanonical theories, i.e., the generalized canonical transformations, are noncanonical,*

$$\omega^{\mu\nu} \rightarrow \frac{\partial b'^{\mu}}{\partial b^{\rho}} \times \omega^{\rho\sigma} \times \frac{\partial b'^{\nu}}{\partial b^{\sigma}} \equiv \Omega^{\mu\nu}(b') \neq \omega^{\mu\nu}. \tag{1.5.19}$$

It is important to understand that *Birkhoffian and Birkhoffian-admissible mechanics are mathematically attractive, but they are not recommended for physical applications, both classically as well as foundations of operator theories.*

The canonical Lie tensor has the well known explicit form (1.5.2). Therefore, the diagonal matrix $I_{3\times 3}$ is left invariant by canonical transformations. But $I_{3\times 3}$ is the *fundamental unit of the basic Euclidean geometry.* As such, it represents in an abstract and dimensionless form the basic units of measurement, such as

$$I_{3\times 3} = Diag.(1\text{cm}, 1\text{cm}, 1\text{cm}). \tag{1.5.20}$$

By their very definition, noncanonical transformations do not preserve the basic unit, namely, they are transformations of the representative type (with arbitrary new values)

$$I_{3\times 3} = Diag.(1\text{cm}, 1\text{cm}, 1\text{cm}) \rightarrow$$

$$\rightarrow U \times I_{3\times 3} \times U^t = Diag.(3.127 \text{ cm}, \ e^{-212} \text{ cm}, \ \log 45 \text{ cm}), \tag{1.5.21a}$$

$$U \times U^t \neq I, \tag{1.5.21b}$$

where t stands for transposed. We, therefore, have the following important:

THEOREM 1.5.1 [53]: *Whether Lie or lie-admissible, all classical noncanonical theories are afflicted by catastrophic mathematical and physical inconsistencies.*

Proof. Noncanonical theories do not leave invariant under time evolution the basic unit. This implies the loss under the time evolution of the base field on which the theory is defined. Still in turn, the loss in time of the base field implies catastrophic mathematical inconsistencies, such as the lack of preservation in time of metric spaces, geometries, symmetries, etc., since the latter are defined over the field of real numbers.

Similarly, noncanonical theories do not leave invariant under time evolution the basic units of measurements, thus being inapplicable for consistent measurements. The same noncanonical theories also do not possess time invariant numerical predictions, thus suffering catastrophic physical inconsistencies. **q.e.d.**

In conclusion, the regaining of a consistent algebra in the brackets of the time evolution, as it is the case for Birkhoffian and Birkhoffian-admissible mechanics, is not sufficient for consistent physical applications because the theories remain noncanonical. In order to achieve a physically consistent representation of non-Hamiltonian systems, it is necessary that

1) The analytic equations must be derivable from a first-order variational principle, as necessary for quantization;

2) The brackets of the time evolution must characterize a consistent algebra admitting exponentiation to a transformation group, as necessary to formulate symmetries; and

3) The resulting theory must be invariant, that is, must admit basic units and numerical predictions that are invariant in time, as necessary for physical value.

Despite the large work done in monographs [9,38], the achievement of all the above conditions required the author to resume classical studies from their foundations.

These third efforts finally gave rise to the new *Hamilton-Santilli iso-, geno- and hypermechanics* [10b] that do verify all conditions 1), 2) and 3), thus being suitable classical foundations of hadronic mechanics, as reviewed in Chapter 3.

However, the joint achievement of conditions 1), 2) and 3) for non-Hamiltonian systems required the prior construction of *basically new mathematics,* [10a] today known as *Santilli's iso-, geno- and hyper-mathematics,* as also reviewed in Chapter 3.

This section would be grossly incomplete and potentially misleading without a study of requirement 1), with particular reference to the derivability of analytic equations from a "first-order" variational principle.

Classical studies of non-Hamiltonian systems are essential, not only to identify the basic methods for their treatment, but above all to identify quantization channels leading to unique and unambiguous operator formulations.

Conventional Hamiltonian mechanics provides a solid foundation of quantum mechanics because it is derivable from the variational principle that we write in the unified notation [9a]

$$\delta A^\circ = \delta \int [R^\circ_\mu(b) \times db^\mu - H \times dt] =$$

$$= \delta \int (p_k \times dr^k - H \times dt), \tag{1.5.22}$$

where the functions R°_μ have the canonical expression

$$(R^\circ_\mu) = (p_k, 0), \tag{1.5.23}$$

under which expression the canonical tensor assumes the realization

$$\omega_{\mu\nu} = \frac{\partial R^\circ_\nu}{\partial b^\mu} - \frac{\partial R^\circ_\mu}{\partial b^\nu}, \tag{1.5.24a}$$

$$(\omega_{\mu\nu}) = (\omega^{\alpha\beta})^{-1}. \tag{1.5.24b}$$

As it is well known, the foundations for quantization are given by the *Hamilton-Jacobi equations* here expressed in the unified notation of Ref. [9a]

$$\frac{\partial A^\circ}{\partial t} = -H, \quad \frac{\partial A^\circ}{\partial b^\mu} = R^\circ_\mu, \tag{1.5.25}$$

that can be written explicitly in the familiar forms

$$\frac{\partial A^\circ}{\partial t} + H = 0, \tag{1.4.26a}$$

$$\frac{\partial A^\circ}{\partial r^k} - p_k = 0, \tag{1.5.26b}$$

$$\frac{\partial A^\circ}{\partial p_k} = 0, \tag{1.5.26c}$$

The use of the *naive quantization*

$$A^\circ \rightarrow -i \times \hbar \times \ell n\, \psi, \tag{1.5.27}$$

yields *Schrödinger's equations* in a unique and unambiguous way

$$\frac{\partial A^\circ}{\partial t} + H = 0 \rightarrow -i \times \bar{h} \frac{\partial \psi}{\partial t} - H \times \psi = 0, \tag{1.5.28a}$$

$$\frac{\partial A^\circ}{\partial r^k} = p_k \rightarrow -i \times \hbar \times \frac{\partial \psi}{\partial r^k} - p_k \times \psi = 0, \quad (1.5.28b)$$

$$\frac{\partial A^\circ}{\partial p_k} = 0 \rightarrow \frac{\partial \psi}{\partial p_k} = 0. \quad (1.4.28c)$$

The much more rigorous *symplectic quantization* yields exactly the same results and, as such, it is not necessary for these introductory notes.

A feature crucial for quantization is Eq. (1.5.26c) from which it follows that *the canonical action A° is independent from the linear momentum*, i.e.,

$$A^\circ = A^\circ(t, r). \quad (1.5.29)$$

an occurrence generally (but not universally) referred in the literature as characterizing a *first-order action functional.*

From the naive quantization it follows that, in the configuration representation, *the wave function originating from first-order action functionals is independent from the linear momentum* (and, vice-versa, in the momentum representation it is independent from the coordinates),

$$\psi = \psi(t, r), \quad (1.5.30)$$

which property is crucial for the axiomatic structure of quantum mechanics, e.g., for the correct formulation of Heisenberg's uncertainty principle, causality, Bell's inequalities, etc.

A serious knowledge of hadronic mechanics requires the understanding of the reason *Birkhoffian mechanics cannot be assumed as a suitable foundations for quantization.* Birkhoff's equations can indeed be derived from the variational principle (see monograph [9b] for details)

$$\delta A = \delta \int [R_\mu(b) \times db^\mu - B \times dt], \quad (1.5.31)$$

where the new functions $R_\mu(b)$ have the general expression

$$(R_\mu(b)) = (A_k(t, r, p), B^k(t, r, p)), \quad (1.5.32)$$

subject to the regularity condition that Det. $\Omega \neq 0$, under which Birkhoff's tensor assumes the realization

$$\Omega_{\mu\nu}(b) = \frac{\partial R_\nu}{\partial b^\mu} - \frac{\partial R_\mu}{\partial b^\nu}, \quad (1.5.33a)$$

$$(\Omega_{\mu\nu}) = (\Omega)^{\alpha\beta})^{-1}, \quad (1.5.33b)$$

with *Birkhoffian Hamilton-Jacobi equations* [9b]

$$\frac{\partial A}{\partial t} = -B, \quad \frac{\partial A}{\partial b^\mu} = R_\mu. \quad (1.5.34)$$

As one can see, Birkhoffian expressions (1.5.31)–(1.5.33) appear to be greatly similar to the corresponding Hamiltonian forms (1.4.22)–(1.4.26). Nevertheless, there is a fundamental structural difference between the two equations given by the fact that *the Birkhoffian action does indeed depend on the linear momenta,*

$$A = A(t, r, p), \tag{1.5.35}$$

a feature generally referred to as characterizing a *second-order action functional.*

As a consequence, *the "wavefunction" resulting from any quantization of Birkhoffian mechanics also depends on the linear momentum,*

$$\psi = \psi(t, r, p), \tag{1.5.36}$$

by characterizing an operator mechanics that is beyond our current technical knowledge for quantitative treatment, since such a dependence would require a dramatic restructuring of all quantum axioms.

In fact, the use of a naive quantization,

$$A(t, r, p) \rightarrow -i \times \hbar \times \ell n\ \psi(t, r, p), \tag{1.5.37}$$

characterizes the following maps

$$\frac{\partial A}{\partial t} + B = 0 \rightarrow -i \times \bar{h}\frac{\partial \psi}{\partial t} - B \times \psi = 0, \tag{1.5.38a}$$

$$\frac{\partial A}{\partial b^\mu} - R_\mu = 0 \rightarrow -i \times \hbar \times \frac{\partial \psi}{\partial b^\mu} - R_\mu \times \psi = 0. \tag{1.5.38b}$$

A first problem is that the latter equations are generally nonlinear and, as such, they cannot be generally solved in the r- and p-operators. This causes the emergence of an operator mechanics in which it is impossible to define basic physical quantities, such as the linear momentum or the angular momentum, with consequential lack of currently known physical relevance at this moment.

On more technical grounds, in the lifting of Hamiltonian into Birkhoffian mechanics, there is the replacement of the r-coordinates with the R-functions. In fact, the Birkhoffian action has the explicit dependence on the R-functions, $A = A[t, R(b)] = A'(t, r, p)$. As such, the Birkhoffian action can indeed be interpreted as being of first-order, but in the R-functions, rather than in the r-coordinates.

Consequently, a correct operator image of the Birkhoffian mechanics is given by the expressions (first derived in Ref. [11b])

$$i \times \hbar \times \frac{\partial \psi[t, R(b)]}{\partial t} = B \times \psi[t, R(b)], \tag{1.5.39a}$$

$$-i \times \hbar \times \frac{\partial \psi[t, R(b)]}{\partial b^\mu} = R_\mu(b) \times \psi[t, R(b)]. \tag{1.5.39b}$$

As we shall see in Chapter 3, the above equations characterize a *covering of hadronic (rather than quantum) mechanics,* in the sense of being structurally more general, yet admitting hadronic mechanics as a particular case.

Even though mathematically impeccable, intriguing, and deserving further studies, the mechanics characterized by Eqs. (1.5.39) is excessively general for our needs, and its study will be left to the interested reader.

The above difficulties identify quite precisely the first basic problem for the achievement of a physically consistent and effective formulation of hadronic mechanics, consisting in the need of constructing a new mathematics capable of representing CLOSED (that is, isolated) non-Hamiltonian systems via a first-order variational principle (as required for consistent quantization), admitting antisymmetric brackets in the time evolution (as required by conservation laws), and possessing time invariant units and numerical predictions (as required for physical value).

The need to construct a new mathematics is evident from the fact that no pre-existing mathematics can fulfill the indicated needs. As we shall see in Chapter 3, *Santilli's isomathematics* [10a] has been constructed precisely for and does indeed solve these specific problems.

The impossibility of assuming the *Birkhoffian-admissible mechanics* as the foundation of operator formulation for OPEN (that is, nonconservative) non-Hamiltonian systems is clearly established by the fact that said mechanics *is not derivable from a variational principle.*[12]

The latter occurrence identifies a much more difficult task given by the *need to construct a yet broader mathematics capable of representing open non-Hamiltonian systems via a first-order variational principle (as required for consistent quantization), admitting non-antisymmetric brackets in the time evolution (as required by non-conservation laws), and possessing time invariant units and numerical predictions (as required by physical value).*

The lack of any pre-existing mathematics for the fulfillment of the latter tasks is beyond credible doubt. Rather than adapting nature to pre-existing mathematics, the author has constructed a yet broader mathematics, today known as *Santilli's genomathematics* [10a], that does indeed achieve all indicated objectives, as outlined in Chapter 4.

Readers interested in the depth of knowledge are suggested to meditate a moment on the implications of the above difficulties. In fact, these difficulties have caused the impossibility in the 20-th century to achieve a meaningful operator formulation of contact, nonconservative and nonpotential interactions.

A consequence has been the widespread belief that nonpotential interactions "do not exist" in the particle world, a view based on the lack of existence of their

[12]Because conventional variations δ can only characterize antisymmetric tensors of type $\omega_{\mu\nu}$ or $\Omega_{\mu\nu}$ and cannot characterize non-antisymmetric tensors such as the Lie-admissible tensor $S_{\mu\nu}$.

operator representation, with negative implications at all levels of knowledge, such as the impossibility of achieving a meaningful understanding of the origin of irreversibility.

As a consequence, the resolution of the difficulties in the quantization of nonpotential interactions achieved by hadronic mechanics implies a rather profound revision of most of the scientific views of the 20-th century, as we shall see in the subsequent chapters.

1.5.3 Catastrophic Inconsistencies of Nonunitary Theories

Once the limitations of quantum mechanics are understood (and admitted), another natural tendency is to exit from the class of equivalence of the theory via suitable generalizations, while keeping the mathematical methods used for quantum mechanics.

It is important for these studies to understand that these efforts are afflicted by catastrophic mathematical and physical inconsistencies equivalent to those suffered by classical noncanonical formulations based on the mathematics of canonical theories.

The author has dedicated his research life to the construction of axiomatically consistent and invariant generalizations of quantum mechanics for the treatment of nonlinear, nonlocal, and nonpotential effects because they are crucial for the prediction and treatment of new clean energies and fuels.

In this section we review the foundations of these studies with the identification, most importantly, of the failed attempts in the hope of assisting receptive colleagues in avoiding the waste of their time in the study of theories that are mathematically significant, yet cannot possibly have real physical value.

To begin, let us recall that a theory is said to be *equivalent to quantum mechanics* when it can be derived from the latter via any possible *unitary transform* on a conventional Hilbert space $\mathcal{H}$ over the field of complex numbers $C = C(c, +, \times)$,

$$U \times U^\dagger = U^\dagger \times U = I, \tag{1.5.40}$$

under certain conditions of topological smoothness and regularity hereon ignored for simplicity, where "$\times$" represents again the conventional associative product of numbers or matrices, $U \times U^\dagger \equiv UU^\dagger$.

As a consequence, *a necessary and sufficient condition for a theory to be inequivalent to quantum mechanics is that it must be outside its class of unitary equivalence,* that is, the new theory is connected to quantum mechanics via a *nonunitary transform*

$$U \times U^\dagger \neq I. \tag{1.5.41}$$

generally defined on a conventional Hilbert space $\mathcal{H}$ over C.

Therefore, true generalized theories must have a *nonunitary structure*, i.e., their time evolution must verify law (1.5.41), rather than (1.5.40).[13]

During his graduate studies in physics at the University of Torino, Italy, and as part of his Ph. D. thesis, Santilli [41-43] published in 1967 the following (p, q)-*parametric deformation of the Lie product* $A \times B - B \times A$, the first in scientific records

$$(A, B) = p \times A \times B - q \times B \times A =$$
$$= m \times (A \times B - B \times A) + n \times (A \times B + B \times A) =$$
$$= m \times [A, B] + n \times \{A, B\}, \tag{1.5.42}$$

where $p = m + n, q = n - m$ and $p \pm q$ are non-null parameters.[14]

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[13]The reader should be aware that there exist in the literature numerous claims of "generalizations of quantum mechanics" although they have a unitary time evolution and, consequently, do not constitute true generalizations. All these "generalizations" will be ignored in this monograph because they will not resist the test of time.

[14]In 1985, Biedenharn [44] and MacFairlane [45] published their papers on the simpler q-deformations

$$A \times B - q \times B \times A$$

without a quotation of the origination of the broader form by the author [41] of 1967

$$p \times A \times B - q \times B \times A.$$

Biedenharn was fully aware of origination [41] as established by the fact that Biedenharn had been part of a DOE research grant application jointly with the author and others, precisely on the latter deformations, application filed two years before the publication of paper [44] (see the full documentation in Refs. [93,94]). Unfortunately for him, Biedenharn was unable to quote origination [41] in his paper [44] for reasons explained below. Similarly, MacFairlane had been made aware of the (p, q)-deformations by the author himself years before paper [45] (see, again, the documentation in [93,94]), but was requested to abstein from proper quotation.

Ironically, by the time Biedenharn and MacFairlane published their papers, the author had already abandoned the field he initiated two decades earlier because of catastrophic inconsistencies studied in this section. The author met Biedenharn the last time prior to his departure at the *Wigner Symposium* held at Oxford University, England, in 1993. During that meeting Biedenharn confessed to the author that he had suppressed origination [41] of the q-deformations in his paper [44] because of "peer pressures from the Cantabridgean area." Biedenharn also confessed to the author that, following the publication of his paper [44], he became aware of the catastrophic inconsistencies of q-deformations, and confirmed that the "q-deformations have no physical value as treated so far."

Following the above behavior by Biedenharn and MacFairlane, the editors in the late 1980s and early 1990s of the American, British, Italian and other physical societies refused to quote paper [41] in the thousands of papers in the field, despite clear documentation of prior paternity. Because of these occurrences, the author acquired the dubbing of *the most plagiarized physicist of the 20-th century.* In reality, the author expressed his appreciation to both Biedenharn and MacFairlane because he did not want to have his name associated to thousands of papers *all* catastrophically inconsistent.

The author remembers Larry Biedenharn as a very brilliant scientist with a pleasant personality and a great potential for basic discoveries. Unfortunately, he was unable to avoid being controlled by organized interests in physics as a condition for an academic position. Consequently, he did indeed achieve a brilliant chair in physics at Duke University, but at the prize of being mainly remembered as an expert in the rotational symmetry with some ethical overtone for plagiarisms. By contrast, the author trashed out any desire for a political chair at Harvard University as a necessary condition for freedom in basic research (see book [93] and the 1132 pages of documentation [94]).

By remembering that the Lie product characterizes *Heisenberg's equations,* the above generalized product was submitted as part of the following *parametric generalization of Heisenberg's equations* in its finite and infinitesimal forms [41,42]

$$A(t) = U \times A(0) \times U^{\dagger} = e^{i \times H \times q \times t} \times A(0) \times e^{-i \times t \times p \times H}, \tag{1.5.43a}$$

$$i \; dA/dt = (A, H) = p \times A \times H - q \times H \times A, \tag{1.5.43b}$$

with classical counterpart studied in Ref. [43].

After an extensive research in European mathematics libraries (conducted prior to the publication of Ref. [41] with the results listed in the same publication), the brackets $(A, B) = p \times A \times B - q \times B \times A$ resulted to be *Lie-admissible* according to A. A. Albert [40], that is, the brackets are such that their attached antisymmetric product

$$[A \hat{,} B] = (A, B) - (B, A) = (p + q) \times [A, B], \tag{1.5.44}$$

characterizes a *Lie algebra.*

Jointly, brackets (A, B) are *Jordan admissible* also according to Albert, in the sense that their attached symmetric product,

$$\{A \hat{,} B\} = (A, B) + (B, A) = (p + q) \times \{A, B\}, \tag{1.5.45}$$

The following episode illustrates the above lines. In the early 1980s, the author was working at the foundation of the isotopies of the Galilei and Einstein relativities, the lifting of the rotational symmetry to represent the transition from stationary orbits with the usual *conserved* angular momentum (exact $O(3)$ symmetry), to unstable orbits with *varying* angular momentum (exact $O(3)$-admissible symmetry), discussed in details in *Elements of Hadronic Mechanics,* Volume II, with a brief review in Chapters 3 and 4 of this volume. To proceed, the author phoned the biggest U. S. expert in the rotational symmetry, Larry Biedenharn, and asked to deliver an seminar at his department to hear his critical comments. With his innate courtesy, Biedenharn quickly agreed, and set the date of the seminar. The author and his family then drove for two days, from Cambridge, Massachusetts, to Durham, North Carolina, for the meeting.

At the time of the seminar, the large lecture room at Duke University was empty (an occurrence often experienced by the author), with the sole exception of Larry Biedenharn and the chairman of the department (the author is unable to remember names of insignificant persons). Following routine presentations, the author's seminar lasted only a few seconds consisting in drawing in the blackboard a stable orbit of a satellite around Earth with exact $O(3)$ symmetry, and then drawing a decaying orbit of the same satellite during re-entry in Earth's atmosphere with "continuously decaying angular momentum and consequential breaking of the rotational symmetry." At the mere mention of this physical evidence, the department chairman went into a rage of nonscientific nonsense preventing the author from proffering any additional word for the unspoken but trivial reason that the breaking of the rotational symmetry implies the collapse of Einsteinian doctrines with consequential loss of money, prestige and power. In the middle of said rage, the author broke the chalk and left the room.

The author sensed Biedenharn's inner tragedy for, on one side, being sincerely interested in the topic while, on the other side, being forced to accept the control of his science to keep his academic job. For this reason, the author and his wife accepted the kind dinner invitation by the Biedenharns, but did run away from Duke University as fast as possible early the following morning. Had Larry Biedenharn been able to cut out the organized scientific crime at his department (where "crime" is intended in the Latin sense of damage to society for equivocal personal gains), he would have been remembered for a major structural advance in his field. The episode reinforced the soundedness of the author's decision to have trashed out Harvard University by the time of this episode as a necessary condition for freedom of scientific inquiries.

characterizes a *Jordan algebra.*

At that time (1967), only three articles on this subject had appeared in Lie- and Jordan-admissibility in the sole mathematical literature (see Ref. [41]).

In 1985, Biederharn [44] and MacFairlane [45] published their papers on the simpler q-deformations $A \times B - q \times B \times A$ without a quotation of the origination of the broader form $p \times A \times B - q \times B \times A$ by Santilli [41] in 1967.

Regrettably, Biedenharn and MacFairlane abstained from quoting Santilli's origination of twenty years earlier despite their documented knowledge of such an origination.

For instance, Biedenharn and Santilli had applied for a DOE grant precisely on the same deformations two years prior to Biedenharn's paper of 1985, and Santilli had personally informed MacFairlaine of said deformations years before his paper of 1985.

The lack of quotation of Santilli's origination of q-deformations resulted in a large number of subsequent papers by numerous other authors that also abstained from quoting said origination (see representative contributions [46-49]), for which reason Santilli has been often referred to as the "most plagiarized physicist of the 20-th century".

Ironically, at the time Biedenharn and MacFairlane published their paper on q-deformations, Santilli had already abandoned them because of their catastrophic mathematical and physical inconsistencies studied in this Section.

In 1978, when at Harvard University, Santilli proposed the following *operator deformation of the Lie product* [Ref. [50], Eqs. (4.15.34) and (4.18.11)],

$$\begin{gathered}(A\hat{,}B) = A \triangleleft B - B \triangleright A = \\ = A \times P \times B - B \times Q \times A = \\ = (A \times T \times B - B \times T \times A) + (A \times W \times B + B \times W \times A) = \\ = [A\hat{,}B] + \{A\hat{,}B\},\end{gathered} \tag{1.5.46}$$

where $P = T + W, Q = W - T$ and $P \pm Q$ are, this time, fixed non-null matrices or operators.

Evidently, product (1.5.46) remains jointly Lie-admissible and Jordan-admissible because the attached antisymmetric and symmetric brackets,

$$[A\hat{,}B] = (A\hat{,}B) - (B\hat{,}A) = A \times T \times B - B \times T \times A, \tag{1.5.47a}$$

$$\{A\hat{,}B\} = (A\hat{,}B) + (B\hat{,}A) = A \times W \times B + B \times W \times A, \tag{1.5.47b}$$

characterizes a *Lie-Santilli and Jordan-Santilli isoalgebra* (see Chapter 4 for details).

The reader should be aware that the following alternative versions of product (1.5.46),

$$P \times A \times B - Q \times B \times A, \tag{1.5.48a}$$

$$A \times B \times P - B \times A \times Q, \tag{1.5.48b}$$

do not constitute an algebra since the former (latter) violates the left (right) distributive and scalar laws [50].

The above operator deformations of the Lie product was also submitted in the original proposal [50] of 1978 as the fundamental equations of hadronic mechanics via the following broader *operator Lie-admissible and Jordan-admissible generalization of Heisenberg's equations* in its finite and infinitesimal forms[15]

$$A(t) = U \times A(0) \times U^{\dagger} = e^{i \times H \times Q \times t} \times A(0) \times e^{-i \times t \times P \times H}, \tag{1.5.49a}$$

$$i\, dA/dt = (A \hat{,} H) = A \lhd H - H \rhd A =$$
$$= A \times P \times H - H \times Q \times A, \tag{1.5.49b}$$

$$P = Q^{\dagger}, \tag{1.5.49c}$$

which equations, as we shall see in Chapter 4, are the fundamental equations of hadronic mechanics following proper mathematical treatment.

It is an instructive exercise for the reader interested in learning the foundation of hadronic mechanics to prove that:

1) Time evolutions (1.5.43) and (1.5.49) are *nonunitary,* thus being outside the class of unitary equivalence of quantum mechanics;

2) The application of a nonunitary transform $R \times R^{\dagger} \neq I$ to structure (1.5.43) yields precisely the broader structure (1.5.49) by essentially transforming the parameters p and q into the operators

$$P = p \times (R \times R^{\dagger})^{-1}, \quad Q = q \times (R \times R^{\dagger})^{-1}; \tag{1.5.50}$$

3) The application of additional nonunitary transforms $S \times S^{\dagger} \neq I$ to structure (1.5.50) preserves its Lie-admissible and Jordan-admissible character, although with different expressions for the P and Q operators.

The above properties prove the following:

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[15] The author would like to be buried in Florida, the land he loved most, and have Eq. (1.5.49b) reproduced in his tombstone as follows:

Ruggero Maria Santilli
Sept. 8, 1935 - xxx, xx, xxxx

$$i\, dA/dt = A \lhd H - H \rhd A.$$

Also, the author would like his coffin to be sufficiently heavy so as to avoid floating when Florida will be submerged by the now inevitable melting of the polar ice. The author wants Eq. (1.5.49b) in his tombstone because, in view of its direct universality, it will take centuries to achieve a broader description of nature equally invariant and equally based on the axioms of a field, particularly when said equation is formulated via the multi-valued hyperstructures of Chapter 5, Eqs. (5.3).

LEMMA 1.5.2 [36]: *General Lie-admissible and Jordan-admissible laws (1.5.49) are "directly universal" in the sense of containing as particular cases all infinitely possible nonunitary generalizations of quantum mechanical equations ("universality") directly in the frame of the observer ("direct universality"), while admitting a consistent algebra in their infinitesimal form.*

The above property can be equally proven by noting that the product $(A\hat{,}B)$ is the most general possible "product" of an "algebras" as commonly understood in mathematics (namely, a vector space with a bilinear composition law verifying the right and left distributive and scalar laws).

In fact, the product $(A\hat{,}B)$ constitutes the most general possible combination of Lie and Jordan products, thus admitting as particular cases *all* known algebras, such as associative algebras, Lie algebras, Jordan algebras, alternative algebras, supersymmetric algebras, Kac-Moody algebras, *etc.*

Despite their unquestionable mathematical beauty, theories (1.5.43) and (1.5.49) possess the following catastrophic physical and mathematical inconsistencies:

THEOREM 1.5.2 [36] *(see also Refs.* [51-58]*): All theories possessing a nonunitary time evolution formulated on conventional Hilbert spaces $\mathcal{H}$ over conventional fields of complex numbers $C(c, +, \times)$ do not admit consistent physical and mathematical applications because:*

1) They do not possess invariant units of time, space, energy, etc., thus lacking physically meaningful application to measurements;

2) They do not conserve Hermiticity in time, thus lacking physically meaningful observables;

3) They do not possess unique and invariant numerical predictions;

4) They generally violate probability and causality laws; and

5) They violate the basic axioms of Galileo's and Einstein's relativities.

Nonunitary theories are also afflicted by catastrophic mathematical inconsistencies.

The proof of the above theorem is essentially identical to that of Theorem 1.5,1 (see Ref. [36] for details). Again, the basic unit is not an abstract mathematical notion, because it embodies the most fundamental quantities, such as the units of space, energy, angular momentum, etc.

The nonunitary character of the theories here considered then causes the lack of conservation of the numerical values of such units with consequential catastrophic inapplicability of nonunitary theories to measurements.

Similarly, it is easy to prove that the condition of Hermiticity at the initial time,

$$(\langle\phi| \times H^\dagger) \times |\psi\rangle \equiv \langle\phi| \times (H \times |\psi\rangle), \quad H = H^\dagger, \tag{1.5.51}$$

is violated at subsequent times for theories with nonunitary time evolution when formulated on $\mathcal{H}$ over C. This additional catastrophic inconsistency (known as *Lopez's lemma* [52,53]), can be expressed by

$$[\langle\psi| \times U^\dagger \times (U \times U^\dagger)^{-1} \times U \times H \times U^\dagger] \times U|\psi\rangle =$$
$$= \langle\psi| \times U^\dagger \times [(U \times H \times U^\dagger) \times (U \times U^\dagger)^{-1} \times U|\psi\rangle] =$$
$$= (\langle\hat{\psi} \times T \times H'^\dagger) \times |\hat{\psi}\rangle = \langle\hat{\psi}| \times (\hat{H} \times T \times |\hat{\psi}\rangle), \tag{1.5.52a}$$

$$|\hat{\psi}\rangle = U \times |\psi\rangle, \ \ T = (U \times U^\dagger)^{-1} = T^\dagger, \tag{1.5.52b}$$

$$H'^\dagger = T^{-1} \times \hat{H} \times T \neq H. \tag{1.5.52c}$$

As a result, nonunitary theories do not admit physically meaningful observables.

Assuming that the preceding inconsistencies can be by-passed with some manipulation, nonunitary theories still remain with additional catastrophic inconsistencies, such as the lack of invariance of numerical predictions.

To illustrate this additional inconsistency, suppose that the considered nonunitary theory is such that, at $t = 0$ sec, $U \times U^\dagger_{[t=0]} = 1$, at $t = 15$ sec, $U \times U^\dagger_{[t=15]} = 15$, and the theory predicts at time $t = 0$ sec, say, the eigenvalue of 2 eV,

$$H|_{t=0} \times |\psi >= 2\ eV \times |\psi > . \tag{1.5.53}$$

It is then easy to see that the same theory predicts under the same conditions the *different* eigenvalue 30 eV at $t = 15$ sec, thus having no physical value of any type. In fact, we have

$$U \times U^\dagger|_{t=0} = I, \ \ U \times U^\dagger|_{t=15} = 15, \tag{1.5.54a}$$

$$U \times H \times |\psi\rangle = (U \times H \times U^\dagger) \times (U \times U^\dagger)^{-1} \times (U \times |\psi\rangle) =$$
$$= H' \times T \times |\hat{\psi}\rangle = U \times E \times |\psi\rangle = E \times (U \times |\psi\rangle) = E \times |\hat{\psi}\rangle, \tag{1.5.54b}$$
$$H' = U \times H \times U^\dagger, \quad T = (U \times U^\dagger)^{-1},$$

$$H' \times |\hat{\psi}\rangle\ |_{t=0} = 2\mathrm{C} \times |\hat{\psi}\rangle\ |_{t=0}, \ \ T = 1\ |_{t=0}, \tag{1.4.54c}$$

$$\begin{aligned} H' \times |\hat{\psi}\rangle\ |_{t=15} &= 2\mathrm{C} \times (U \times U^\dagger) \times |\hat{\psi}\rangle\ |_{t=15} = \\ &= 30\mathrm{C} \times |\hat{\psi}\rangle\ |_{t=15}\ . \end{aligned} \tag{1.5.54d}$$

Probability and causality laws are notoriously based on the unitary character of the time evolution and the invariant decomposition of the unit.

Their violation for nonunitary theories is then evident. It is an instructive exercise for the reader interested in learning hadronic mechanics, superconductivity and chemistry to identify a specific example of nonunitary transforms for which the effect *precedes* the cause.

The violation by nonunitary theories of the basic axioms of Galileo's and Einstein's relativities is so evident to require no comment.

An additional, most fundamental inconsistency of the theories considered is their *noninvariance*, that can be best illustrated with the lack of invariance of the general Lie-admissible and Jordan-admissible laws (1.5.49).

In fact, under nonunitary transforms, we have, e.g., the lack of invariance of the Lie-admissible and Jordan-admissible product,

$$U \times U^\dagger \neq I \tag{1.5.55a}$$

$$\begin{gathered} U\times(A\hat{,}B)\times U^\dagger = U\times(A\lhd B - B\rhd A)\times U^\dagger = (U\times A\times U^\dagger)\times \\ \times[(U\times U^{-1})\times(U\times P\times U^\dagger)\times(U\times U^\dagger)^{-1}]\times(U\times B\times U^\dagger)- \\ -(U\times B\times U^\dagger)\times[(U\times U^{-1})\times(U\times Q\times U^\dagger)\times(U\times U^\dagger)^{-1}]\times \\ \times(U\times A\times U^\dagger) = A'\times P'\times B' - B'\times Q'\times A' = \\ = A'\lhd' B' - B'\rhd' A'. \end{gathered} \tag{1.5.55b}$$

The above rules confirm the preservation of a Lie-admissible structure under the most general possible transforms, thus confirming the direct universality of laws (1.4.49) as per Theorem 1.4.2. The point is that *the formulations are not invariant* because

$$P' = (U \times U^{-1}) \times (U \times Q \times U^\dagger) \times (U \times U^\dagger)^{-1} \neq P, \tag{1.5.56a}$$

$$Q' = (U \times U^{-1}) \times (U \times Q \times U^\dagger) \times (U \times U^\dagger)^{-1} \neq Q, \tag{1.5.56b}$$

that is, because *the product itself is not invariant.*

By comparison, the invariance of quantum mechanics follows from the fact that the associative product "×" is not changed by unitary transforms

$$U \times U^\dagger = U^\dagger \times U = I, \tag{1.5.57a}$$

$$\begin{gathered} A \times B \rightarrow U \times (A \times B) \times U^\dagger = \\ = (U \times A \times U^\dagger) \times (U \times U^\dagger)^{-1} \times (U \times B \times U^\dagger) = A' \times B'. \end{gathered} \tag{1.5.57b}$$

Therefore, generalized Lie-admissible and Jordan-admissible theories (1.5.49) are not invariant because the generalized products "$\lhd$" and "$\rhd$" are changed by nonunitary transformations, including the time evolution of the theory itself. The same results also holds for other nonunitary theories, as the reader is encouraged to verify.

The mathematical inconsistencies of nonunitary theories are the same as those of noncanonical theories. Recall that mathematics is formulated over a given field of numbers. Whenever the theory is nonunitary, the first noninvariance is that of the basic unit of the field.

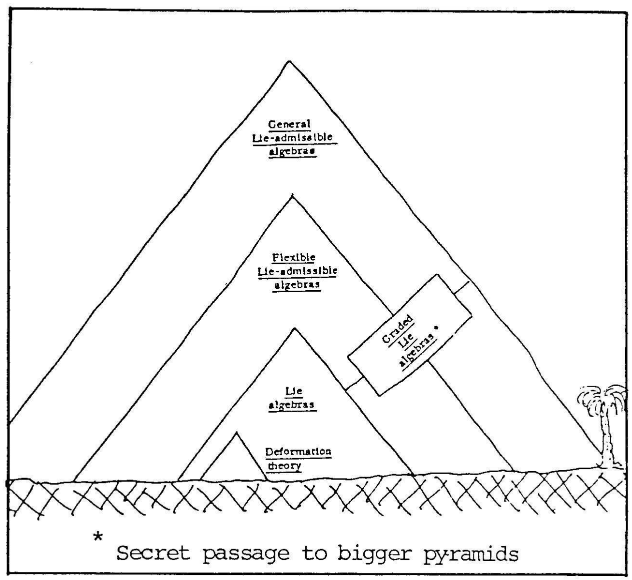

Figure 1.21. The reproduction of another "vignetta" presented by the author in 1978 to his colleagues at the Lyman Laboratory of Physics at Harvard University as part of his research under DOE (see Refs. [93,94] for details). This "vignetta" is a complement of that of Figure 1.3 on the need to maintain the external terms in the historical analytic equations because, when properly formulated, said equations yield covering, directly universal. Lie-admissible theories because Lie-admissible algebras contain as particular cases *all* algebras as defined in mathematics (universality) without the us of any transformation (direct universality). Finally, this "vignetta" was intended to illustrate that all theories preferred by the Lyman colleagues at the time, including symmetry breakings, supersymmetries, etc., were mere particular cases of the universal Lie-admissible formulations.

The lack of conservation of the unit then causes the loss of the basic field of numbers on which mathematics is constructed. It then follows that the entire axiomatic structure as formulated at the initial time, is no longer applicable at subsequent times.

For instance, the formulation of a nonunitary theory on a conventional Hilbert space has no mathematical sense because that space is defined over the field of complex numbers.

The loss of the latter property under nonunitary transforms then implies the loss of the former. The same result holds for metric spaces and other mathematics based on a field.

In short, the lack of invariance of the fundamental unit under nonunitary time evolutions causes the catastrophic collapse of the entire mathematical structure, without known exception.

The reader should be aware that the above physical and mathematical inconsistencies apply not only for Eqs. (1.5.49) but also for a large number of generalized theories, as expected from the direct universality of the former.

It is of the essence to identify in the following at least the most representative cases of physically inconsistent theories, to prevent their possible application (see Ref. [36] for details):

1) Dissipative nuclear theories [13] represented via an imaginary potential in non-Hermitian Hamiltonians,

$$H = H_0 = iV \neq H^\dagger \tag{1.5.58}$$

lose all algebras in the brackets of their time evolution (requiring a bilinear product) in favor of the triple system,

$$i \times \ dA/dt = A \times H - H^\dagger \times A = [A, H, H^\dagger]. \tag{1.5.59}$$

This causes the loss of nuclear notions such as "protons and neutrons" as conventionally understood, e.g., because the definition of their spin mandates the presence of a consistent algebra in the brackets of the time evolution.

2) Statistical theories with an external collision term C (see Ref. [59] and literature quoted therein) and equation of the density

$$i \ d\rho/dt = \rho \odot H = [\rho, H] + C, \quad H = H^\dagger, \tag{1.5.60}$$

violate the conditions for the product $\rho \odot H$ to characterize any algebra, as well as the existence of exponentiation to a finite transform, let alone violating the conditions of unitarity.

3) The so-called "q-deformations" of the Lie product (see, e.g., [64,65,66–69] and very large literature quoted therein)

$$A \times B - q \times B \times A, \tag{1.5.61}$$

where q is a non-null scalar, that are a trivial particular case of Santilli's (p, q)-deformations (1.4.42).

4) The so-called "k-deformations" [60-63] that are a relativistic version of the q-deformations, thus also being a particular case of general structures (1.4.42).

5) The so-called "star deformations" [64] of the associative product

$$A \star B = A \times T \times B, \tag{1.5.62}$$

where T is fixed, and related generalized Lie product

$$A \star B - B \star A, \tag{1.5.63}$$

are manifestly nonunitary and *coincide* with Santilli's Lie-isotopic algebras [50].

6) Deformed creation-annihilation operators theories [65,66].

7) Nonunitary statistical theories [67].

8) Irreversible black holes dynamics [68] with Santilli's Lie-admissible structure (1.4.46) [103,104].

9) Noncanonical time theories [6971].

10) Supersymmetric theories [104] with product

$$(A, B) = [A, B] + \{A, B\} =$$
$$= (A \times B - B \times A) + (A \times B + B \times A), \tag{1.5.64}$$

are an evident particular case of Santilli's Lie-admissible product (1.4.46) with $T = W = I$.

11) String theories (see ref. [58] and literature quoted therein) generally have a noncanonical structure due to the inclusion of gravitation with additional catastrophic inconsistencies when including supersymmetries.

12) The so-called squeezed states theories [73,74] due to their manifest nonunitary character.

13) All quantum groups (see, e.g., refs. [75-77]) with a nonunitary structure.

14) Kac-Moody superalgebras [78] are also nonunitary and a particular case of Santilli's Lie-admissible algebra (1.4.46) with $T = I$ and W a phase factor.

Numerous additional theories are also afflicted by the catastrophic inconsistencies of Theorem 1.5.2, such as quantum groups, quantum gravity, and other theories the reader can easily identify from the *departures* of their time evolution from the unitary law.

All the above theories have a nonunitary structure formulated via conventional mathematics and, therefore, are afflicted by the catastrophic physical and mathematical inconsistencies of Theorem 1.5.2.

Additional generalized theories were attempted via *the relaxation of the linear character of quantum mechanics* [56]. These theories are essentially based on eigenvalue equations with the structure

$$H(t, r, p, |\psi\rangle) \times |\psi\rangle = E \times |\psi\rangle, \tag{1.5.65}$$

(i.e., H depends on the wavefunction).

Even though mathematically intriguing and possessing a seemingly unitary time evolution, these theories also possess rather serious physical drawbacks, such as: they violate the superposition principle necessary for composite systems such as a hadron; they violate the fundamental Mackay imprimitivity theorem necessary for the applicability of Galileo's and Einstein's relativities and possess other drawbacks [36] so serious to prevent consistent applications.

Yet another type of broader theory is *Weinberg's nonlinear theory* [79] with brackets of the type

$$A \odot B - B \odot A =$$

$$= \frac{\partial A}{\partial \psi} \times \frac{\partial B}{\partial \psi^\dagger} - \frac{\partial B}{\partial \psi} \times \frac{\partial A}{\partial \psi^\dagger}, \tag{1.5.66}$$

where the product $A \odot B$ is *nonassociative.*

This theory violates Okubo's No-Quantization Theorem [70], prohibiting the use of nonassociative envelopes because of catastrophic physical consequences, such as the loss of equivalence between the Schrödinger and Heisenberg representations (the former remains associative, while the latter becomes nonassociative, thus resulting in inequivalence).

Weinberg's theory also suffers from the absence of any unit at all, with consequential inability to apply the theory to measurements, the loss of exponentiation to a finite transform (lack of Poincaré-Birkhoff-Witt theorem), and other inconsistencies studied in Ref. [55].

These inconsistencies are not resolved by the adaptation of Weinberg's theory proposed by Jordan [80] as readers seriously interested in avoiding the publication of theories known to be inconsistent *ab initio* are encouraged to verify.

Several authors also attempted *the relaxation of the local-differential character of quantum mechanics* via the addition of "integral potentials" in the Hamiltonian,

$$V = \int d\tau \Gamma(\tau, \dots). \tag{1.5.67}$$

These theories are structurally flawed on both mathematical and physical grounds.

In fact, the nonlocal extension is elaborated via the conventional mathematics of quantum mechanics which, beginning with its topology, is strictly local-differential, thus implying fundamental *mathematical* inconsistencies. Nonlocal interactions are in general of contact type, for which the notion of a potential has no physical meaning, thus resulting in rather serious *physical* inconsistencies.

In conclusion, by the early 1980's Santilli had identified classical and operator generalized theories [103,104] that are directly universal in their fields, with a plethora of simpler versions by various other authors.

However, all these theories subsequently resulted in being mathematically significant, but having no physical meaning because they are noninvariant when elaborated with conventional mathematics.

As we shall see in Chapter 3 and 4, thanks to the construction of new mathematics, hadronic mechanics does indeed solve all the above inconsistencies. The clear difficulties in the solutions then illustrate the value of the result.

1.5.4 The Birth of Isomathematics, Genomathematics and their Isoduals

As it is well known, the basic equations of quantum mechanics, *Heisenberg's time evolution* of a (Hermitian) operator A ($\hbar = 1$),

$$i \times \frac{dA}{dt} = A \times H - H \times A = [A, H], \tag{1.5.68a}$$

$$H = p^2/2 \times m + V(r), \tag{1.5.68b}$$

can only represent the *conservation* of the total energy H (and other quantities) under action-at-a-distance interactions derivable from a potential $V(r)$,

$$i \times \frac{dH}{dt} = [H, H] = H \times H - H \times H \equiv 0. \tag{1.5.69}$$

Consequently, the above equations are basically insufficient to provide an operator representation of *closed non-Hamiltonian systems,* namely, systems of extended particles verifying conventional total conservation laws yet possessing internal potential; and nonpotential interactions, as it is the case for all interior problems, such as the structure of hadron, nuclei and stars.

The central requirement for a meaningful representation of closed, classical or operator interior systems of *particles* with internal contact interactions is the achievement of a *generalization of Lie's theory* in such a way to admit broader brackets, hereon denoted $[A\hat{,}B]$, verifying the following conditions:

1) The new brackets $[A\hat{,}B]$ must verify the distributive and scalars laws (3.9) in order to characterize an algebra.

2) Besides the Hamiltonian, the new brackets should admit a new Hermitian operator, hereon denoted with $\hat{T} = \hat{T}^\dagger$, and we shall write $[A\hat{,}B]_{\hat{T}}$, as a necessary condition for the representation of all non-Hamiltonian forces and effects.

3) The new brackets must be anti-symmetric in order to allow the conservation of the total energy under contact nonpotential internal interactions

$$i \times \frac{dH}{dt} = [H\hat{,}H]_{\hat{T}} \equiv 0. \tag{1.5.70}$$

For the case of *open,* classical or operator irreversible interior systems of *particles* there is the need of a *second generalization of Lie's theory* characterizing broader brackets, hereon denoted $(A\hat{,}B)$ verifying the following conditions:

1') The broader brackets (A, B) must also verify the scalar and distributive laws (3.9) to characterize an algebra;

2') The broader brackets must include *two* non-Hermitian operators, hereon denoted $\hat{P}$ and $\hat{Q}, \hat{P} = \hat{Q}^\dagger$ to represent the two directions of time, and the new brackets, denoted ${}_{\hat{P}}(A\hat{,}B)_{\hat{Q}}$, must be neither antisymmetric nor symmetric to characterize the time rate of variation of the energy and other quantities,

$$i \times \frac{dH}{dt} \ = \ {}_{\hat{P}}(H \hat{,} H)_{\hat{Q}} \ \neq \ 0; \tag{1.5.71}$$

3') The broader brackets must admit the antisymmetric brackets $[A \hat{,} B]$ and $[A, B]$ as particular cases because conservation laws are particular cases of non-conservation laws.

For the case of closed and open interior systems of *antiparticles,* it is easy to see that the above generalizations of Lie's theory will not apply for the same reason that the conventional Lie theory cannot characterize exterior systems of point-like antiparticles at classical level studied in Section 1.1 (due to the existence of only one quantization channel, the operator image of classical treatments of antiparticles can only yield particles with the wrong sign of the charge, and certainly not their charge conjugate).

The above occurrence requires a *third generalization of Lie's theory* specifically conceived for the representation of closed or open interior systems of antiparticles at *all* levels of study, from Newton to second quantization. As we shall see, the latter generalization is provided by the isodual map.

In an attempt to resolve the scientific imbalances of the preceding section, when at the Department of Mathematics of Harvard University, Santilli [39,50] proposed in 1978 an axiom-preserving generalization of conventional mathematics verifying conditions 1), 2) and 3), that he subsequently studied in various works (see monographs [9,10,11,38] and quoted literature).

The new mathematics is today known as *Santilli's isotopic and genotopic mathematics* or *isomathematics and genomathematics* for short [81-86], where the word "isotopic" or the prefix "iso" are used in the Greek meaning of preserving the original axioms, and the word "geno" is used in the sense of inducing new axioms.

Proposal [39] for the new isomathematics was centered in the generalization (called *lifting*) of the conventional, N-dimensional unit, $I = Diag.(1, 1, ..., 1)$ into an $N \times N$-dimensional matrix $\hat{I}$ that is nowhere singular, Hermitian and positive-definite, but otherwise possesses an unrestricted functional dependence on local coordinates r, velocities v, accelerations a, dimension d, density μ, wavefunctions ψ, their derivatives $\partial\psi$ and any other needed quantity,

$$I = Diag.(1, 1, ..., 1) > 0 \rightarrow \hat{I}(r, v, a, d, \mu, \psi, \partial\psi, ...) = \hat{I}^{\dagger} = 1/\hat{T} > 0 \tag{1.5.72}$$

while jointly lifting the conventional associative product $A \times B$ among generic quantities A and B (numbers, vector fields, matrices, operators, etc.) into the form

$$A \times B \rightarrow A \hat{\times} B = A \times \hat{T} \times B, \tag{1.5.73}$$

under which $\hat{I}$, rather than I, is the correct left and right unit,

$$I \times A = A \times I \equiv A \rightarrow \hat{I} \hat{\times} A = A \hat{\times} \hat{I} \equiv A, \tag{1.5.74}$$

for all A of the set considered, in which case $\hat{I}$ is called *Santilli's isounit,* and $\hat{T}$ is called the *isotopic element.*

Eqs. (1.5.72)–(1.5.74) illustrate the isotopic character of the lifting. In fact, $\hat{I}$ preserves all topological properties of I; the isoproduct $A\hat{\times}B$ remains as associative as the original product $A \times B$; and the same holds for the preservation of the axioms for a left and right identity.

More generally, the lifting of the basic unit required, for evident reasons of consistency, a corresponding compatible lifting of *all* mathematics used by special relativity and quantum mechanics, with no exception known to this author, thus resulting in the new *isonumbers*, isospaces, isofunctional analysis, isodifferential calculus, isotopologies, isogeometries, etc. (for mathematical works see Refs. [10,11,38]).

Via the use of the above liftings, Santilli presented in the original proposal [39] a step-by-step isotopic (that is, axiom-preserving) lifting of all main branches of Lie's theory, including the isotopic generalization of universal enveloping associative algebras, Lie algebras, Lie groups and the representation theory. The new theory was then studied in various works and it is today known as the *Lie-Santilli isotheory* [81-86]. Predictably. from Eqs. (1.5.73) one can see that the new isobrackets have the form

$$[A\hat{,}B]_{\hat{T}} = A\hat{\times}B - B\hat{\times}A =$$

$$= A \times \hat{T} \times B - B \times \hat{T} \times A = [A\hat{,}B], \tag{1.5.75}$$

where the subscript $\hat{T}$ shall be dropped hereon, whose verification of conditions 1), 2), 3) is evident.

The point important for these introductory lines is that *isomathematics does allow a consistent representation of extended, nonspherical, deformable and hyperdense particles under local and nonlocal, linear and nonlinear, and potential as well as nonpotential interactions.*

In fact, all conventional linear, local and potential interactions can be represented with a conventional Hamiltonian, while the shape and density of the particles and their nonlinear, nonlocal and nonpotential interactions can be represented with Santilli's isounits via realizations of the type

$$\hat{I} = \Pi_{k=1,2,...,n} Diag(n_{k1}^2, n_{k2}^2, n_{k3}^2, n_{k4}^2) \times e^{\Gamma(\psi,\psi^\dagger)\times\int d^3r\psi^\dagger(r)_k\times\psi(r)_k}, \tag{1.5.76}$$

where: the $n_{k1}^2, n_{k2}^2, n_{k3}^2$ allow to represent, for the first time, the actual, extended, nonspherical and deformable shapes of the particles considered (normalized to the values $n_k = 1$ for the perfect sphere); n_{k4}^2 allows to represent, also for the first time, the density of the interior medium (normalized to the value $n_4 = 1$ for empty space); the function $\Gamma(\psi, \psi^\dagger)$ represents the nonlinear character of the interactions; and the integral $\int d^3r\psi^\dagger(r)_k \times \psi(r)_k$ represents nonlocal interactions due to the overlapping of particles or of their wave packets.

When the mutual distances of the particles are much greater than 10^{-13}cm = 1 F, the integral in Eq. (1.5.76) is identically null, and all nonlinear and nonlocal effects are null. When, in addition, the particles considered are reduced to points moving in vacuum, all the n-quantities are equal to 1, generalized unit (1.3.22) recovers the trivial unit, and isomathematics recovers conventional mathematics identically, uniquely and unambiguously.

In the same memoir [39], in order to represent irreversibility, Santilli proposed a broader genomathematics based on the following differentiation of the product to the right and to the left with corresponding generalized units

$$A > B = A \times \hat{P} \times B, \quad \hat{I}^{>} = 1/\hat{P}; \tag{1.5.77a}$$

$$A < B = A \times \hat{Q} \times B, \quad {}^{<}\hat{I} = 1/\hat{Q}, \tag{1.5.77b}$$

$$\hat{I}^{>} = {}^{<}\hat{I}^{\dagger}, \tag{1.5.77c}$$

where evidently the product to the right, $A > B$, represents motion forward in time and that to the left, $A < B$, represents motion backward in time. Since $A > B \neq A < B$, the latter mathematics represents irreversibility from the most elementary possible axioms.

The latter mathematics was proposed under a broader lifting called "genotopy" in the Greek meaning of inducing new axioms, and it is known today as *Santilli genotopic mathematics,* pr *genomathematics* for short [81-86].

It is evident that genoliftings (1.5.77) require a step by step generalization of all aspects of isomathematics, resulting in *genonumbers, genofields, genospaces, genoalgebras, genogeometries, genotopologies, etc.* [9b,10b,11,38a].

Via the use of the latter mathematics, Santilli proposed also in the original memoir [39] a genotopy of the main branches of Lie's theory, including a genotopic broadening of universal enveloping isoassociative algebras, Lie-Santilli isoalgebras, Lie-Santilli isogroup, isorepresentation theory, etc. and the resulting theory is today known as the *Lie-Santilli genotheory* with basic brackets

$$\begin{aligned} {}_{\hat{P}}(A \hat{,} B)_{\hat{Q}} &= A < B - B > A = \\ &= A \times P \times B - B \times Q \times A = (A \hat{,} B), \end{aligned} \tag{1.5.78}$$

where the subscripts $\hat{P}$ and $\hat{Q}$ shall be dropped from now on.

It should be noted that the main proposal of memoir [39] is genomathematics, while isomathematics is presented as a particular case for

$$(A \hat{,} B)_{\hat{P}=\hat{Q}=\hat{T}} = [A \hat{,} B]. \tag{1.5.79}$$

as we shall see in Chapters 3 and 4, the *isodual isomathematics* and *isodual genomathematics* for the treatment of antiparticles are given by the isodual image (1.1.6) of the above iso- and geno-mathematics, respectively.

1.5.5 Hadronic Mechanics

Thanks to the prior discovery of isomathematics and genomathematics, in memoir [50] also of 1978 Santilli proposed a generalization of quantum mechanics for closed and open interior systems, respectively, under the name of *hadronic mechanics,* because hyperdense hadrons, such as protons and neutrons, constitute the most representative (and most difficult) cases of interior dynamical systems.

For the case of closed interior systems of particles, hadronic mechanics is based on the following *isotopic generalization of Heisenberg's equations* (Ref. [50], Eqs. (4.15.34) and (4.18.11))

$$i \times \frac{dA}{dt} = [A \hat{,} H] = A \hat{\times} H - H \hat{\times} A. \tag{1.5.80}$$

while for the broader case of open interior systems hadronic mechanics is based on the following *genotopic generalization of Heisenberg's equations* (Ref. [50], Eqs. (4.18.16))

$$\begin{aligned} i \times \frac{dA}{dt} &= (A \hat{,} H) = A < H - H > A = \\ &= A \times P \times H - H \times Q \times A. \end{aligned} \tag{1.5.81}$$

The isodual images of Eqs. (1.5.80) and (1.5.81) for antiparticles as well as their multivalued hyperformulations significant for biological studies, were added more recently [88].

A rather intense scientific activity followed the original proposal [50], including five *Workshops on Lie-admissible Formulations* held at Harvard University from 1978 to 1982, fifteen *Workshops on Hadronic Mechanics*, and several formal conferences held in various countries, plus a rather large number of research papers and monographs written by various mathematicians, theoreticians and experimentalists, for an estimated total of some 15,000 pages of research published refereed journals (see the *General References on Hadronic Mechanics* at the end of this volume).

It should be indicated that, following the original proposal of 1978 [50], maturity on the basic new numbers of hadronic mechanics, the *iso-, geno- and hyper-numbers and their isoduals* was reached only in 1993 [87]; a correct mathematical formulation was reached only in 1996 [88] due to problems that had remained unsolved for years; and a fully invariant physical formulation was reached only in 1997 for invariant Lie-isotopic theories [89] and invariant Lie-admissible theories [89] (see also memoir [91] for a recent review).

The lapse of time between the original proposal of 1978 and the achievement of mathematical and physical maturity illustrates the difficulties to be resolved.

As a result of all these efforts, hadronic mechanics is today a rather diversified discipline conceived and constructed for quantitative treatments of all classical and operator systems of particles according to Definition 1.3.1 with corresponding isodual formulations for antiparticles.

It is evident that in the following chapters we can review only the most salient foundations of hadronic mechanics and have to defer the interested reader to the technical literature for brevity.

As of today, hadronic mechanics has experimental verifications and applications in particle physics, nuclear physics, atomic physics, superconductivity, chemistry, biology, astrophysics and cosmology, including numerous industrial applications outlined in monograph [92].

Hadronic mechanics can be classified into **sixteen different branches**, including: four branches of classical treatment of particles with corresponding four branches of operator treatment also of particles, and eight corresponding (classical and operator) treatments of antiparticles.

An effective classification of hadronic mechanics is that done via the main topological features of the assumed basic unit, since the latter characterizes all branches according to:

$I = 1 > 0$:
HAMILTONIAN AND QUANTUM MECHANICS
Used for the description of closed and reversible systems of point-like particles in exterior conditions in vacuum;

$I^d = -1 < 0$:
ISODUAL HAMILTONIAN AND ISODUAL QUANTUM MECHANICS
Used for the description of closed and reversible systems of point-like antiparticles in exterior conditions in vacuum;

$\hat{I}(r, v, ...) = \hat{I}^\dagger > 0$:
CLASSICAL AND OPERATOR ISOMECHANICS
Used for the description of closed and reversible systems of extended particles in interior conditions;

$\hat{I}^d(r^d, v^d, ...) = \hat{I}^{d\dagger} < 0$:
ISODUAL CLASSICAL AND OPERATOR ISOMECHANICS
Used for the description of closed and reversible systems of extended antiparticles in interior conditions;

$\hat{I}^>(r^>, v^>, ...) = ({}^<\hat{I})^\dagger$:
CLASSICAL AND OPERATOR GENOMECHANICS
Used for the description of open and irreversible systems of extended particles in interior conditions;

$\hat{I}^{d>}(r^{d>}, v^{d>}, ...\} = ({}^<\hat{I})^{d\dagger}$:
ISODUAL CLASSICAL AND OPERATOR GENOMECHANICS

HADRONIC MECHANICS

MECHANICS AND THEIR ISODUALS

Newtonian Mechanics	Isodual Newtonian Mechanics
Hamiltonian mechanics	Isodual Hamiltonian Mechanics
Quantization	Isodual Quantization
Quantum mechanics	Isodual Quantum Mechanics
Special Relativity	Isodual Special Relativity

REPRESENTATION: isolated systems of point-like particles (mechanics) and antiparticles (isodual mechanics) under local, linear and potential forces.

ISOMECHANICS AND THEIR ISODUALS

Iso-Newtonian Mechanics	Isodual iso-Newtonian Mech.
Iso-Hamiltonian mechanics	Isodual iso-Hamiltonian Mech.
Isoquantization	Isodual Isoquantization
Isohadronic mechanics	Isodual isohadronic Mech.
Isospecial Relativity	Isodual Special Relativity

REPRESENTATION: Isolated, reversible and single-valued systems of extended particles (isomechanics) and antiparticles (isodual isomechanics) under internal, local and nonlocal, linear and nonlinear, potential and nonpotential forces.

GENOMECHANICS AND THEIR ISODUALS

Geno-Newtonian Mechanics	Isodual Geno-Newtonian Mech.
Geno-Hamiltonian mechanics	Isodual Geno-Hamiltonian Mech.
Genoquantization	Isodual Genoquantization
Genohadronic mechanics	Isodual Genohadronic Mechanics
Genospecial Relativity	Isodual Genospecial Relativity

REPRESENTATION: open, irreversible and single-valued systems of extended particles (genomechanics) and antiparticles (isodual genomechanics) under external, local and nonlocal, linear and nonlinear, potential and nonpotential forces.

HYPERMECHANICS AND THEIR ISODUALS

Hyper-Newtonian Mechanics	Isodual Hyper-Newtonian Mech.
Hyper-Hamiltonian mechanics	Isodual Hyper-Hamiltonian Mech.
Hyperquantization	Isodual Hyperquantization
Hyperhadronic mechanics	Isodual Hyperhadronic Mech.
Hyperspecial Relativity	Isodual Hyperspecial Relativity

REPRESENTATION: open, irreversible and multi--valued systems of extended particles (hypermechanics) and antiparticles (isodual hypermechanics) under external, local and nonlocal, linear and nonlinear, potential and nonpotential forces.

Figure 1.22. The structure of hadronic mechanics.

Used for the description of open and irreversible systems of extended antiparticles in interior conditions;

$\hat{I}^{>} = (\hat{I}_1^{>}, \hat{I}_2^{>}, ...) = ({}^{<}\hat{I})^{\dagger}$:
CLASSICAL AND OPERATOR HYPERMECHANICS
Used for the description of multivalued open and irreversible systems of extended particles in interior conditions;

$\hat{I}^{d>} = \{\hat{I}_1^{>}, \hat{I}_2^{>}, ...\} = ({}^{<}\hat{I})^{\dagger}$:
ISODUAL CLASSICAL AND OPERATOR HYPERMECHANICS
Used for the description of multivalued open and irreversible systems of extended antiparticles in interior conditions.

In summary, a serious study of antiparticles requires its study beginning at the classical level and then following at all subsequent levels, exactly as it is the case for particles.

In so doing, the mathematical and physical treatments of antiparticles emerge as being deeply linked to that of particles since, as we shall see, the former are an anti-isomorphic image of the latter.

Above all, a serious study of antiparticles requires the admission of their existence in physical conditions of progressively increasing complexity, that consequently require mathematical and physical methods with an equally increasing complexity, resulting in the various branches depicted in Figure 5.

All in all, young minds of any age will agree that, rather than having reached a terminal character, our knowledge of nature is still at its first infancy and so much remains to be discovered.

Appendix 1.A
Crothers' Critical Analysis of General Relativity

In this appendix we reproduce *ad litteram* the independent studies on gravitation conducted by Stephen J. Crothers of the Australian Division of the Institute for basic Research, email ¡thenarmis@yahoo.com¿.

The General Theory of Relativity has now become a topic of household discussion, at least within the context of black holes, Big Bang cosmology and expansion of the Universe. These concepts have found their way into the curricula of high schools, deep into university physics courses, much research, and some pretty expensive experimental projects. Almost daily there are reports of discovery of another black hole and of physical evidence of the beginning of the Universe from the Big Bang of a cosmological singularity. So widespread now are these notions that they have taken on the mantle of verified scientific facts. Yet nothing can be further from the truth. Indeed, the evidence, both theoretical and physical, actually refutes black holes, big bangs and expansion of the Universe.

Has anyone ever found final scientific evidence on a black hole? The short answer to this question is no, not a single black hole can be claimed to have been detected beyond scientific doubt. According to the proponents of the black hole, the signatures of that bizarre object are:

1) an infinitely dense singularity, a "point-mass";

2) an event horizon.

Since nobody has ever identified in a final scientific form an infinitely dense singularity anywhere, and since nobody has ever identified an event horizon anywhere, nobody has ever identified a black hole, anywhere. Furthermore, General Relativity is claimed to be a generalisation of Special Relativity, to non-uniform motion of material bodies. However, it is very easily proved that Special Relativity forbids the existence of infinite densities, and hence it forbids singularities, i.e. infinite point-densities. So if General Relativity permits singularities (e.g. black holes), it does so in violation of Special Relativity. Indeed, according to Special Relativity, the dynamic mass m of a rest-mass m_0, moving with a speed $v < c$ along the x-axis, is

$$m = \frac{m_0}{\sqrt{1 - \frac{v^2}{c^2}}}.$$

The dynamic volume of a cuboid rest-mass m_0 is $V = x_0^3\sqrt{1-\frac{v^2}{c^2}}$, where x_0 is the length of the sides of m_0. Then the dynamic density D is

$$D = \frac{m}{V} = \frac{m_0}{x_0^3\left(1-\frac{v^2}{c^2}\right)}.$$

This is infinite when $v = c$. But according to Special Relativity no material object can acquire the speed c, of light in vacuo (equivalently, this would require an infinite amount of energy, which is impossible). Therefore, point-masses are forbidden by Special Relativity, and hence also by General Relativity if the latter is to be consistent with the former. This is sufficient to invalidate the alleged black hole singularity and the alleged Big Bang cosmological singularity.

Another simple physical argument re-affirms this result; violation of Einstein's 'Principle of Equivalence' [111]. According to this Principle [112], in a freely falling inertial frame in a sufficiently small region of Einstein's gravitational field, Special Relativity must hold. Now Einstein's field equations are

$$G_{\mu\nu} = R_{\mu\nu} - \frac{1}{2}g_{\mu\nu}R = -\kappa T_{\mu\nu}\,,$$

where $G_{\mu\nu}$ is Einstein's tensor, $R_{\mu\nu}$ the Ricci tensor, κ a constant, and $T_{\mu\nu}$ the energy-momentum tensor. Einstein claimed that for the static vacuum (i.e. empty) gravitational field, $T_{\mu\nu} = 0$, so that

$$R_{\mu\nu} = 0,$$

(since in this case the Ricci curvature invariant R is also zero). It is from a solution to $R_{\mu\nu} = 0$, the so-called "Schwarzschild solution", that the black hole is alleged. Now Special Relativity permits the presence of any number of arbitrarily large (but not infinitely large) masses, which can interact. Furthermore, the very definition of an inertial frame involves the presence of mass (and in the case of Special Relativity, two masses, viz., the mass of the observer and the mass of the observed, so that relative motion of material bodies is defined). But $R_{\mu\nu} = 0$ is a statement that there are no masses permitted, by definition, in the alleged gravitational field of $R_{\mu\nu} = 0$. Therefore, Special Relativity cannot be recovered in any "freely falling" inertial frame in the spacetime of $R_{\mu\nu} = 0$ and, indeed, a "freely falling" inertial frame cannot even be present (since its very definition requires the presence of mass). Thus, Einstein's 'Principle of Equivalence' is violated by $R_{\mu\nu} = 0$, and is therefore inconsistent with the General Theory of Relativity, which is based upon the validity of his 'Principle'. Therefore, the "Schwarzschild solution" violates the 'Principle' and is consequently invalid, thereby completely invalidating the black hole, even if the latter can be deduced from the "Schwarzschild solution" by some purely formal mathematical means.

However, it has also been proved [113–131] that it is impossible to obtain the black hole from the "Schwarzschild solution" without violating the rules of differential geometry. This too is sufficient to invalidate the black hole.

It should also be noted that the concept of the black hole did not come from any observations requiring a theoretical explanation. It was generated entirely from theory (and an erroneous theory at that). It is no wonder that nobody has ever found a black hole; and there is no theory which rightly predicts them. The black hole was stillborn, and has no place in science.

The Big Bang concept and its associated expansion of the Universe is in the same boat as its cousin, the black hole. First, as shown above, the alleged cosmological singularity, an infinitely dense point-mass containing all the matter and energy of the Universe, and spacetime itself besides, is inconsistent with Special Relativity and hence also with General Relativity. Once again, if General Relativity predicted a cosmological singularity it would do so in violation of Special Relativity. Furthermore, the Big Bang and expansion of the Universe are allegedly a consequence of the Friedmann-Lemaître-Robertson-Walker (FLRW) line-element. But it has been proved that the Big Bang and associated expansion of the Universe cannot be obtained from the FLRW line-element without a gross violation of differential geometry, and so they are invalid. In actual fact, the FLRW line-element predicts an infinite, unbounded Universe, independent of time [122] – no Big Bang and no expansion.

Another interesting fact is that "Schwarzschild's solution" is not Schwarzschild's solution [7, 8, 130–134]. It is also frequently claimed that Schwarzschild deduced the black hole from his solution, with an event horizon at the "Schwarzschild radius", R_s, given by

$$R_s = \frac{2Gm}{c^2}.$$

All these claims are patently false, because Schwarzschild did not breathe a single word about black holes, never "deduced" the alleged "Schwarzschild radius", of the so-called "event horizon", and in fact obtained a solution which precludes the black hole. Here is the "Schwarzschild solution", due to David Hilbert [130, 131, 133, 134] (using $c = G = 1$),

$$ds^2 = \left(1 - \frac{2m}{r}\right) dt^2 - \left(1 - \frac{2m}{r}\right)^{-1} dr^2 - r^2(d\theta^2 + \sin^2\theta d\varphi^2),$$

wherein r is alleged to go down to zero, one way or another. But here now is Schwarzschild's real solution [7],

$$ds^2 = \left(1 - \frac{\alpha}{R}\right) dt^2 - \left(1 - \frac{\alpha}{R}\right)^{-1} dR^2 - R^2(d\theta^2 + \sin^2\theta d\varphi^2),$$

$$R = R(r) = \left(r^3 + \alpha^3\right)^{\frac{1}{3}},$$

$$0 < r < \infty,$$

wherein α is an undetermined constant, supposed a function of the mass of the source of the alleged gravitational field associated therewith. Note that when $r = 0$, Schwarzschild's line element is undefined, and there is no possibility of a black hole, which is alleged to occur in Hilbert's "Schwarzschild's solution" with infinitely dense singularity at $r = 0$ and event horizon at $r = 2m$ therein. Hilbert's "Schwarzschild's solution" violates the intrinsic geometry of the line-element, and is inconsistent with Schwarzschild's solution which does not violate the intrinsic geometry of the line-element. Also, one cannot assign a value to the constant α without introducing extraneous and *ad hoc* arguments, as Schwarzschild knew – and so he didn't. And even if Schwarzschild's solution or Hilbert's "Schwarzschild solution" were permissible, they conceive of the mass in terms of a centre of mass (i.e. a point-mass), and a centre of mass is not a physical object. There is no sense in asserting that an object and its centre of mass are identical, which is effectively what the proponents of the black hole do. In addition, the energy-momentum tensor contains all matter and energy that cause the gravitational field. Setting it to zero eliminates all causation of the gravitational field, and so causative mass cannot be introduced into the metric tensor *a posteriori* in the fashion of the proponents of black holes by their analogy with Newton's gravitational potential in the infinitely far field.

In the usual interpretation of Hilbert's "Schwarzschild's solution", the quantity r therein has never been properly identified. It has variously been called "the radius" [135, 136] of a sphere, the "coordinate radius"[137] or "radial coordinate" [17, 138] or "radial space coordinate" [139], the "areal radius" [137, 140], the "reduced circumference" [141], even "a gauge choice, which defines r" [142], but *never* for what it really is – the radius of Gaussian curvature. Being the radius of curvature it does not in fact determine the geodesic radial distance from the centre of spherical symmetry [111, 113–128, 140–145]. For a 2-D spherically symmetric geometric surface given by

$$R_c^2(d\theta^2 + \sin^2\theta d\varphi^2),$$

$$R_c = R_c(r),$$

the Riemannian curvature reduces to the Gaussian curvature K, given by [143, 149–152],

$$K = \frac{R_{1212}}{g},$$

where R_{ijkm} is the Riemann tensor of the first kind and $g = g_{\theta\theta}g_{\varphi\varphi}$. Straightforward calculation gives

$$K = \frac{1}{R_c^2},$$

so that R_c is the inverse square root of the Gaussian curvature, i. e. the radius of curvature, and so r in Hilbert's "Schwarzschild's solution" is the radius of Gaussian curvature. The geodesic (or proper) radius, R_p, of Schwarzschild's solution is given by

$$R_p = \int \frac{dR}{\sqrt{1 - \frac{\alpha}{R}}},$$

and for Hilbert's black hole "Schwarzschild's solution", by

$$R_p = \int \frac{dr}{\sqrt{1 - \frac{2m}{r}}}.$$

Thus the proper radius and the radius of curvature *are not the same*; for the above, $R_p \neq R$ and $R_p \neq r$ respectively, in general [111, 113–128].

That Einstein's conception of the conservation and localisation of gravitational energy are erroneous easily follows from the fact that $R_{\mu\nu} = 0$ is inadmissible. Since the energy-momentum tensor can never be zero, Einstein's field equations can be written as

$$\frac{G_{\mu\nu}}{\kappa} + T_{\mu\nu} = 0,$$

where $G_{\mu\nu}/\kappa$ gives the components of a gravitational energy tensor. Thus, when $T_{\mu\nu} = 0$, $G_{\mu\nu} = 0$, i .e. $T_{\mu\nu}$ and $G_{\mu\nu}/\kappa$, *vanish identically.* Consequently, the total energy is always zero; there is no possibility of the localisation of gravitational energy; there are no Einstein gravitational waves. The LIGO project and its counterparts around the world, such as the AIGO, are destined to detect nothing.

Einstein's pseudo-tensor is alleged to describe the localisation of gravitational energy, gravitational waves, and the flow of energy and momentum. According to the foregoing this cannot be true. This is re-affirmed by the fact that Einstein's pseudo-tensor is a meaningless collection of mathematical symbols [153]. Einstein's pseudo-tensor, $\sqrt{-g}t^{\mu}_{\nu}$, is defined as [112, 149, 153–155],

$$\sqrt{-g}t^{\mu}_{\nu} = \frac{1}{2}\left(\delta^{\mu}_{\nu}L - \frac{\partial L}{\partial g^{\sigma\rho}_{,\mu}} g^{\sigma\rho}_{,\nu}\right)$$

wherein L is given by

$$L = -g^{\alpha\beta}\left(\Gamma^{\gamma}_{\alpha\kappa}\Gamma^{\kappa}_{\beta\gamma} - \Gamma^{\gamma}_{\alpha\beta}\Gamma^{\kappa}_{\gamma\kappa}\right).$$

Contracting the pseudo-tensor and applying Euler's theorem yields,

$$\sqrt{-g}t^{\mu}_{\mu} = L,$$

which is a 1st-order intrinsic differential invariant that depends only upon the components of the metric tensor and its 1st derivatives. However, the mathematicians Ricci and Levi-Civita proved in 1900 that such invariants *do not exist*

[153, 156]. The invalidity of the pseudo-tensor is, of course, consistent with the invalidity of $R_{\mu\nu} = 0$. Consequently, everything built upon Einstein's pseudo-tensor is invalid. Connected with is the fact that Einstein's field equations cannot be linearised because linearisation implies the existence of a tensor that, except of the trivial case of being zero, *does not otherwise exist*, as proved by Hermann Weyl in 1944 [157].

The proponents of the Standard Model routinely ignore and attempt to suppress these facts [158, 159], because they completely invalidate their theories of black holes, big bangs and expansion of the Universe. Ironically, theoretically speaking, it is General Relativity itself which invalidates them. Observations also refute them.

References

[1] P. A. M. Dirac, *The Principles of Quantum Mechanics,* Clarendon Press, Oxford, fourth edition (1958).

[2] I. Newton, *Philosophiae Naturalis Principia Mathematica* (1687), translated and reprinted by Cambridge Univ. Press. (1934).

[3] J. L. Lagrange, *Mechanique Analytique* (1788), reprinted by Gauthier-Villars, Paris (1888).

[4] W. R. Hamilton, *On a General Method in Dynamics* (1834), reprinted in *Hamilton's Collected Works,* Cambridge Univ. Press (1940).

[5] C. G. Jacobi, *Zur Theorie del Variationensrechnung under der Differentialgleichungen* (1937).

[6] E. T. Whittaker, *A Treatise on the Analytic Dynamics of particles and Rigid Bodies,* Cambridge University Press (1943, reprinted 1963).

[7] K. Schwarzschild, *On the gravitational field of a mass point according to Einstein's theory,* Sitzungsber. Preuss. Akad. Wiss., Phys. Math. Kl., 189 (1916) (arXiv: physics/9905030, www.geocities.com/theometria/schwarzschild.pdf).

[8] K. Schwarzschild, *On the gravitational field of a sphere of incompressible fluid according to Einstein's theory,* Sitzungsber. Preuss. Akad. Wiss., Phys. Math. Kl., 424 (1916) (arXiv: physics/9912033).

[9] R. M. Santilli, *Foundations of Theoretical Mechanics,* Vol. I: *The Inverse Problem in Newtonian Mechanics,* (1978) [9a]; Vol. II: *Birkhoffian Generalization of hamiltonian Mechanics,* [1982 [9b], Springer, Verlag, Heidelberg-New York.

[10] R. M. Santilli, *Elements of Hadronic Mechanics,* Vol. I: *Mathematical Foundations,* Second edition 91995) [10a], Vol. II: *Theoretical Foundations,* Second edition (1995) [10b], Ukrainian Academy of Sciences, Kiev.

[11] R. M. Santilli, *Foundations of Hadronic Chemistry with Applications to New Clean Energies and Fuels,* Kluwer Academic Publishers, Boston-Dordrecht-London (2001).

[12] I. B. Lorstad, J. Modern Phys. A **4**, 286 (1989).

[13] J. M. Blatt and V. F. Weiskopf, *Theoretical Nuclear Physics*, Wiley, New York (1964).

[14] D. Eisenberg and W. Kauzmann, *The Structure and Properties of Water*, Oxford University Press, New York (1969).

[15] M. W. Hanna, *Quantum Mechanical Chemistry*, Benjamin, New York (1965).

[16] C. Illert and R. M. Santilli, *Foundations of Conchology*, Hadronic Press (1996).

[17] C. W. Misner, K. S. Thorne and J. A. Wheeler, *Gravitation,* W. H. Freeman and Company, New York (1970).

[18] C. J.Isham, R. Penrose and D. W. Sciama, Editors, *Quantum Gravity 2* (Oxford University Press, Oxford, 1981).

[19] H. Weber, ed. (Dover, New York, 1953).

[20] D. Hilbert, Nachr. Kgl. Ges. Wissench. Gottingen, 1915, p. 395.

[21] A. Einstein, Sitz. Ber. Preuss. Akad. Wissssench Berlin, 1915, p. 844.

[22] R. M. Santilli, Ann. Phys. **83**, 108 (1974).

[23] P. Freud, Ann. Math. **40** (2), 417 (1939) [11b].

[24] W. Pauli, *Theory of Relativity*, Pergamon Press, London (1958).

[25] D. Lovelock and H. Rund, *Tensors, Differential Forms and Variational Principles*, Wiley, New York (1975).

[26] H. Rund, Algebras, Groups and Geometries **8**, 267 (1991).

[27] H. Yilmaz, Hadronic J. **11**, 179 (1988).

[28] H. E. Wilhelm, Chinese J. Syst. Eng. & Electr. **6,** 59 (1965).

[29] H. E. Wilhelm, Hadronic J. **19,** 1 (1996).

[30] H. E. Wilhelm, Hadronic J. **27,** 349 (2004).

[31] R. M. Santilli, Chinese J. Syst. Eng. & Electr. **6,** 155 (1965).

[32] H. Alfvén, contributed paper in *Cosmology, Myth and Theology,* W. Yourgrau and A. D. Breck, Editors, Plenum Press, New York (1977).

[33] H. Alfvén, American Scientist **76,** 249 (1988).

[34] V. Fock, *Theory of Space, Time and Gravitation,* Pergamon Press, London (1969).

[35] H. Nordenson, *Relativity, Time and Reality: A Logical Analysis,* Allen and Unwin, London (1969).

[36] R. M. Santilli, Intern. J. Modern Phys. A **20,** 3157 (1999).

[37] G. D. Birkhoff, *Dynamical Systems*, Amer. Math. Soc., Providence, R.I. (1927).

[38] R. M. Santilli, *Lie-admissible Approach to the Hadronic Structure,* Vols. I and II, Hadronic Press, Palm Harbor, Florida (1978).

[39] R. M. Santilli, "On a possible Lie-admissible covering of the Galilei Relativity for non-conservative and Galilei form-noninvariant systems," Lyman Laboratory of Physics, Harvard University, Cambridge MA, under DOE contract DE-ACO2-80ER-10651.A001, published in the Hadronic J. **1**, 223-423 (l978), with addendum published in the Hadronic Journal **1**, 1279-1342 (l978) [this memoir set the mathematical foundations of hadronic mechanics presented in the adjoining memoir [50] of the same year].

[40] A. A. Albert, Trans. Amer. Math. Soc. **64**, 552 (1948).

[41] R. M. Santilli, Nuovo Cimento **51**, 570 (1967).

[42] R. M. Santilli, Supl. Nuovo Cimento **6**, 1225 (1968).

[43] R. M. Santilli, Meccanica **1**, 3 (1969).

[44] L. C. Biedernharn, J. Phys. A **22**, L873 (1989).

[45] A. J. Macfarlane, J. Phys. A **22**, L4581 (1989).

[46] V. Dobrev, in *Proceedings of the Second Wigner Symposium*, Clausthal 1991, World Scientific, Singapore (1993).

[47] J. Lukierski, A. Novicki, H. Ruegg and V. Tolstoy, Phys. Lett. B **264**, 331 (1991).

[48] O. Ogivetski, W. B. Schmidke, J. Wess and B. Zumino, Comm. Math. Phys. **50**, 495 (1992).

[49] S. Giller, J. Kunz, P. Kosinky, M. Majewskil and P. Maslanka, Phys. Lett. B. **286**, 57 (1992).

[50] R. M. Santilli, "Need for subjecting to an experimental verification the validity within a hadron of Einstein's Special Relativity and Pauli's Exclusion Principle," Lyman Laboratory of Physics, Harvard University, Cambridge, MA, under DOE contract DE-ACO2-80ER-10651.A001, published in the Hadronic J. Vol. **1**, 574-902 (l978) [this memoir proposed the construction of hadronic mechanics following the preceding memoir [39] on the needed new mathematics].

[51] S. Okubo, Hadronic J. **5**, 1667 (1982).

[52] D. F. Lopez, in *Symmetry Methods in Physics*, A. N. Sissakian, G. S. Pogosyan and X. I. Vinitsky, Editors (JINR, Dubna, Russia, 1994).

[53] D. F. Lopez, Hadronic J. **16**, 429 (1993).

[54] A. Jannussis and D. Skaltsas, Ann. Fond. L. de Broglie **18**, 137 (1993).

[55] A. Jannussis, R. Mignani and R. M. Santilli, Ann. Fond. L. de Broglie **18**, 371 (1993).

[56] D. Schuch, Phys. Rev. A **55**, 955 (1997).

[57] R. M. Santilli, Modern Phys. Letters **13**, 327 (1998).

[58] R. M. Santilli, Found. Phys. **32**, 1111 (2002).

[59] W. Band, *An Introduction to Quantum Statistics*, van Nostrand, Princeton (1955).

[60] J. Lukierski, A. Nowiski and H. Ruegg, Phys. Lett. B **293**, 344 (1992).

[61] J. Lukierski, H. Ruegg and W. Ruhl, Phys. Lett. B **313**, 357 (1993).

[62] J. Lukierski and H. Ruegg, Phys. Lett. B **329**, 189 (1994).

[63] S. Majid and H. Ruegg, Phys. Lett. B **334**, 348 (1994).

[64] F. Bayen, M. Flato, C. Fronsdal, A. Lichnerowitz and D. Sternheimer, Ann. Phys. **111**, 61 and 111 (1978).

[65] A. Jannussis et al, Lett. Nuovo Cimento **29**, 427 (1980).

[66] A. Jannussis et al., Nuovo Cimento **103B**, 537 (1989).

[67] Cl. George, F. Henin, F. Mayne' and I. Prigogine, Hadronic J. **1**, 5.

[68] J. Ellis, N. E. Mavromatos and D. V. Nanopoulos in *Proceedings of the Erice Summer School, 31st Course: From Superstrings to the Origin of Space-Time*, World Scientific (1996).

[69] P. Caldirola, Nuovo Cimento,**3** 297 (1956) and Lett. Nuovo Cimento **16**, 151 (1976).

[70] A. Jannussis et al. Lett. Nuovo Cimento **29**, 427 (1980).

[71] D. Lee, Phys. Rev. Lett. **122b**, 217 (1983).

[72] R. N. Mahopatra, *Unification and Supersymmetries: The Frontiers of Quark-Lepton Physics*, 2-nd ed., Springer-Verlag (1992).

[73] A. Jannussis et al., Nuovo Cimento **103B** 17 and 537 (1989); **104B**, 33 and 53 (1989); **108B**, 57 (l993); Phys. Lett. A **132**, 324 (1988).

[74] S. Sebawe Abdallah et al., Physica A **163** 822 (1990).

[75] T. L. Curtis, B. Fairlie and Z. K. Zachos, **Editors**, *Quantum Groups*, World, Scientific, Singapore (1991).

[76] Mo-Lin Ge and Bao Heng Zhao, Editors, *Introduction to Quantum Groups and Integrable Massive Models of Quantum Field Theory*, World Scientific (1991).

[77] Yu. F. Smirnov and R. M. Asherova, Editors, *Proceedings of the Fifth Workshop Symmetry Methods in Physics*, JINR, Dubna, Russia (1992).

[78] V. G. Kac, *Infinite dimensional Lie Algebras*, Birkhauser, New York (1983).

[79] S. Weinberg, Ann. Phys. **194**, 336 (1989).

[80] T. F. Jordan, Ann. Phys. **225**, 83 (1993).

[81] A. K. Aringazin, A. Jannussis, D. F. Lopez, M. Nishioka and B. Veljanosky, *Santilli's Lie–Isotopic Generalization of Galilei's Relativities,* Kostarakis Publisher, Athens, Greece (1980).

[82] J. V. Kadeisvili, *Santilli's Isotopies of Contemporary Algebras, Geometries and Relativities*, Second Edition, Ukrainian Academy of Sciences, Kiev (1997).

[83] D. S. Sourlas and G. T. Tsagas, *Mathematical Foundations of the Lie-Santilli Theory*, Ukrainian Academy of Sciences, Kiev (1993).

[84] J. Lôhmus, E. Paal and L. Sorgsepp, *Nonassociative Algebras in Physics*, Hadronic Press, Palm Harbor, FL, (1994).

[85] R. M. Falcon Ganfornina and J. Nunez Valdes, *Fondamentos de la Isoteoria de Lie-Santilli,* (in Spanish) International Academic Press, America-Europe-Asia, (2001), also available in the pdf file http://www.i-b-r.org/docs/spanish.pdf.

[86] Chun-Xuan Jiang, *Foundations of Santilli's Isonumber Theory,* International Academic Press, America-Europe-Asia (2002), also available in the pdf file http://www.i-b-r.org/docs/jiang.pdf.

[87] R. M. Santilli, Algebras, Groups and Geometries **10**, 273 (1993).

[88] R. M. Santilli, Rendiconti Circolo Matematico di Palermo, Supplemento **42**, 7 (1996).

[89] R. M. Santilli, Found. Phys. **27**, 625 (1997).

[90] R. M. Santilli, Found. Phys. **27**, 1159 (1997).

[91] R. M. Santilli, Journal of Dynamical Systems and Geometric Theories, **1**, 121 (2003).

[92] R. M. Santilli, *The Physics of New Clean Energies and Fuels According to Hadronic Mechanics,* Special issue of the Journal of New Energy, 318 pages (1998), reprinted by International Academic Press (2005).

[93] R. M. Santilli, *Ethical Probe of Einstein's Followers in the U.S.A.: An Insider's View,* Alpha Publishing, Newtonville, MA (1984), ISBN # 0-931753-00-7, available as free download in pdf format in the web site http://www.scientificethics.org/IlGrandeGrido.htm

[94] R. M. Santilli, *Documentation of the Ethical Probe,* Volumes I, II and III, Alpha Publishing, Newtonville, MA (1986), available as free download in pdf format from the web site http://www.scientificethics.org/IlGrandeGrido.htm

[95] R. M. Santilli, *Isodual Theory of Antimatter with Applications to Antigravity, Spacetime Machine and Cosmology,* Springer, in press for 2006).

[96] A. Logunov, *On the article by Henri Poincaré,* Hadronic Journal **19**, 109 (1996).

[97] C. J. Bjerknes, *Albert Einstein, the Incorrigible Plagiarism, XTX* Publications, Downers Grove, Illinois (2003).

[98] C. J. Bjerknes, *Anticipation of Einstein in the General Theory of relativity,* Volumes I and Ii, *XTX* publications, Downers Grove, Illinois (2003).

[99] M. Kaku, *Quantum Field Theory,* Oxford University Press, New York (1993).

[100] R. M. Santilli, Found. Phys. **11**, 383 (l981).

[101] R. M. Santilli, Hyperfine Interactions, **109**, 63 (1997).

[102] R. M. Santilli, *Inconsistencies of neutrino and quark conjectures and their negative environmental implications,* preprint IBR-TH-34-05 (2005), submitted for publication.

[103] H. Rutherford, Proc. Roy. Soc. A **97**, 374 (1920).

[104] J. Chadwick, Proc. Roy. Soc. A **136**, 692 (1932).

[105] W. Pauli, Handbruch der Physik Vol. 24, Springer-Verlag, Berlin (1933).

[106] E. Fermi, *Nuclear Physics,* University of Chicago Press (1949).

[107] E. R. Bagge, *World and Antiworlds as Physical Reality,* Haag & Herchen, Frankfurt (1994)

[108] A. Franklin, *Are There really neutrinos?* Westview Press, Boulder, CO (2000).

[109] H. E. Wilhelm, Hadronic Journal **27**, 349 (2004)

[110] R. M. Santilli, Galilean Electrodynamics, **17**, 43 (2006)

[111] S. J. Crothers, *On Certain Conceptual Anomalies in Einstein's Theory of Relativity,* Progress in Physics **1**, 52–57 (2008) (www.ptep-online.com/index_files/2008/PP-12-11.PDF).

[112] A. Einstein, *The Meaning of Relativity,* Science Paperbacks and Methuen & Co. Ltd. (1967), pp. 156–157.

[113] S. J. Crothers, *On the General Solution to Einstein's Vacuum Field and its Implications for Relativistic Degeneracy,* Progress in Physics **1**, 68–73 (2005) (www.ptep-online.com/index_files/2005/PP-01-09.PDF).

[114] S. J. Crothers, *On the Ramifications of the Schwarzschild Space-time Metric,* Progress in Physics **1**, 74–80 (2005) (www.ptep-online.com/index_files/2005/PP-01-10.PDF).

[115] S. J. Crothers, *On the geometry of the general solution for the vacuum field of the point-mass,* Progress in Physics **2**, 3–14 (2005) (www.ptep-online.com/index_files/2005/PP-02-01.PDF).

[116] S. J. Crothers, *On the Generalisation of Kepler's 3rd Law for the Vacuum Field of the Point-Mass,* Progress in Physics **2**, 70–75 (2005) (www.ptep-online.com/index_files/2005/PP-02-05.PDF).

[117] S. J. Crothers, *On the vacuum field of a sphere of incompressible fluid,* Progress in Physics **2**, 76–81 (2005) (www.ptep-online.com/index_files/2005/PP-02-06.PDF).

[118] S. J. Crothers, *On Isotropic Coordinates and Einstein's Gravitational Field,* Progress in Physics **3**, 7–12 (2006) (www.ptep-online.com/index_files/2006/PP-06-02.PDF).

[119] S. J. Crothers, *On the Regge-Wheeler tortoise and the Kruskal-Szekeres coordinates,* Progress in Physics **3**, 30–34 (2006) (www.ptep-online.com/index_files/2006/PP-06-06.PDF).

[120] S. J. Crothers, *Spherically Symmetric Metric Manifolds and the Black Hole Catastrophe* (2007) (www.aias.us).

[121] M. W. Evans, H. Eckardt and S. J. Crothers, *The Coulomb and Ampere Maxwell Laws in Generally Covariant Unified Field Theory,* paper 93, (www.aias.us).

[122] S. J. Crothers, *On the 'Size' of Einstein's Spherically Symmetric Universe,* Progress in Physics **4**, 69–73 (2007) (www.ptep-online.com/index_files/2007/PP-11-10.PDF).

[123] S. J. Crothers, *A Brief History of Black Holes,* Progress in Physics **2**, 54–57 (2006) (www.ptep-online.com/index_files/2006/PP-05-10.PDF).

[124] S. J. Crothers, *Introducing Distance and Measurement in General Relativity: Changes for the Standard Tests and the Cosmological Large Scale,* Progress in Physics **3**, 41–47 (2005) (www.ptep-online.com/index_files/2005/PP-03-07.PDF).

[125] S. J. Crothers, *A Short Discussion of Relativistic Geometry,* Bulletin of Pure and Applied Sciences **24E**, no. 2, 267–273 (2005) (www.geocities.com/theometria/shortgeo.pdf).

[126] S. J. Crothers, *On the general solution to Einstein's vacuum field for the point-mass when $\lambda \neq 0$ and its consequences for relativistic cosmology,* Progress in Physics **3**, 7–18 (2005) (www.ptep-online.com/index_files/2005/PP-03-02.PDF).

[127] S. J. Crothers, *Relativistic cosmology revisited,* Progress in Physics **2**, 27–30 (2007) (www.ptep-online.com/index_files/2007/PP-09-05.PDF).

[128] S. J. Crothers, *On line-elements and radii: a correction,* Progress in Physics **2**, 25–26 (2007) (www.ptep-online.com/index_files/2007/PP-11-01.PDF).

[129] S. J. Crothers, *Gravitation On a Spherically Symmetric Metric Manifold,* Progress in Physics **2**, 68–74 (2007) (www.ptep-online.com/index_files/2007/PP-09-04.PDF).

[130] L. S. Abrams, *Alternative space-time for the point mass,* Phys. Rev. D **20**, 2474–2479 (1979) (arXiv:gr-qc/0201044).

[131] L. S. Abrams, *Black holes: the legacy of Hilbert's error,* Can. J. Phys. **67**, 919 (1989) (arXiv:gr-qc/0102055).

[132] M. Brillouin, *The singular points of Einstein's Universe,* Journ. Phys. Radium **23**, 43 (1923) (www.geocities.com/theometria/brillouin.pdf).

[133] S. Antoci, *David Hilbert and the origin of the "Schwarzschild" solution* (2001) (arXiv: physics/0310104).

[134] A. Loinger, *On black holes and gravitational waves,* La Goliardica Paves, Pavia (2002).

[135] R. A. Mould, *Basic Relativity,* Springer–Verlag New York Inc., New York (1994).

[136] C. T. J. Dodson and T. Poston, *Tensor Geometry – The Geometric Viewpoint and its Uses,* 2nd Ed., Springer–Verlag (1991).

[137] R. M. Wald, *General Relativity,* The University of Chicago Press, Chicago (1984).

[138] B. W. Carroll and D. A. Ostile, *An Introduction to Modern Astrophysics,* Addison–Wesley Publishing Company Inc. (1996).

[139] Ya. B. Zel'dovich and I. D. Novikov, *Stars and Relativity,* Dover Publications Inc., New York (1996).

[140] M. Ludvigsen, *General Relativity – A Geometric Approach,* Cambridge University Press, Cambridge, UK (1999).

[141] E. F. Taylor and J. A. Wheeler, *Exploring Black Holes – Introduction to General Relativity,* Addison Wesley Longman (2000) (in draft).

[142] G. 't Hooft, private communication.

[143] T. Levi-Civita, *The Absolute Differential Calculus,* Dover Publications Inc., New York (1977).

[144] N. Stavroulakis, *A statical smooth extension of Schwarzschild's metric,* Lettre al Nuovo Cimento, Serie 2, **11**, no. 8, 427–430 (1974) (www.geocities.com/theometria/Stavroulakis-3.pdf).

[145] N. Stavroulakis, *On the principles of General Relativity and the* $\Theta(4)$*-invariant metrics,* Proceedings of the 3^{rd} Panhellenic Congress of Geometry, Athens, 169–182 (1997) (www.geocities.com/theometria/Stavroulakis-2.pdf).

[146] N. Stavroulakis, *On a paper by J. Smoller and B. Temple,* Annales Fond. Louis de Broglie **27**, no. 3, 511–521 (2002) (www.ptep-online.com/theometria/Stavroulakis-1.pdf).

[147] N. Stavroulakis, *Non-Euclidean geometry and gravitation,* Progress in Physics **2**, 68–75 (2006) (www.ptep-online.com/index_files/2006/PP-00-13.PDF).

[148] N. Stavroulakis, *On the gravitational field of a pulsating source,* Progress in Physics **4**, 3–8 (2007) (www.ptep-online.com/index_files/2007/PP-11-01.PDF).

[149] W. Pauli, *The Theory of Relativity,* Dover Publications Inc., New York (1981).

[150] D. C. Kay, *Theory and Problems of Tensor Calculus, Schaum's Outline Series,* McGraw-Hill Book Company (1988).

[151] A. J. McConnell, *Applications of Tensor Analysis,* Dover Publications Inc., New York (1957).

[152] L. Landau and E. Lifshitz, *The Classical Theory of Fields,* Addison-Wesley Publishing Company Inc., Reading, Massachusettes (1951).

[153] T. Levi-Civita, *Mechanics. – On the analytical expression that must be given to the gravitational tensor in Einstein's theory,* Rendiconti della Reale Accadmeia dei Lincei **26**, 381 (1917) (English translation by S. Antoci and A. Loinger: www.geocities.com/theometria/Levi-Civita.pdf).

[154] R. C. Tolman, *Relativity Thermodynamics and Cosmology,* Dover Publications Inc., New York (1987).

[155] P. A. M. Dirac, *General Theory of Relativity. Princeton Landmarks in Physics Series,* Princeton University Press, Princeton, New Jersey (1996).

[156] Ricci and T. Levi-Civita *Méthodes de calcul différential absolu et leurs applications,* Matematische Annalen, B. 54 (1900), p. 162.

[157] H. Weyl, *How far can one get with a linear field theory of gravitation in flat space-time?* Amer. J. Math. **66**, 591 (1944) (www.geocities.com/theometria/weyl-1.pdf).

[158] S. J. Crothers, www.geocities.com/theometria/challenge.html.

[159] S. J. Crothers, www.geocities.com/theometria/Ricci.html.

General Bibliography

Historical References

Preliminary and Partial list of papers - Sept. 05

[1] R. M. Santilli, "Why space is rigid," in Italian, Il Pungolo Verde, Campobasso, Italy (1956).

[2] R. M. Santilli, Nuovo Cimento **51**, 570 (1967).

[3] R. M. Santilli, Suppl. Nuovo Cimento **6**, 1225 (l968).

[4] S. L. Adler, Phys.Rev. **17**, 3212 (1978).

[5] R. M. Santilli, Phys. Rev. D **20**, 555 (1979).

[6] C. N. Ktorides, H. C. Myung and R. M. Santilli, Phys. Rev. D **22**, 892 (1980).

[7] R. M. Santilli, Found. Phys. **11**, 383 (l981).

[8] R. M. Santilli, Novo Cimento Lett. **37**, 545 (1983).

[9] J. Fronteau, R. Mignani, H. C. Myung and R. M. Santilli, Editors, *Proceedings of the First Workshop on Hadronic Mechanics,* Hadronic J. Vol. 6, issue no. 6, pp. 1400–1989 (l983).

[10] D. L. Schuch, K.-M. Chung and H. Hartmann, J. Math. Phys. **24**, 1652 (1983).

[11] R. Mignani, Lett. Nuovo Cimento **39**, 413 (1984).

[12] M. Nishioka, Nuovo Cimento A **82**, 351 (1984).

[13] A. Jannussis and R. Mignani, Physica A **152**, 469 (1988).

[14] A. Jannussis et al., Phys. Lett. A **132**, 324 (1988).

[15] A. Jannussis et al, Nuovo Cimento B**103**, 17 and 537 (1989).

[16] A. Jannussis et al., Nuovo Cimento B**104**, 33 and 53 (1989).

[17] D. Schuch 23, Phys. Rev. A **23**, 59, (1989).

[18] D. L. Rapoport, contributed paper in the*Proceedings of the Fifth International Workshop on Hadronic Mechanics,* H.C. Myung, Editor, Nova Science Publisher (1990).

[19] D. L. Rapoport, contributed paper in the*Proceedings of the Fifth International Workshop on Hadronic Mechanics,* H.C. Myung, Editor, Nova Science Publisher (1990).

[20] A. O. Animalu and R. M. Santilli, contributed paper in *Hadronic Mechanics and Nonpotential Interactions* M. Mijatovic, Editor, Nova Science, New York, pp. 19–26 (l990).

[21] A. Jannussis, M. Miatovic and B. Veljanosky, Physics Essays **4**, (1991).

[22] A. Jannussis, D. Brodimas and R. Mignani, J. Phys. A: Math. Gen. **24**, L775 (1991).

[23] R. Mignani, Physics Essays **5**, 531 (1992).

[24] F. Cardone, R. Mignani and R. M. Santilli, J. Phys. G: Nucl. Part. Phys. **18**, L61 (1992).

[25] F. Cardone, R. Mignani and R. M. Santilli, J. Phys. G: Nucl. Part. Phys. **18**, L141 (1992).

[26] A. Jannussis and R. Mignani, Physica A **187**, 575 (1992).

[27] A. Jannussis, R. Mignani and D. Skaltsas, Physics A **187**, 575 (1992).

[28] C. Borghi, C. Giori and A. Dall'Oilio Russian J. Nucl. Phys. **56**, 147 (1993).

[29] R. M. Santilli, Comm. Theor. Phys. **3**, 153 (1993).

[30] R. M. Santilli, J.Moscow Phys.Soc. **3**, 255 (1993).

[31] R. M. Santilli, JINR Rapid. Comm. **6**, 24 (1993).

[32] C. Borghi, C. Giori and A. Dall'Oilio Russian J. Nucl. Phys. **56**, 147 (1993).

[33] A. Jannussis and D. Skaltsas, *Ann. Fond. L. de Broglie* **18**,137 (1993).

[34] A. Jannussis, R. Mignani and R. M. Santilli, *Ann. Fond. L. de Broglie* **18**, 371 (1993).

[35] A. Jannussis et al., Nuovo Cimento B **108** 57 (l993).

[36] A. K. Aringazin and K. M. Aringazin, Invited paper, in the *Proceedings of the Intern. Conference 'Frontiers of Fundamental Physics',* Plenum Press, (1993).

[37] A. K. Aringazin, K. M. Aringazin, S. Baskoutas, G. Brodimas, A. Jannussis, and K. Vlachos, contribuuted paper in the *Proceedings of the Intern. Conference 'Frontiers of Fundamental Physics',* Plenum Press, (1993).

[38] T. L. Gill and J. Lindesay, Int. J. Theor. Phys **32**, 2087 (1993).

[39] J. V. Kadeisvili, Editor, *The Mathematical Legacy of Hanno Rund*, Hadronic Press (1994).

[40] J. Lôhmus, E. Paal and L. Sorgsepp, *Nonassociative Algebras in Physics*, Hadronic Press, Palm Harbor, FL, USA (1994).

[41] J. V. Kadeisvili, contributed paper in the *Proceedings of the International Workshop on Symmetry Methods in Physics,* G. Pogosyan et al., Editors, JINR, Dubna, Russia (1994).

[42] R. M. Santilli, contributed paper to *Frontiers of Fundamental Physics,* M. Barone and F. Selleri, Editors Plenum, New York, pp 41–58 (1994).

[43] D. F. Lopez, in *Symmetry Methods in Physics*, A. N. Sissakian, G. S. Pogosyan and X. I. Vinitsky, Editors, JINR, Dubna, Russia (1994).

[44] H. E. Wilhelm, contributed paper in *Space, Time and Motion: Theory and Experiments*, H. E. Wilhelm and K. Liu, Editors, Chinese J. Syst Eng. Electr., **6**, 4 (1995).

[45] R. M. Santilli, Comm. Theor. Phys. **4**, 123 (1995).

[46] A. O. E. Animalu and R. M. Santilli, Intern. J. Quantum Chem. **26**, 175 (1995).

[47] F. Cardone and R. Mignani, JETP **88**, 435 (1995).

[48] D. Schuch, contributed paper in *New Frontiers in Theoretical Physics,* Vol. I, p. 113, T. Gill, Editor, Hadronic Press, Palm Harbor (1996); D. L. Schuch, Hadronic J. **19**, 505 (1996).

[49] R. M. Santilli and T. Vougiouklis, contributed paper in *New Frontiers in Hyperstructures,* T. Vougiouklis, Editor, Hadronic Press, p. 1 (1996).

[50] R. M. Santilli, Chinese J. Syst. Ing. & Electr. **6**, 177 (1996).

[51] R. M. Santilli, Rendiconti Circolo Matematico di Palermo, Supplemento **42**, 7 (1996).

[52] R. M. Santilli, Communication of the JINR, Dubna, Russia, No. E2-96-259 (1996).

[53] R. M. Santilli, Contributed paper in *New Frontiers of Hadronic Mechanics,* T. L. Gill, ed., Hadronic Press (1996).

[54] J. V. Kadeisvili, Math. Methods in Appl. Sci. **19** 1349 (1996).

[55] J. Ellis, N. E. Mavromatos and D. V. Nanopoulos in *Proceedings of the Erice Summer School, 31st Course: From Superstrings to the Origin of Space-Time*, World Sientific (1996).

[56] R. M. Santilli, Found. Phys. Letters **10**, 307 (1997).

[57] R. M. Santilli, Hyperfine Interactions, **109**, 63 (1997).

[58] R. M. Santilli, Found. Phys. **27**, 635 (1997).

[59] R. M. Santilli, Found. Phys. **27**, 1159 (1997).

[60] R. M. Santilli, Hyperfine Interactions, **109**, 63 (1997).

[61] R. M. Santilli, Contributed paper in the *Proceedings of the International Symposium on Large Scale Collective Motion of Atomic Nuclei,* G. Giardina, G. Fazio and M. Lattuada, Editors, World Scientific, Singapore, p. 549 (1997).

[62] T. L. Gill, W. W. Zachary and J. Lindesay, Foundations of Physics Letters **10**, 547 (1997).

[63] C. A. Chatzidimitriou-Dreismann, T. Abdul-Redah, R. M. F. Streffer, J. Mayers, Phys. Rev. Lett. **79**, 2839 (1997).

[64] R. M. Santilli, Intern. J. Modern Phys. D **7**, 351 (1998).

[65] R. M. Santilli, Intern. J. of Phys. **4**, 1 (1998).

[66] R. M. Santilli, Modern Phys. Letters **13**, 327 (1998).

[67] R. M. Santilli, Acta Appl. Math. **50**, 177 (1998).

[68] R. M. Santilli, Contributed paper to the *Proceedings of the International Workshop on Modern Modified Theories of Gravitation and Cosmology,* E. I. Guendelman, Editor, Hadronic Press, p. 113 (1998).

[69] R. M. Santilli, *The Physics of New Clean Energies and Fuels According to Hadronic Mechanics,* Special Issue of the Journal of New Energy, Vol. 4, Special Issue, 318 pages (1998).

[70] Yu. Arestov, V. Solovianov and R. M. Santilli, Found. Phys. Letters **11**, 483 (1998).

[71] T. L. Gill, W. W. Zachary and J. Lindesay, Int. J. Theor. Phys. **37**, 22637 (1998).

[72] J. Dunning-Davies, Foundations of Physics Letters, **12**, 593 (1999).

[73] R. M. Santilli, Intern. J. Modern Phys. A **14**, 2205 (1999).

[74] R. M. Santilli, Intern. J. Modern Phys. A **14**, 3157 (1999).

[75] R. M. Santilli and D. D. Shillady, Intern. J. Hydrogen Energy **24**, 943 (1999).

[76] R. M. Santilli, Contributed paper to the *Proceedings of the VIII M. Grossmann Meeting on General Relativity,* Jerusalem, June 1998, World Scientific, p. 473 (1999).

[77] R. M. Santilli and D. D. Shillady, Intern. J. Hydrogen Energy **25**, 173 (2000).

[78] V. V. Dvoeglazov, Editor *Photon: Old Problems in Light of New Ideas,* Nova Science (2000).

[79] R. M. Santilli, Contributed paper in *Photons: Old Problems in Light of New Ideas,* V. V. Dvoeglazov, Editor, Nova Science Publishers, pp. 421–442 (2000).

[80] T. L. Gill, W. W. Zachary and J. Lindesay, Foundations of Physics, **31**, 1299 (2001).

[81] C. A. Chatzidimitriou-Dreismann, T. Abdul-Redah, B. Kolaric J. Am. Chem. Soc. **123**, 11945 (2001).

[82] R. M. Santilli, Found. Phys. Letters **32**, 1111 (2002).

[83] E. Trell, "Tessellation of Diophantine Equation Block Universe," Contributed paper to *Physical Interpretations of Relativity Theory,* 6–9 September 2002, Imperial College, London, British Society for the Philosophy of Science, in print, (2002).

[84] C. A. Chatzidimitriou-Dreismann, T. Abdul-Redah, R. M. F. Streffer, J. Mayers, J. Chem. Phys. **116**, 1511 (2002).

[85] R. M. Falcon Ganfornina and J. Nunez Valdes, *Fondamentos de la Isoteoria de Lie-Santilli* (in Spanish), International Academic Press, America-Europe-Asia, (2001), also available in the pdf file http://www.i-b-r.org/docs/spanish.pdf.

[86] Chun-Xuan Jiang, *Foundations of Santilli's Isonumber Theory,* with Applications to New Cryptograms, Fermat's Theorem and Goldbach's Conjecture, International Academic Press, America-Europe-Asia (2002), also available in the pdf file http://www.i-b-r.org/docs/jiang.pdf.

[87] R. M. Santilli and A. K. Aringazin, "Structure and Combustion of Magnegases," e-print http://arxiv.org/abs/physics/0112066, to be published.

[88] To be completed

Papers Published in the *Hadronic Journal*

[89] R. M. Santilli, "On a possible Lie-admissible covering of the Galilei Relativity in Newtonian Mechanics for nonconservative and Galilei form-noninvariant system," Hadronic Journal **1**, 223–423 (1978).

[90] R. M. Santilli, "Need of subjecting to an experimental verification the validity within a hadron of Einstein's special relativity and Paul's exclusion principle," Hadronic Journal **1**, 574–901 (1978).

[91] R. M. Santilli, "Addendum to 'On a possible Lie-admissible covering of the Galilei Relativity in Newtonian Mechanics for nonconservative and Galilei form-noninvariant system'," Hadronic Journal **1**, 1279–1342 (1978).

[92] W. Sarlet and F. Cantrijn, "On some aspects of the Inverse Problem for general first order systems," Hadronic Journal **1**, 101–133 (1978).

[93] H. C. Myung, "Lie-admissible algebras," Hadronic Journal **1**, 169–193 (1978).

[94] C. I. George, F. Henin, F. Maynee, and I. Prigogine, "New quantum rules for dissipative systems," Hadronic Journal **1**, 520–573 (1978).

[95] G. P. Wene, "An example of a flexible, Jordan-admissible algebra of current use in hadron physics," Hadronic Journal **1**, 944–954 (1978).

[96] J. A. Kobussen, "Relation between Nambu mechanics and generalized Hamiltonian Mechanics," Hadronic Journal **1**, 975–966 (1978).

[97] C. N. Ktorades, "On a possible incompatibility of Lie local powers of a quantum field with the Wightman axioms and the spin-statistics theorem," Hadronic Journal **1**, 1012–1020 (1978).

[98] H. C. Myung, "On nonflexible Lie-admissible algebra," Hadronic Journal **1**, 1021–1140 (1978).

[99] D. Y. Kim, "Remarks on recently proposed tests of Einstein's Special relativity in hadron physics," Hadronic Journal **1**, 1343–1363 (1978).

[100] S. Okubo, "Octonians as traceless 3x3 matrices via a flexible Lie-admissible algebra," Hadronic Journal **1**, 1432–1465 (1978).

[101] W. Sarlet and F. Cantrijn, "Canonical transformations and the Hamiltonian-Jacobi problem for general first-order systems derivable from a variational principle," Hadronic Journal **1**, 1497–1521 (1978).

[102] K. Yasue, “Nonconservative quantum mechanics as the nonrelativistic limit of quark dynamics,” Hadronic Journal **1**, 1546–1580 (1978).

[103] S. Okubo, “Octonion, pseudo-alternative, and Lie-admissible algebras, ”Hadronic Journal **2**, 39–66 (1979).

[104] W. Sarlet, “On the structure and classification of matrices characterizing jointly Lie-admissible brackets and symplectic-admissible two-forms,” Hadronic Journal **2**, 91–134 (1979).

[105] L. Y. Bahar and H. G. Kwatny, “Exact Lagrangians for linear nonconservative systems,” Hadronic Journal **2**, 238–260 (1979).

[106] J. A. Kobussen, “Generalized Hamiltonian dynamics for fields,” Hadronic Journal **2**, 321–359 (1979).

[107] H. C. Myung, “Flexible Lie-admissible algebras with nil-basis,” Hadronic Journal **2**, 360–368 (1979).

[108] W. Sarlet, “On the transition between second-order and first-order systems within the context of the inverse problem of Newtonian Mechanics,” Hadronic Journal **2**, 407–432 (1979).

[109] Y. S. Kim and M. E. Noz, “Lorentz deformation of the Bethe-Salpeter wave function,” Hadronic Journal **2**, 460–480 (1979).

[110] F. Cantrijn, “On structure preserving transformations for Newtonian Lie-admissible equations,” Hadronic Journal **2**,481–503 (1979).

[111] S. Okubo and H. C. Myung, “On the classification of simple flexible Lie-admissible algebras,” Hadronic Journal **2**, 504–567 (1979).

[112] J. A. Kobussen, “Applications of generalized Hamiltonian dynamics,” Hadronic Journal **2**, 578–519 (1979).

[113] A. L. Vanderbauwhede, “Potential operators and variational principles: a generalization,” Hadronic Journal **2**, 620– 641 (1979).

[114] V. Mandadi and K. Huseyin, “Nonlinear instability behaviour of nongradient systems,” Hadronic Journal **2**, 657–681 (1979).

[115] J. P. Constantopoulos and C. N. Ktorides, “Symmetry schemes compatible with non-self-adjoint Lie-admissible forces,” Hadronic Journal **2**, 697–726 (1979).

[116] J. Fronteau, “Vers une description non conservative de l’évolution en physique,” Hadronic Journal **2**, 727–829 (1979).

[117] R. F. Alvarez-Estrada, “Inverse scattering solution of non-linear evolution equations on one space dimension: an introduction,” Hadronic Journal **2**, 858–916 (1979).

[118] H. Yilmaz, “Einstein, the exponential metric, and a proposed gravitatial Michelson-Morley experiment,” Hadronic Journal **2**, 997–1020 (1979).

[119] C. J. Eliezer, “The symmetries and first integrals of some differential equations of dynamics,” Hadronic Journal **2**, 1067–1109 (1979).

[120] H. Yilmaz, “Analysis of space-time in non-intertial frames with applications to gauge theories,” Hadronic Journal **2**, 1186–1251 (1979).

[121] M. L. Tomber, “A short history of nonassociative algebras,” Hadronic Journal **2**, 1252–1387 (1979).

[122] L. Sorgsepp and J. Lôhmus, “About nonassociativity in physics and Cayley-Graves octonians,” Hadronic Journal **2**, 1388–1459 (1979).

[123] R. M. Santilli, “Status of the mathematical and physical studies on the Lie-admissible formulations on July 1979 with particular reference to strong interactions,” Hadronic Journal **2**, 1460–2018 (1979).

[124] Errata corrige: R. M. Santilli, “Status of the mathematical and physical studies on the Lie-admissible formulations on July 1979 with particular reference to strong interactions,” Hadronic Journal **2**, 1460–2018 (1979). In Hadronic Journal **2**, 914 (1979).

[125] S. Okubo, “A generalization of Hurwitz theorem and flexible Lie-admissible algebras,” Hadronic Journal **3**, 1–52 (1980).

[126] M. Koiv and J. Lôhmus, “Generalized deformations of nonassociative algebras,” Hadronic Journal **3**, 53–78 (1980).

[127] J. A. Kobussen, ”Lie-admissible structure of classical field theory,” Hadronic Journal **3**, 79–129 (1980).

[128] J. Fronteau, A. Tellez-Arenas, and R. M. Santilli, “Lie-admissible structure of statistical mechanics,” Hadronic Journal **3**, 130–176 (1980).

[129] A. Tellez-Arenas and J. Fronteau, “Closed systems with nonconservative internal forces,” Hadronic Journal **3**, 177–195 (1980).

[130] H. C. Myung and R. M. Santilli, “Further studies on the recently proposed experimenal test of Pauli’s exclusion principle for the strong interactions, Hadronic Journal **1**, 196–255 (1980).

[131] Chun-Xuan Jiang, “A simple approach to the computation of the total number of hadronic constituents in Santilli’s model, “Hadronic Journal **3**, 256–292 (1980).

[132] R. H. Oehmke, “Some elementary structure theorems for a class of Lie-admissible algebras,“ Hadronic Journal **3**, 293–319 (1980).

[133] G. P. Wene, “A Generalization of bonded algebras,” Hadronic Journal **3**, 320–326 (1980).

[134] Y. Ilamed, “On realizations of infinite-dimensional Lie-admissible algebras,” Hadronic Journal **3**, 327–338 (1980).

[135] N. Salingaros, “Realization and classification of the universal Clifford algebras as associative Lie-admissible algebras,” Hadronic Journal **3**, 339–389 (1980).

[136] G. E. Prince, P. G. Leach, T. M. Kalotas, and C. J. Eliezer, “The Lie and Lie-admissible symmetries of dynamical systems,” Hadronic Journal **3**, 390–439 (1980).

[137] R. M. Santilli, "Initiation of the representation theory of Lie-admissible algebras of operators on bimodular Hilbert spaces," Hadronic Journal **3**, 440–506 (1980).

[138] M. L. Tomber, D. M. Norris, M. Reynolds, C. Balzer, K. Trebilcott, T. Terry, H. Coryell, and J. Ordway, "A nonassociative algebra bibliography," Hadronic Journal **3**, 507–725 (19780).

[139] D. K. P. Ghikas, C. N. Ktorides, and L. Papaloukas, "Representation theory of Lie-admissible enveloping algebras on operator algebras: an extension of a theorem by Nelson," Hadronic Journal **3**, 726–742 (1980).

[140] W. Sarlet, "On linear nonconservative systems derivable from a variational principle," Hadronic Journal **3**, 765–793 (1980).

[141] R. M. Santilli, "Remarks on the problematic aspects of Heisenberg/Lie/symplectic formulations," Hadronic Journal **3**, 854–913 (1980).

[142] J. Salmon, "Irreversibility, velocity correlations, and non-Hamiltonian dynamics," Hadronic Journal **3**, 1080–1107 (1980).

[143] J. Fronteau and A. Tellez-Arenas, "Inverse Liouville problem," Hadronic Journal **3**, 1209–1241 (1980).

[144] M. Grmela, "Non-Hamiltonian dynamics of an Enskog quasiparticle," Hadronic Journal **1**, 1242–1263 (1980).

[145] J. P. Constantopoulos, "Lie-admissible deformation of self-adjoint systems," Hadronic Journal **3**, 1281–1312 (1980).

[146] R. Mignani, "On Jordan- and Lie-admissibility of generalized superalgebras," Hadronic Journal $\underset{\sim}{3}$, 1313–1319 (1980).

[147] A. J. Kálny, "On fundamental realizations of Lie-admissible algebras: flexibility, centers and nuclei," Hadronic Journal **3**, 1552–1564 (1980).

[148] Errata-corrige: A. J. Kálny, "On fundamental realizations of Lie-admissible algebras: flexibility, centers and nuclei," Hadronic Journal **3**, 1552–1564 (1980). " Hadronic Journal **1**, 211–210 (1983).

[149] T. L. Gill, "New perspctives in time-ordered operators and divergencies, I," Hadronic Journal **3**, 1575–1596 (1980).

[150] T. L. Gill, "New Perspectives in time-ordered operators and divergencies, II," Hadronic Journal **3**, 1597–1621 (1980).

[151] A. D. Jannussus, L. C. Papaloucas and P. D. Siafarikas, "Eigenfunctions and Eigenvalues of the q-differential operators," Hadronic Journal **3**, 1622–1632 (1980).

[152] M. L. Tomber, "Jacobson-Witt algebras and Lie-admissible algebras," Hadronic Journal **4**, 183–198 (1980).

[153] S. Okubo and H. C. Myung, "Commutatvity of adjoint operator algebras in simple Lie algebras," Hadronic Journal **4**, 199–215 (1980).

[154] S. Okubo, "Dimension and classification of general composition algebras," Hadronic Journal **4**, 216–273 (1980).

[155] G. M. Benkart, J. M. Osborn and D. J. Britten, "Flexible Lie-admissible algebras with the solvable radical of Abelian and Lie algebras with nondegenerate forms," Hadronic Journal **4**, 274–326 (1980).

[156] L. Sorgsepp and J. Lôhmus, "Binary and ternary sedenions," Hadronic Journal **4**, 327–353 (1980).

[157] S. Okubo, "Some classes of flexible Lie-Jordan-admissible algebras," Hadronic Journal **4**, 354–391 (1980).

[158] G. M. Benkart, J. M. Osborn, "Real division algebras and other algebras motivated by physics," Hadronic Journal **4**, 392–443 (1980).

[159] V. K. Agrawala, "Invariants of generalized Lie algebras," Hadronic Journal **4**, 444–496 (1981).

[160] D. J. Britten, "On application of isotopy to real division algebras," Hadronic Journal **1**, 497–607 (1981).

[161] Y. Ko, B. L. Kang and H. C. Myung, "On Lie-admissibility of vector matrix algebras," Hadronic Journal **4**, 530–549 (1981).

[162] R. H. Oehmk and J. F. Oehmke, "Lie-admissible algebras with specified automorphism groups," Hadronic Journal **4**, 550–579 (1981).

[163] G. P. Wene, "Towards a structure theory for Lie-admissible algebras," Hadronic Journal **4**, 580–607 (1981).

[164] S. Okubo, "Nonassociative quantum mechanics and strong correspondence principle," Hadronic Journal **4**, 608–633 (1981).

[165] G. Eder, "On the the mutation parameters of the generalized spin algebra for particles with spin 1/2," Hadronic Journal **4**, 634–641 (1981).

[166] R. M. Santilli, "Generalization of Heisenberg uncertainty principle for strong interactions," Hadronic Journal **4**, 642–657 (1981).

[167] D. P. K. Ghikas, "Symmetries and bi-representations in the C-algebraic framework: First thoughts," Hadronic Journal **4**, 658–672 (1981).

[168] E. Kapuscik, "On nonassociative algebras and quantum-mechanical observables," Hadronic Journal **4**, 673–696 (1981).

[169] J. A. Kabussen, "Transformation theory for first-order dynamical systems," Hadronic Journal **4**, 697–741 (1981).

[170] J. Fronteau, "Brief introduction to Lie-admissible formulations in statistical mechanics," Hadronic Journal **4**, 742–753 (1981).

[171] A. Tellez-Arenas, "Mean effect in nuclei," Hadronic Journal **4**, 754–769 (1981).

[172] R. M. Santilli, "A structure model of the elementary charge," Hadronic Journal **4**, 770–784 (1981).

[173] R. Mignani, "Subsector approach to hadron properties and the classification problem," Hadronic Journal **4**, 785–823 (1981).

[174] Y. Ilamed, "On the brackets of Nambu, on d-polynomials and on canonical lists of variables," Hadronic Journal **4**, 831–843 (1981).

[175] J. Sniatycki, "On particles with gauge degrees of freedom," Hadronic Journal **41**, 844–878 (1981).

[176] P. R. Chernoff, "Mathematical obstructions to quantization," Hadronic Journal **1**, 879–898 (1981).

[177] P. Broadbridge, "Problems in quantization of quadratic Hamiltonians," Hadronic Journal **4**, 899–948 (1981).

[178] N. Salingaros, "Clifford, Dirac, and Majorana algebras, and their matrix representation," Hadronic Journal **4**, 949–980 (1981).

[179] P. Truini, L. C. Biedenharn, and G. Cassinelli, "Imprimitivity theorem and quarternionic quantum mechanics," Hadronic Journal **4**, 981–994 (1981).

[180] E. Prugovecki, "Quantum spacetime operationally based on propagators for extended test particles," Hadronic Journal **4**, 1018–1104 (1981).

[181] G. Lochak, "A nonlinear generalization of the Floquet theorem and an adiabatical theorem for dynamical systems," Hadronic Journal **4**, 1105–1126 (1981).

[182] A. J. Kalnay, "On certain intriguing physical, mathematical and logical aspects concerning quantization," Hadronic Journal **4**, 1127–1165 (1981).

[183] R. M. Santilli, "Experimental, theoretical, and mathematical elements for a possible Lie-admissible generalization of the notion of particle under strong interactions," Hadronic Journal **4**, 1166–1257 (1981).

[184] R. J. Slobodrian, "Tests of time and iso-spin symmetries: violation of time reversal invarience," Hadronic Journal **4**,1258–1279 (1981).

[185] H. Rauch and A. Zeitlinger, "Demonstration of $SU(2)$-symmetries by neutron interferometry," Hadronic Journal **4**,1280–1294 (1981).

[186] L. Federici, G. Giordano, G. Matone, G. Pasquariello, P. G. Picozza, R. Caloi, L. Casana, M. P. de Pascale, M. Mattioli, E. Poldi, C. Schaerf, M. Vanni, P. Pelfer, D. Prosperi, S. Frullani, and B. Girolami, "The Ladon photon beam at Frascati," Hadronic Journal **4**, 1295–1305 (1981).

[187] D. Y. Kim and S. I. H. Naqui, "Search for light charged scaler bosons," Hadronic Journal **4**, 1306–1317 (1981).

[188] M. L. Tomber, C. L. Smith, D. M. Norris, and R. Welk, "Addenda to 'A nonassociative algebra bibliography'," Hadronic Journal **4**, 1318–1443 (1981).

[189] M. L. Tomber, C. L. Smith, D. M. Norris, and R. Welk, “A Subject index of works relating to nonassociative algebras,” Hadronic Journal **4**, 1444–1625 (1981).

[190] A. Vanderbauwhede, “The inverse problem of nonlinear dynamical systems: An alternative approach,” Hadronic Journal **4**, 1889–1915 (1981).

[191] T. L. Gill, “The Original Schrodinger Equation and a Lie-isoscopic generalization of relativistic quantum mechanics,” Hadronic Journal **4**, 1962–1995 (1981).

[192] G. Eder, “Physical Implications of a Lie-admissible spin algebra,” Hadronic Journal **4**, 2018–2032 (1981).

[193] H. C. Myung, “Flexible Malcev-admissible algebras,” Hadronic Journal **4**, 2033–2136 (1981).

[194] R. Mignani, “Violation of time-reversal invariance in nuclear interactions and non-potential forces,” Hadronic Journal **4**, 2185–2191 (1981).

[195] E. Kleinfeld, “A generalization of communitative and associative rings. II,” Hadronic Journal **5**, 1–6 (1982).

[196] S. Okubo, “The uniqueness of SU(5) and SO(10) grand unified theories. II,” Hadronic Journal **5**, 7–70 (1982).

[197] S. Hojman, “Construction of Genotopic transformations for first order systems of differential equations,” Hadronic Journal **5**, 174–184 (1982).

[198] M. Nishioka, “Geometric Quantization of curved phase space,” Hadronic Journal **5**, 207–213 (1982).

[199] A. Schober, “Non-Euclidean and non-Desarguesian geometries: Models for hadronic structure,” Hadronic Journal **5**, 214–243 (1982).

[200] R. M. Santilli, “Introduction to the Lie-admissible treatment of non-potential interactions in Newtonian, Statistical, and Particle Mechanics,” Hadronic Journal **5**, 264–359 (1982).

[201] M. L. Tomber, “The history and methods of Lie-admissible algebras,” Hadronic Journal **5**, 360–430 (1982).

[202] G. M. Benkart, “The construction of examples of Lie-admissible algebras,” Hadronic Journal **5**, 431–493 (1982).

[203] Y. Ilamed, “On realizations of infinite-dimensional Lie-admissible algebras II,” Hadronic Journal **5**, 494–500 (1982).

[204] J. A. Kobussen, “Generalizations of the canonical transformation theory,” Hadronic Journal **5**, 518–546 (1982).

[205] R. H. Oehmke, “On the geometry of Lie-admissible algebras,” Hadronic Journal **5**, 518–546 (1982).

[206] S. Guiasu, “On stochastic evolution in non-conservative Statistical Mechanics,” Hadronic Journal **5**, 547–576 (1982).

[207] J. Fronteau, "Liouville's theorem as a link between different viewpoints," Hadronic Journal **5**, 577–592 (1982).

[208] J. Salmon, "Le grandient du logarithme de la fonction de distribution et l'experiénce," Hadronic Journal **5**, 593–637 (1982).

[209] M. Grmela, "Field versus particle description in Statistical Mechanics," Hadronic Journal **5**, 638–658 (1982).

[210] B. M. Barbashov and V. V. Nesterenko, "Exactly solvable nonlinear equations in the theory of the minimal surfaces," Hadronic Journal **5**, 659–678 (1982).

[211] R. J. Slobodrian, "Tests of time symmetry: evidence of violation of time reversal invariance," Hadronic Journal **5**, 679–713 (1982).

[212] H. E. Conzett, "Concerning tests of time-reversal invariance via the polarization-analyzing power equality," Hadronic Journal **5**, 714–728 (1982).

[213] H. Rauch, "Test of quantum mechanics by neutron interferometer," Hadronic Journal **5**, 728–732 (1982).

[214] A. Tellez-Arenas, "Short-range interactions and irreversibility in Statistical Mechanics," Hadronic Journal **5**, 733–749 (1982).

[215] G. Eder, "Lie-admissible spin algebra for arbitrary spin and the interaction of neutrons with the electric field of atoms," Hadronic Journal **5**, 750–770 (1982).

[216] H. C. Myung, "The exponentiation of deformations of Lie-admissible algebras," Hadronic Journal **5**, 771–903 (1982).

[217] M. Osborn, "The Lie-admissible mutation $A(r, s)$ of an associative algebra A," Hadronic Journal **5**, 904–930 (1982).

[218] K. Husein, "Bifurcations, Instabilities and catastrophies associated with non-potential systems," Hadronic Journal **5**, 931–974 (1982).

[219] Ji Sun, "Non-potential interactions and the origin of masses of elementary particles," Hadronic Journal **5**, 975–1000 (1982).

[220] S. Twareque Ali, "Stochastic phase formulation and non-potential interactions," Hadronic Journal **5**, 1001–1022 (1982).

[221] R. Trostel, "Geometrical treatment of non-potential interactions: The Exterior variational calculus, dynamical systems, physical 1-forms and variational selfadjointness," Hadronic Journal **5**, 1023–1119 (1982).

[222] R. Mignani, "Nonpotential scattering theory and Lie-admissible algebras: time evolution operators and the S-matrix..." Hadronic Journal **5**, 1120–1139 (1982).

[223] A. Schober, "Non-Euclidean and non-Desarguesian geometries for non-selfadjoint systems," Hadronic Journal **5**, 1140–1183 (1982).

[224] C. Jung, "Some classical results in the theory of univalent functions," Hadronic Journal **5**, 1184–1193 (1982).

[225] R. M. Santilli, "Foundations of the hadronic generalization of the atomic mechanics I: generalization of Heisenberg's and Schrodinger's representations," Hadronic Journal **5**, 1194–1276 (1982).

[226] H. C. Myung and R. M. Santilli, "Foundations of the hadronic generalization of the atomic mechanics II: modular-isotopic Hilbert space formulation of the exterior strong problem," Hadronic Journal **5**,1277–1366 (1982).

[227] H. C. Myung and R. M. Santilli, "Foundations of the hadronic generalization of the atomic mechanics III: bimodular-genotopic Hilbert space formulation of the interior strong problem," Hadronic Journal **5**,1367–1403 (1982).

[228] E. Tonti, "A general solution of the inverse problem of the calculus of variations," Hadronic Journal **5**, 1404–1450 (1982).

[229] J. A. Kobussen, "On symmetries and first integrals," Hadronic Journal **5**, 1451–1478 (1982).

[230] R. W. Hasse and K. Albrecht, "On the foundation of damped nonlinear Schrodinger equations," Hadronic Journal **5**, 1479–1488 (1982).

[231] J. G. Gilson, "The complex Schrodinger configuration plane and its relation to a 'classical' and real two dimensional representation for one dimensional quantum theory," Hadronic Journal **5**, 1489–1516 (1982).

[232] Chuan-Xuan Jiang, "A unified theory of particle decay modes in electonic model," Hadronic Journal **5**, 1517–1528 (1982).

[233] R. Trostel, "Gauge degrees of freedom of the Lie-admissible formulation of dynamical systems," Hadronic Journal **5**, 1529–1545 (1982).

[234] A. A. Sagle, "Reductive Lie-admissible algebras applied to H-spaces and connections," Hadronic Journal **5**, 1546–1563 (1982).

[235] S. Okubo, "Classification of flexible composition algebras, I," Hadronic Journal **5**, 1564–1612 (1982).

[236] S. Okubo, "Classification of flexible composition algebras, II," Hadronic Journal **5**, 1613–1626 (1982).

[237] S. Guiasu and J. Fronteau, "An Interpretation of fine' entropy from non-conservative Statistical Mechanics," Hadronic Journal **5**, 1627–1631 (1982).

[238] V. K. Agrawala, "Commutativity of products for adjoint operators," Hadronic Journal **5**, 1632–1657(1982).

[239] S. Okubo and H. C. Myung, "Note on commutativity of adjoint operator algebras," Hadronic Journal **5**, 1658–1666 (1982).

[240] S. Okubo, "Schrodinger equation for non-associative quantum Mechanics and no-go theorem," Hadronic Journal **5**, 1667–1700 (1982).

[241] G. P. Wene, "Subspace decompositions invariant under ade for Lie-admissible algebras," Hadronic Journal **5**, 1701–1716 (1982).

[242] J. A. Brooke, W. Guz, and E. Prugovecki, "The reciprocity principle in Stochastic Quantum Mechanics," Hadronic Journal **5**, 1717–1733 (1982).

[243] Y. Ilamed, "On extensions of Heisenberg's equations," Hadronic Journal **5**, 1734–1737 (1982).

[244] W. H. Steeb, "Classical Mechanics and constants of motion," Hadronic Journal **5**, 1738–1747 (1982).

[245] C. P. Bruter, "Interaction between conservative and gradient-like systems," Hadronic Journal **5**, 1748–1753 (1982).

[246] Ji Sun, "Non-potential interaction and inseparable constituents of hadrons," Hadronic Journal **5**, 1754–1763 (1982).

[247] A. O. E. Animalu, "Quark approach to Santilli's conjecture on hadronic structure on potential interaction and inseparable constituents of hadrons," Hadronic Journal **5**, 1764–1773 (1982).

[248] M. Mijatovic, "The second virial coefficient of one dimensional gas," Hadronic Journal **5**, 1774–1780 (1982).

[249] M. Sachs, "On the incompatibility of the quantum and relativity theories and a possible resolution," Hadronic Journal **5**, 1781–1801 (1982).

[250] T. B. Man, "On the construction of the programmed motion," Hadronic Journal **5**, 1802–1811 (1982).

[251] M. Banai, "A new approach to Quantum Field Theory and a spacetime quantization," Hadronic Journal **5**, 1812–1841 (1982).

[252] P. Broadbridge, "Quantization, non-locality and Lie-admissible formulations," Hadronic Journal **5**, 1842–1858 (1982).

[253] G. M. Benkart and J. M. Osborn, "Power-associative products on matrices," Hadronic Journal **5**, 1859–1892 (1982).

[254] R. Trostel, "The Lie-admissible formulation of differential systems of even order," Hadronic Journal **5**, 1893–1900 (1982).

[255] R. Broucke, "On the principle of least action; some possible generalizations of the Lie-admissible formulation of differential systems of even order," Hadronic Journal **5**, 1901–1922 (1982).

[256] A. Jannussis, G. Brodimas, D. Sourlas, A. Streclas, P. Siafaricas, L. Papaloucas, and N. Tsangas, "Foundations of the Lie-admissible Fock space of the Hadronic Mechanics ," Hadronic Journal **5**, 1923–1947 (1982).

[257] A. J. Kalnay, "Lie-admissible structure of a quantized Nambu's generalized Hamiltonian dynamics," Hadronic Journal **6**, 1–30 (1983).

[258] W. H. Steeb, "Embedding of nonlinear finite dimensional systems in linear infinite dimensional systems and bose operators," Hadronic Journal **6**, 68–76 (1983).

[259] V. V. Dodonov, V. I. Man'ko, and Skarzhinsky, "Inverse variational problems and ambiguities of quantization for a particle in a magnetic field," Hadronic Journal **6**, 159–179 (1983).

[260] M. Razavy, "Classical and quantum mechanical Hamiltonians for velocity-dependent forces," Hadronic Journal **6**, 406–439 (1983).

[261] A. D. Jannussis, G. Brodimas, V. Papatheou, and H. Ioannidou, "Time-non-canonical mechanics," Hadronic Journal **6**, 623–649 (1983).

[262] R. Trostel, "A class of integrating operators for some isotopic degrees of freedom of non-linear evolution equations," Hadronic Journal **6**, 650–698 (1983).

[263] F. Gónzalez-Gascón and F. Gónzalez-López, "The inverse problem concerning the Poincaré symmetry for second order differential equations," Hadronic Journal **6**, 841–852 (1983).

[264] M. Gasperini, "Elements for a Lie-isotopic gauge theory," Hadronic Journal **6**, 935–944 (1983).

[265] P. Caldirola, "Dissipation in quantum theory (40 years of research)," Hadronic Journal **6**, 1400–1433 (1983).

[266] A. Jannussis, G. Brodimas, V. Papatheou, G. Karayannis, P. Panagopoulos, and H. Ioannidou, "Lie-admissible unification of dissipative Schrodinger's equations," Hadronic Journal **6**, 1434–1461 (1983).

[267] M. Gasperini, "Lie-isotopic lifting of gauge theorie," Hadronic Journal **6**, 1462–1479 (1983).

[268] M. Nishioka, "Remarks on the coefficients of antisymmetric connection induced by the Lie-isotopic lifting of gauge theory," Hadronic Journal **6**, 1480–1508 (1983).

[269] H. H. E. Leipholz, "On fundamental integrals for certain mechanical problems having non-selfadjoint differential equations" Hadronic Journal **6**, 1488–1508 (1983).

[270] J. Śniatycki, "On gauge invariance and confinement," Hadronic Journal **6**, 1509–1517 (1983).

[271] R. Trostel, "Generalized Grassmannian analysis, vector-valued differential forms on Banach spaces and generalized variational self-adjointness," Hadronic Journal **6**, 1518–1578 (1983).

[272] Z. Oziewicz and W. Gruhn, "On Jacobi's theorem," Hadronic Journal **6**, 1579–1605 (1983).

[273] M. Mijatović and B. Veljanovski, "Inverse Lie and Lie-admissible approaches to systems with velocity-dependent forces," Hadronic Journal **6**, 1606–1618 (1983).

[274] R. Roy, "Experiments on time-asymmetry: The $^{9}\mathrm{Be}(^{3}\mathrm{He}, \mathrm{p})^{11}\mathrm{B}$ reaction revisited," Hadronic Journal **6**, 1619–1640 (1983).

[275] A. Jannussis, G. Brodimas, and H. Ioannidou, "Time non-canonical character of hadronic mechanics, " Hadronic Journal **6**, 1641–1652 (1983).

[276] A. Jannussis, G. Brodimas, D. Sourlas, K. Vlachos, P. Siafarikas, and L. Papaloucas, "Some properties of q-analysis and applications to non-canonical mechanics " Hadronic Journal **6**, 1653–1686 (1983).

[277] W. H. Steeb, "Constants of motion in relativistic and non-relativistic classical mechanics," Hadronic Journal **6**, 1687–1692 (1983).

[278] R. Ramirez, "Dynamics of non-holonomic systems of motion in relativistic and non-relativistic classical mechanics," Hadronic Journal **6**, 1693–1704 (1983).

[279] A. Orlov and R. Ramirez, "On the construction of the potential function from a preassigned family of particular integrals," Hadronic Journal **6**, 1705–1710 (1983).

[280] U. Bleyer and V. D. Skarzhinsky, "The inverse variational problem applied to Treder's tetras theory," Hadronic Journal **6**, 1711–1721 (1983).

[281] M. Nishioka, "Gradient Weyl's gauge field and meron solution," Hadronic Journal **1**, 1722–1732 (1983).

[282] I. A. Pedrosa and B. Baseia, "Dissipative systems and Bateman's Hamiltonian," Hadronic Journal **6**, 1733–1741 (1983).

[283] J. A. de Wet, "Nuclei as bound states of protons and electrons," Hadronic Journal **6**, 1742–1770 (1983).

[284] E. Recami, "Confinement from general relativity," Hadronic Journal **6**, 1771–1772 (1983).

[285] E. Recami and W. A. Rodriguez, Jr., "Some applications of non-Hermitian operators in quantum mechanics and quantum field theory," Hadronic Journal **6**, 1773–1789 (1983).

[286] Errata Corrige: E. Recami and W. A. Rodriguez, Jr. and P. SMRZ, "Some applications of non-Hermitian operators in quantum mechanics and quantum field theory," Hadronic Journal **6**, 1773–1789 (1983). Hadronic Journal **7**, 648 (1984).

[287] A. J. Kálnay, "Why Nambu mechanics?" Hadronic Journal **6**, 1790–1797 (1983).

[288] A. J. Kálnay and R. M. Santilli, "Heuristic approach to symmetries and conserved quantities of classical and quantum versions of Nambu's generalized mechanics," Hadronic Journal**6**, 1798–1840 (1983).

[289] Ji Sun, "Masses of stable baryons," Hadronic Journal **6**, 1841–1865 (1983).

[290] H. H. Denman, "Time-translation invariance in damped wave equation," Hadronic Journal **6**, 1866–1872 (1983).

[291] R. Mignani, H. C. Myung and R. M. Santilli, "Foundations of hadronic mechanics via an isotopic lifting of Dirac's formulation of quantum mechanics," Hadronic Journal **6**, 1873–1950 (1983).

[292] M. Gasperini, "From Lie-admissible algebra to nonsymmetric gravity," Hadronic Journal **7**, 234–239 (1984).

[293] H. Yilmaz, "Problematic aspects of general relativity for planetary orbits," Hadronic Journal **7**, 1–61 (1984).

[294] R. H. Oehmke, "The geometry of Lie-admissible algebras II," Hadronic Journal **7**, 62–75 (1984).

[295] H. C. Myung, "A generalization of Hermetian and unitary operators in a Hilbert space geometry of Lie-admissible algebras II," Hadronic Journal **7**, 76–87 (1984).

[296] W. A. Rodrigues, Jr., "Is Lorentz invariance an exact symmetry of nature?" Hadronic Journal **7**, 436–455 (1984).

[297] W. A. Rodrigues, Jr., "Is Lorentz invariance an exact symmetry of nature?" Hadronic Journal **7**, 436–455 (1984).

[298] M. Gasperini, "On the geometrical structure of a Lie-isotopic gravity," Hadronic Journal **7**, 650–658 (1984).

[299] A. Tellez-Arenas, "A kinetic equation for short range interactions," Hadronic Journal **7**, 659–676 (1984).

[300] A. Jannussis, P. Filippakis, and T. Filippakis, "Quantum theory in phase space and applications to dissipative systems," Hadronic Journal **7**, 677–707 (1984).

[301] J. Fronteau and P. Combis, "A Lie-admissible integration of Focker-Planck equations with non-linear coefficients (exact and numerical solution)," Hadronic Journal **7**, 911–930 (1984).

[302] H. C. Myung, "An isotensor product of isohilbert spaces," Hadronic Journal **7**, 931–947 (1984).

[303] A. Jannus and D. Vavougios, "Some aspects of perturbation theory in hadronic mechanics and the hadronic anharmonic oscillator," Hadronic Journal **7**, 947–971 (1984).

[304] M. Gasperini, "Gravitation and Lie-admissible algebra," Hadronic Journal **7**, 971–1018 (1984).

[305] R. Trostel, "Color-admissible algebra," Hadronic Journal **7**, 1019–1057 (1984).

[306] G. Yu. Bogoslovsky, "On the gauge invariance of the observables in the general relativistic theory of the locally anisotropic space-time," Hadronic Journal **7**, 1078–1117 (1984).

[307] Yi-Fang Changu, "High energy behaviour of particles and unified systems," Hadronic Journal **7**, 1118–1133 (1984).

[308] R. O. R. Inostroza, "Dynamics of non holonomics systems," Hadronic Journal **7**, 1134–1157 (1984).

[309] M. Nishioka, "Yukawa's nonlocal field theory from a viewpoint of the Lie-admissible approach," Hadronic Journal **7**, 1158–1163 (1984).

[310] H. Yilmaz, "Gravitation: field theory par excellence Newton, Einstein, and beyond," Hadronic Journal **7**, 1164–1206 (1984).

[311] M. Mijatovic, B. Veljanoski, and D. Hajdukovic, "Gravitation: field theory par excellence Newton, Einstein, and beyond," Hadronic Journal **7**, 1207–1223 (1984).

[312] T. L. Gill, "A stochastic Lie-isotopic approach to the foundation of classical electrodynamics," Hadronic Journal **7**, 1224–1256 (1984).

[313] A. A. Sagle, "Nonassociative algebras and invariant mechanical systems, I," Hadronic Journal **7**, 1259–1302 (1984).

[314] Ji Sun, "On the origin of isotopic and strangeness," Hadronic Journal **7**, 1303–1320 (1984).

[315] A. Italiano, M. Lattauada, G. D. Maccarrone, E. Recami, F. Riggi, and D. Vinciguerra, "On the origin of isotopic and strangeness," Hadronic Journal **7**, 1321–1330 (1984).

[316] R. H. Oehmke, "On idempotent decompositions," Hadronic Journal **7**, 1331–1341 (1984).

[317] G. Karayannis, A. Jannussis, and L. Papaloucas, "New gauge transformations for quantum dissipative systems and the Lie-isotopic theory," Hadronic Journal **7**, 1342–1360 (1984).

[318] G. Yu. Bogoslovsky, "A generalization of Einstein's relativity theory for the anisotropic space-time," Hadronic Journal **7**, 1361–1408 (1984).

[319] R. Trostel, "Color-analysis and generalized Fock space," Hadronic Journal **7**, 1409–1449 (1984).

[320] B. A. Kupershmidt, "Cylindrical reduction of continuous dynamical systems," Hadronic Journal **7**, 1450–1468 (1984).

[321] Yi-Fang Chang, "Some possible tests of the inapplicability of Pauli's exclusion principle," Hadronic Journal **7**, 1469–1473 (1984).

[322] A. O. E. Animalu, "Possible identification of quarks with leptons in Lie-isotopic $SU(3)$ theory," Hadronic Journal **7**, 1474–1505 (1984).

[323] M. Nishioka, "Note on the Lie-admissible lifting of the commutation relations and the introduction of a fundamental length," Hadronic Journal **7**, 1506–1514 (1984).

[324] A. Jannussis, P. Filippakis, T. Filippakis, V. Papatheou, and A. Leodaris, P. Siafarikas, V. Zisis, N. Tsangasas, "Damped and coupled oscillators," Hadronic Journal **7**, 1515–1534 (1984).

[325] F. Cardone, "Numerical algebra and quark model," Hadronic Journal **7**, 1535–1545 (1984).

[326] F. González-Gascón and A. González-López, "Some physical results underlying a geometric theorem of Palais," Hadronic Journal **7**, 1546–1583 (1984).

[327] G. Dattoli, R. Mignani, and A. Torre, "An introductory view about Raman-Nath-type equations," Hadronic Journal **7**, 1584–1621 (1984).

[328] J. A. de Wet, "Non-potential nuclear forces and mutation algebra," Hadronic Journal **7**, 1622–1635 (1984).

[329] M. Nishioka, "Some realizations of hadronic mechanics," Hadronic Journal **7**, 1636–1679 (1984).

[330] R. M. Santilli, "Use of hadronic mechanics for the possible regaining to the exact space-reflection symmetry in weak interactions," Hadronic Journal **7**, 1680–1685 (1984).

[331] S. Roy, "Lie isotopic lifting, stochastic space-time and the Helmholz-Lie space problems," Hadronic Journal **7**, 1686–1705 (1984).

[332] P. Bandyopadhyay, "Extended conformal group, geometrical origin of the internal symmetry of hadrons and grand unification of elementary particle interactions," Hadronic Journal **7**, 1706–1742 (1984).

[333] P. Bandyopadhyay and S. Roy, "Spin in large pT2 proton-proton scattering and the anisotropy of microlocal space-time," Hadronic Journal **7**, 1743–1749 (1984).

[334] R. M. Santilli, "Lie-isotopic liftings of Lie symmetries I. General Considerations," Hadronic Journal **8**, 25–35 (1985).

[335] R. M. Santilli, "Lie-isotopic liftings of Lie symmetries II. Liftings of rotations," Hadronic Journal **8**, 36–51(1985).

[336] M. Gasperini, "Lie-isotopic gravity with matter: An effective theory of gravity for testing local Lorentz symmetry," Hadronic Journal **8**, 52–59 (1985).

[337] G. P. Wene, "Comments on the geometry of Lie algebras and Lie-homotopic algebras," Hadronic Journal **8**, 63–74 (1985).

[338] E. Kapuscik, "Quantum mechanics with quantum time," Hadronic Journal **8**, 75–80 (1985).

[339] R. Mignani, "Towards a nonpotential scattering theory," Hadronic Journal **8**, 121–142 (1985).

[340] R. Trostel, "Color analysis and generalized Lie (super) groups," Hadronic Journal **8**, 159–162 (1985).

[341] Y. Mizobuchi, "New theory of space-time and gravitation — Yilmaz's approach," Hadronic Journal **8**, 193–220 (1985).

[342] Y. Mizobuchi, "Erratum : New theory of space-time and gravitation — Yilmaz's approach," Hadronic Journal **9**, 191 (1986).

[343] M. Muraskin, "Aesthetic fields without integrability," Hadronic Journal **8**, 279–286 (1985).

[344] M. Muraskin, "More aesthetic field theory," Hadronic Journal **8**, 287–293 (1985).

[345] L. Vazquez and F. Ferrini, "A generalization of the Planck distribution law for particles with mass," Hadronic Journal **8**, 321–326 (1985).

[346] M. Nishioka, "An application of the Lie-isotopic lifting of the canonical communication relations to gauge theory," Hadronic Journal **8**, 331–333 (1985).

[347] A. Italiano, "How to recover causality in general relativity," Hadronic Journal **9**, 9–12 (1986).

[348] U. Bruzzo, "Geometry of rigid supersymmetry," Hadronic Journal **9**, 25–30 (1986).

[349] H. Yilmaz, “Dynamics of curved spaces,” Hadronic Journal **9**, 55–60 (1986).

[350] A. O. E. Animalu, “Relativistic hadronic mechanics of extended deformable particles,” Hadronic Journal **9**, 61–76 (1986).

[351] M. Nishioka, “A generalization of the Einstein-Maxwell system,” Hadronic Journal **9**, 87–89 (1986).

[352] L. I. Gould, “Connection between nonlocal equations of motion and their balance laws,” Hadronic Journal **9**, 91–94 (1986).

[353] L. Chatterjee and S. Bhattacharyya, “Nonnull probability of quark tunneling: A quantum-mechanical probe,” Hadronic Journal **9**, 95–96 (1986).

[354] R. Mignani, “Multichannel nonpotential scattering theory,” Hadronic Journal **9**, 103–111 (1986).

[355] H. Aspden, “The theoretical nature of the neutron and the deuteron,” Hadronic Journal **9**, 129–136 (1986).

[356] A. G. Fellouris, “Graded Lie-admissibility of a 2×2 matrix algebra,” Hadronic Journal **9**, 159–164 (1986).

[357] G. L. Strobel, “Hyperspherical reduction of the single-time three-body Dirac equation,” Hadronic Journal **9**, 181–189 (1986).

[358] G. Arcidiacono, “The general projective relativity and the vector-tensor gravitational field,” Hadronic Journal **9**, 197–198 (1986).

[359] P. F. González-Diáz, “Lie-admissible structure of small-distance quantum cosmology,” Hadronic Journal **9**, 199–201 (1986).

[360] G. Karayannis and A. Jannnussis, “Lie-isotopic lifting of conventional Lagrangian densities for some field models,” Hadronic Journal **9**, 203–207 (1986).

[361] E. Kupczynski, “Scattering of extended hadrons and time-reversal invariance,” Hadronic Journal **9**, 215–218 (1986).

[362] A. Jannnussis and D. Vavougios, “The noncanonical harmonic and anharmonic oscillator in high-energy physics,” Hadronic Journal **9**, 223–231 (1986).

[363] H. Yilmaz, “Present status of gravity theories,” Hadronic Journal **9**, 233–238 (1986).

[364] E. Wall, “ On tachyons and hadrons,” Hadronic Journal **9**, 239–257 (1986).

[365] E. Wall, “Unresolved problems of the tachyonic models of the electron and the muon,” Hadronic Journal **9**, 263–271 (1986).

[366] H. Yilmaz, “New direction in gravity theory,” Hadronic Journal **9**, 281–290 (1986).

[367] A. Chaljub-Simon and J. Fronteau, “Quasi-differential systems associated to some equations of evolution,” Hadronic Journal **9**, 291–300 (1986).

[368] D. L. Rapoport Campodonico and M. Tilli, “Correlation, metrodes, and Feynman integrals,” Hadronic Journal **10**, 25–34 (1987).

[369] H. C. Myung and A. A. Sagle, “On Lie-admissible mutations of associative algebras,” Hadronic Journal **10**, 35–51 (1987).

[370] B. Veljanoski and A. Jannussi, “Quantum probabilities in open dissipative systems: A Lie-admissible formulation,” Hadronic Journal **10**, 53–57 (1987).

[371] C. I. Mocanu, “Hertzian alternative to the special theory of relativity. I. Qualitative analysis of Maxwell’s equations for motionless media,” Hadronic Journal **10**, 61–74 (1987).

[372] C. I. Mocanu, “Erratum: Hertzian alternative to the special theory of relativity. I,” Hadronic Journal **10**, 367 (1987).

[373] A. Jannussi and D. Vavougios, “New creation and annihilation operators as linear combinations of Bose and Fermi operators,” Hadronic Journal **10**, 75–78 (1987).

[374] M. L. Espindola, O. Espindola and N. L. Teizeira, “Field theory Hamiltonization as a twofold procedure,” Hadronic Journal **10**, 83–86 (1987).

[375] G. Arcidiacon, “The general projective relativity and the scalar-tensor gravitational field,” Hadronic Journal **10**, 87–89 (1987).

[376] D. Sourlas and B. Veljanoski, “Heisenberg’s equations of motion for the Caldirola-Montaldi Procedure: An oscillatory case,” Hadronic Journal **10**, 103–108 (1987).

[377] N. Salingaros, “An alternate description of the reversed-field toroidal plasma pinch and prediction of the critical parameter,” Hadronic Journal **10**, 109–116 (1987).

[378] C. Wolf, “The quasistability of super heavy atoms,” Hadronic Journal **10**, 141–143 (1987).

[379] P. Graneau Wolf, “Inertia, gravitation and radiation time delays,” Hadronic Journal **10**, 145–148 (1987).

[380] C. I. Mocanu, “Hertzian alternative to the special theory of relativity. II. Qualitative analysis of Maxwell-Herz and Einstein-Minkowski equations,” Hadronic Journal **10**, 153–166 (1987).

[381] M. Razavy, “Quantum mechanical formulation of dissipative systems and the minimal coupling rule,” Hadronic Journal **10**, 173–180 (1987).

[382] B. Veljanoski and A. Jannussis, “Damped harmonic oscillator with complex coefficient of friction,” Hadronic Journal **10**, 193–197 (1987).

[383] D. Sourlas and D. Vavougios, “Some remarks on the noncanonical harmonic oscillator,” Hadronic Journal **10**, 209–211 (1987).

[384] C. I. Mocanu, “Hertzian alternative to the special theory of relativity. III. Iterative system of equations and transformation formulae for electromagnetic quantities,” Hadronic Journal **10**, 231–247 (1987).

[385] M. Nishioka, “Isotopic lifting of a Riemannian space-time,” Hadronic Journal **10**, 253–254 (1987).

[386] M. Nishioka, “Note on the Lie-isotopic lifting of gauge theory,” Hadronic Journal **10**, 255–256 (1987).

[387] M. Nishioka, “A note on q-algebra treatment of Bose operators,” Hadronic Journal **10**, 291–293 (1987).

[388] M. Nishioka, “Remarks on Mignani’s nonpotential scattering theory,” Hadronic Journal **10**, 295–298 (1987).

[389] M. Nishioka, “Some connections between field theory and Mignani’s nonpotential scattering theory,” Hadronic Journal **10**, 309–313 (1987).

[390] A. O. E. Animalu, “Lie-admissible approach to extended relativity’. I. Nonlinear velocity, mass, and charge transformations.” Hadronic Journal **10**, 321–330 (1987).

[391] C. I. Mocanu, “Erratum: Hertzian alternative to the special theory of relativity. I,” Hadronic Journal **10**, 367 (1987).

[392] A. Jannussis and I. Tsohantjis, “Review of recent studies on the Lie-admissible approach to quantum gravity,” Hadronic Journal **11**, 1–8 (1988).

[393] C. I. Mocanu, “Hertzian alternative to the special theory of relativity. IV. Kinematic analysis of the iterative process,” Hadronic Journal **11**, 55–69 (1988).

[394] M. Nishioka, “A simple model of isonorms and of the Lie-admissible lifting of commutation relations,” Hadronic Journal **11**, 71–73 (1988).

[395] E.-B. Lin, “Hadronic quantization,” Hadronic Journal **11**, 81–83 (1988).

[396] M. Nishioka, “Remarks on the Lie-isotopic lifting of the continuity equations,” Hadronic Journal **11**, 97–99 (1988).

[397] C.-X. Jiang, “Nonlinear dynamics in Santilli’s electonic model of hadronic structure.” Hadronic Journal **11**, 125–142 (1988).

[398] M. Nishioka, “Noncanonical commutation relations and Jacobi’s identity.” Hadronic Journal **11**, 143–146 (1988).

[399] H. Aspden, “The theory of the proton constants,” Hadronic Journal **11**, 169–176 (1988).

[400] R. B. Driscoll, “Comments on the paper ‘Gravitational lift via the Coriolis force’ by Leon R. Dragone,” Hadronic Journal **11**, 177 (1988).

[401] H. Yilmaz, “On the new theory of gravitation,” Hadronic Journal **11**, 179–182 (1988).

[402] R. Ramirez, N. Sadovskaia and R. L. Avis, “On the Korteweg-de Vries equations,” Hadronic Journal **11**, 211–220 (1988).

[403] C. Wolf, “A new approach to the K0, K0 system using discrete quantum mechanics and explicit T violation,” Hadronic Journal **11**, 227–229 (1988).

[404] V. M. Savchin, “A possible generalization of the field-theoretical Hamilton’s equation,” Hadronic Journal **11**, 279–286 (1988).

[405] H. Aspden, "Instantanious electrodynamic potential with retarded energy transfer," Hadronic Journal **11**, 307–313 (1988).

[406] R. V. Konoplich, "The Casimir effect with nontrivial field configurations," Hadronic Journal **11**, 19–24 (1988).

[407] A. K. Aringazin, "Lie-isotopic Finslerian lifting of the Lorentz group and Blokhintsev-Redei-like behavior of the meson lifetimes and of the parameters of the K0, K0 system," Hadronic Journal **12**, 71–74 (1989).

[408] M. Kovalyov, "Strong interactions in hyperbolic geometry," Hadronic Journal **12**, 227–229 (1989).

[409] R. Mignani, "Nonpotential scattering for the density matrix and quantum gravity," Hadronic Journal **12**, 167–170 (1989).

[410] R. Ramirez and R. Martinexz, "Lyra spaces. Their application to mechanics," Hadronic Journal **12**, 223–236 (1989).

[411] C. Y. Lo, "The cylindrical condition and Einstein-Bergman theory," Hadronic Journal **12**, 275–277 (1989).

[412] C. Wolf, "Probing the possible composite structure of leptons through discrete-time effects," Hadronic Journal **13**, 22–29 (1990).

[413] V. S. Gurin and A. P. Trofimenko Wolf, "Higher-dimensional space-time and the causality problem connected with tachyons," Hadronic Journal **13**, 57–67 (1990).

[414] F. Cardone, "On the low energy spectrum of tritium beta decay," Hadronic Journal **13**, 125–132 (1990).

[415] A. K. Aringazin, "Pauli's principle in the exterior branch of hadronic mechanics," Hadronic Journal **13**, 165–181 (1990).

[416] M. Nishioka, "Note on supersymmetric quantum mechanics," Hadronic Journal **13**, 241–247 (1990).

[417] A. K. Aringazin, "Supersymmetric hadronic mechanical harmonic oscillator," Hadronic Journal **13**, 263–276 (1990).

[418] E. Trell, "Geometrical reproduction of (u, d, s) baryon, meson and lepton transformation symmetries, mass relations and channel supersymmetric hadronic mechanical harmonic oscillator," Hadronic Journal **13**, 277–297 (1990).

[419] V. N. Strel'tsov, "Anisotropic space-time," Hadronic Journal **13**, 299–316 (1990).

[420] W. A. Rodrigues, "The exponential of the generators of the Lorentz group and the solution of the Lorentz force equation," Hadronic Journal **13**, 317–323 (1990).

[421] D. P. Allen, "Aspden's early law of electrodynamics," Hadronic Journal **13**, 355–360 (1990).

[422] L. Chatterjee, "Moun sticking revisited," Hadronic Journal **13**, 361–373 (1990).

[423] A. Jannussis, D. Skaltsas and G. Brodimas, "Lie-admissible complex time and its applications to quantum gravity," Hadronic Journal **13**, 399–413 (1990).

[424] A. Jannussis, "Lie-admissible complex time model and relativity theorem," Hadronic Journal **13**, 425–434 (1990).

[425] A. Jannussis, E. Vhahos, D. Skaltsas, G. S. Kliros and V. Bartzis, "Coherent and squeezed states in the presence of magnetic field," Hadronic Journal **13**, 435–440 (1990).

[426] R. M. Santilli, "Apparent consistency of Rutherford's hypothesis of the neutron as a compressed hydrogen atom," Hadronic Journal **13**, 513–531 (1990).

[427] R. M. Santilli, "On a conceivable feasibility of the 'DEATH RAY'," Hadronic Journal **13**, 540–555 (1990).

[428] E. B. Manoukian, "Spacetime formulation of closed-time path of field theory for multi particle states," Hadronic Journal **14**, 1–7 (1991).

[429] A. Osman, M. Zaky and M. A. Allam, "Hyperspherical treatment of the three nucleon systems with soft core potentials," Hadronic Journal **14**, 49–77 (1991).

[430] A. Horzela, E. Kapuscí, and J. Kempczyński, "On the new notion of mass in classical mechanics," Hadronic Journal **14**, 79–84 (1991).

[431] G. Arcidiacono and E. Capelas de Oliviera, "The generalized Laplace equation in special projective relativity," Hadronic Journal **14**, 137–141 (1991).

[432] A. Jannussis, "Quantum group and Lie-admissible Q-algebra," Hadronic Journal **14**, 257–275 (1991).

[433] A. Jannussis, G. Brodimas, and S. Bascoutas, "Lie-admissible Q-algebra and the Pauli exclusion principle," Hadronic Journal **14**, 277–289 (1991).

[434] G. Arcidiacono and E. C. de Oliveira, "The generalized d'Alembert equation in special projective relativity," Hadronic Journal **14**, 353–359 (1991).

[435] A. Nakamura and K. Shiraishi, "Born-Infeld monopoles and instantons," Hadronic Journal **14**, 369–375 (1991).

[436] B. S. Neganov, "On the principle of relativity and its violation in the case of a spin procession of moving charged particles," Hadronic Journal **14**, 369–394 (1991).

[437] G. Kar and S. Roy, "Modification of the Lorentz metric within the hadronic structure and the randon zero-point field," Hadronic Journal **14**, 431–440 (1991).

[438] A. O. E. Animalu, "Application of hadronic mechanics to the theory of pairing in high Tc superconductors," Hadronic Journal **14**, 459–499 (1991).

[439] L. Fonseca and L. A. Amarante Ribeiro, "Noncanonical angular momentum operators," Hadronic Journal **14**, 517–529 (1991).

[440] A. K. Aringazin, "Lie-isotopic approach to a new hadronization model," Hadronic Journal **14**, 531–539 (1991).

[441] R. M. Santilli, "Nonlocal formulation of the Bose-Einstein correlation within the context of hadronic mechanics, Part 1," Hadronic Journal **15**, 1–50 (1992).

[442] E. Kapuścik and A. Horzela, "Classical mechanics of confined particles," Hadronic Journal **15**, 61–70 (1992).

[443] R. M. Santilli, "Nonlocal formulation of the Bose-Einstein correlation within the cotext of hadronic mechanics, Part II," Hadronic Journal **15**, 77–134 (1992).

[444] C. Wolf, "Space, mutated spin correlation induced by a non-local discrete time quantum theory," Hadronic Journal **15**, 149–161 (1992).

[445] H. Q. Placido, R. Bunchaftm, and A. E. Santana, "On the Quantization of generalized Hamiltonian dynamics," Hadronic Journal **15**, 225–238 (1992).

[446] A. Dall'olio, "Experimental evidence on the emission of neutrons from cold hydrogen plasma," Hadronic Journal **15**, 239–251 (1992).

[447] E. B. Manuokian, "Quantum field theory of reflection of light," Hadronic Journal **15**, 253–265 (1992).

[448] M. Molski, "Extended class of particles with unusual properties," Hadronic Journal **15**, 275–282 (1992).

[449] O. Espindola, "Hamiltonian compatability versus Hamiltonian equivalence," Hadronic Journal **15**, 283–302 (1992).

[450] V. S. Gurin and A. P. Trofimenko, "Extended relativity and possible existence of electromagnetic waves of different type," Hadronic Journal **15**, 333–341 (1992).

[451] A. A. Logunov, "The basic principles of the relativistic theory of gravitation," Hadronic Journal **15**, 407–429 (1992).

[452] D. F. Lopez, "Confirmation of Logunov's relativistic gravitation via Santilli's isoriemannian geometry," Hadronic Journal **15**, 431–450 (1992).

[453] F. Gonzáles Gascon, "Another method of finding first intergrals of three-dimensional dynamical systems by quadrature," Hadronic Journal **15**, 471–473 (1992).

[454] A. Abbas, "A new consistency constraint on the validity of grand unified theories," Hadronic Journal **15**, 475–480 (1992).

[455] E. P. Yukalova and V. I. Yukalov, "Statistical approach to deconfinement in pure gauge models," Hadronic Journal **16**, 1–36 (1993).

[456] E. B. Manoukian, "Model independent dynamical treatment of reflection of light," Hadronic Journal **16**, 81–88 (1993).

[457] R. M. Santilli, "A characterization of isofields and their isoduals," Hadronic Journal **16**, 169–186 (1993).

[458] K. Trencevski, "The Aharonov-Bohm effect and classical potentials," Hadronic Journal **16**, 187–194 (1993).

[459] A. K. Aringazin, "Some remarks on Lie-isotopic lifting of Minkowski metric," Hadronic Journal **16**, 195–206 (1993).

[460] M. Molski, "Ancient cosmological tachyons in the present day world," Hadronic Journal **16**, 207–215 (1993).

[461] E. P. Yukalova and V. I. Yukalov, "Statistical approach to deconfinement in pure gauge models," Hadronic Journal **16**, 1–36 (1993).

[462] D. F. Lopez, "Problematic aspects of q-deformations and their isotopic resolution," Hadronic Journal **16**, 429–458 (1993).

[463] V. R. Gavrilov, "Zeldovich matter in seven-dimensional generalized Friedman-Robertson-Walker model," Hadronic Journal **16**, 469–478 (1993).

[464] R. F. Wehrhahn and D. Vranceanu, "Q-deformation and annihilation tensors for the two parameters deformation of $U(su(2))$," Hadronic Journal **16**, 357–384 (1993).

[465] A. K. Aringazin, "Supersymmetry properties of Birkhoffian Mechanics," Hadronic Journal **16**, 385–409 (1993).

[466] A. O. E. Animalu, "Isominskowskian theory of Cooper pairs in superconductivity," Hadronic Journal **16**, 411–421 (1993).

[467] L. Ntibashirakandi and D. K. Callebaut, "Supersymmetric hadronic mechanics and procedures for isosupersymmetrization," Hadronic Journal **17**, 1–13 (1994).

[468] G. Lazzari and F. de Blasio, "Hadronic superfluidity in the inner crust of neutron stars from an effective force," Hadronic Journal **17**, 15–29 (1994).

[469] V. N. Strel'tsov, "Some problems of relativistic electrodynamics," Hadronic Journal **17**, 73–86 (1994).

[470] V. N. Strel'tsov, "The question is: are fast moving scales contracted or elongated" Hadronic Journal **17**, 105–114 (1994).

[471] A. Horzela, E. Kapuscik and J. Kempczynski, "On the Galilian covariance classical mechanics," Hadronic Journal **17**, 169–205 (1994).

[472] R. M. Santilli, "Antigravity," Hadronic Journal **17**, 257–2849 (1994).

[473] R. M. Santilli, "Space-time machine," Hadronic Journal **17**, 285–310 (1994).

[474] R. M. Santilli, "Hadronic energy," Hadronic Journal **17**, 311–348 (1994).

[475] A. O. E. "Isosuperconductivity: A nonlocal-nonhamiltonian theory of pairing in high -Tc superconducters," Hadronic Journal **17**, 349–427 (1994).

[476] A. K. Aringazin, K. M. Aringazin and V. Arkhip, "BRST symmetry in cohomological Hamiltonian mechanics," Hadronic Journal **17**, 429–439 (1994).

[477] T. L. Gill, W. W. Zachary, M. F. Mahmood, and J. Lindesay, "Proper time relativistic dynamics and a resolution of the no-interaction problem," Hadronic Journal **17**, 449–471 (1994).

[478] G. Arcidiacono, "The Fantappié group and cosmology," Hadronic Journal **17**, 473–482 (1994).

[479] E. B. Manoukian and C. C. Caramanlian, "Particle correlation and jet-like production from a Nambu string," Hadronic Journal **17**, 525–532 (1994).

[480] P. Helde and P. Kuusk, "A simple mathematical model for nonrelativistic space-time," Hadronic Journal **17**, 593–601 (1994).

[481] G. G. Likhachev and A. I. Studenikin, "Neutrino oscillations in magnetic fields of the sun, supernovae and neutron stars," Hadronic Journal **18**, 1–14 (1995).

[482] A. V. Sidorov and L. G. Zastavenko, "Perturbative theory of a gap for many-body Hamiltonians with pair interaction," Hadronic Journal **18**, 29–43 (1995).

[483] C. I. Mocanu, A. M. Morega and M. Morega, "On the difficulties of the Thomas-Wigner rotation," Hadronic Journal **18**, 63–96 (1995).

[484] R. B. Driscoll, "Externally induced beta decay of the deuteron and other nuclei," Hadronic Journal **18**, 195–208 (1995).

[485] M. Muraskin, "Techniques for nonintegrable systems," Hadronic Journal **18**, 209–235 (1995).

[486] I. B. Seftelis, S. X. Trasanidis, G. C. Bakos, I. Kappos, K. N. Tarchanidis, and N. F. Tsagas, "Variations of gross alpha, beta air radioactivity correlated with air temperature and humidity," Hadronic Journal **18**, 237–244 (1995).

[487] A. K. Aringazin, D. A. Kirukin and R. M. Santilli, "Nonpotential two-body elastic scattering problem," Hadronic Journal **18**, 245–255 (1995).

[488] A. K. Aringazin, D. A. Kirukin and R. M. Santilli, "Nonpotential elastic scattering of spinning particles," Hadronic Journal **18**, 257–269 (1995).

[489] T. Assis and P. Graneau, "The reality of newtonian forces of inertia," Hadronic Journal **18**, 271–289 (1995).

[490] H. Q. Plácido and A. E. Santana, "On Lie-Santilli algebraic aspects of generalized Hamiltonian dynamics: Application to Nambu Mechanics and Vlasov Equation," Hadronic Journal **18**, 319–399 (1995).

[491] B. K. Das, "Some nonrelativistic aspects in the bound state systems of 2B2B and 3B3B," Hadronic Journal **18**, 403–432 (1995).

[492] V. S. Barashenkov and M. Z. Yur'iev, "Tachyons: Difficulties and hopes," Hadronic Journal **18**, 440–485 (1995).

[493] D. Skaltsas, A. Jannussis, and H. Ioannidou, "Extention of Lie to Lie-admissible algebras for the description of open quantum systems," Hadronic Journal **18**, 493–508 (1995).

[494] G. Spavieri, R. Becerra, and L. Nieves, "Semiclassical interpretation of the Aharonov-Bohm quantum effects," Hadronic Journal **18**, 509–523 (1995).

[495] D. Gosh, D. Halder, and S. Halder, "Q-analogue of Dennison formula," Hadronic Journal **18**, 585–597 (1995).

[496] H. E. Wilhelm, “Physical problematics of Einstein’s relativity theories,” Hadronic Journal **19**, 1–39 (1996).

[497] R. M. Santilli, “Limits of applicability of the special and genral relativities,” Hadronic Journal **19**, 41–66 (1996).

[498] A. Logunov, “On the article by Henri Poincaré,” Hadronic Journal **19**, 109–183 (1996).

[499] A. A. Tyapkin, “On the history of the special relativity concept,” Hadronic Journal **19**, 185–203 (1996).

[500] Y. Arestov, “An advantage of asymmetric e^+ e^- colliders with polarized beams in verification of the Minkowskian geometry in the interior of hadrons,” Hadronic Journal **19**, 205–203 (1996).

[501] P. Cornille, “Does the ether exist?” Hadronic Journal **19**, 215–237 (1996).

[502] A. O. E. Animalu, “Lie-Santilli isoapproach to the unification of gravity and electromagnetism,” Hadronic Journal **19**, 255–272 (1996).

[503] A. S. Rabinowitch, “On the anomalous magnetic moment of nucleons,” Hadronic Journal **19**, 375–384 (1996).

[504] M. Borneas and Cristeas, “A Lagrangian formalism for extended supersymmetry equations,” Hadronic Journal **19**, 465–472 (1996).

[505] G. Spavieri and R. Angulo Becerra, “Derivation of the quantum effects of the Aharonov-Bohn type from the classical Hamilton-Jacobi theory,” Hadronic Journal **19**, 493–503 (1996).

[506] A. Jannussis, “Lie-admissible structure of Caldi’s model,” Hadronic Journal **19**, 535–541 (1996).

[507] J. Dunning-Davies, “Questions concerning relativity theory and some of its applications,” Hadronic Journal **19**, 543–560 (1996).

[508] E. M. Rabei, “On Hamiltonian systems with constraints,” Hadronic Journal **19**, 597–617 (1996).

[509] D. G. Koukouluis, “The magnetic helicity,” Hadronic Journal **20**, 65–71 (1997).

[510] A. Motoyoshi, T. Ogura, K. Yamaguchi, T. Yoneda, and G. Koukouluis, “The magnetic helicity,” Hadronic Journal **20**, 117–130 (1997).

[511] A. Nesterov and L. V. Sabinin, “Smooth loops and Thomas precession,” Hadronic Journal **20**, 219–233 (1997).

[512] I. M. Matora, “Some properties of elementary semilocal quantized ring-particles,” Hadronic Journal **20**, 267–281 (1997).

[513] R. B. Driscoll, “Studies on Santilli’s induced beta decay and electron capture for isotopes with $35 < A < 210$,” Hadronic Journal **20**, 301–312 (1997).

[514] J. Dunning-Davies and G. H. A. Cole, “Time travel: fact or fiction?,” Hadronic Journal **20**, 317–328 (1997).

[515] J. Lôhmus, "Contractions and deformations of space-time algebras, I: General Theory and Kinematical Algebras," Hadronic Journal **20**, 361–416 (1997).

[516] C. M. I. Okoye, A. O. E. Animalu, and G. C. Asomba, "Nonlocal two-band model of Cooper pairing in high temperature superconductivity as predicted by hadronic mechanics," Hadronic Journal **20**, 585–602 (1997).

[517] M. Havlicek, E. Pelantova, and A. U. Klimyk, "Santilli-fairlie algebra $Uq(SO(3))$: tensor products, oscillator realizations and root of unity," Hadronic Journal **20**, 603–584 (1997).

[518] R. Angulo, O. Rodriguez, and G. Spavieri, "Does the expression for the Lorentz force need to be modified?" Hadronic Journal **20**, 621–630 (1997).

[519] M. Israelit, "Torsional Weil-Dirac Electrodynamics," Hadronic Journal **21**, 75–93 (1998).

[520] R. M. Santilli, "Isominkowskian formulation of gravitation an cosmology," Hadronic Journal **21**, 113–169 (1998).

[521] M. Borneas and M. Christea, "Some generalizations of (anti)-communication relations in the quantum theory," Hadronic Journal **21**, 405–413 (1998).

[522] A. Renreng, "A new solution of Einstein's field equations with apparently repulsive gravitation," Hadronic Journal **21**, 527–540 (1998).

[523] V. Mazorchuck, "On simple momodules over q-analog for the virasoro algebra," Hadronic Journal **21**, 541–550 (1998).

[524] G. Spavieri and G. Spinelli, "Nonlocality in the electric and scalar Aharonov-Bohm and Aharonov-Casher effects," Hadronic Journal **21**, 621–629 (1998).

[525] R. M. Santilli and D. D. Shillady, "Ab Initio hadronic chemistry, I: Basic Methods" Hadronic Journal **21**, 633–714 (1998).

[526] R. M. Santilli and D. D. Shillady, "Ab Initio hadronic chemistry, II: Isochemical model of the hydrogen molecule," Hadronic Journal **21**, 715–757 (1998).

[527] R. M. Santilli and D. D. Shillady, "Ab Initio hadronic chemistry, III: Isochemical model of the water molecule," Hadronic Journal **21**, 759–787 (1998).

[528] M. G. Kucherenko and A. K. Aringazin, "Magnetic moment of the polarized isoelectronium orbit in the hydrogen molecule," Hadronic Journal **21**, 895–901 (1998).

[529] J. R. Croca, "Counter examples to the general validity of Heisenberg's uncertainty relations," Hadronic Journal **22**, 29–39 (1999).

[530] I. M. Matora, "The interaction of electron and neutron magnetic moments as one of the causes of UCN heating in metallic UCN traps," Hadronic Journal **22**, 41–50 (1999).

[531] J. Dunning-Davies, "Strings and inflation in modern cosmology," Hadronic Journal **222**, 41–50 (1999).

[532] H. H. Ugurlu, "The relations among instantaneous velocities of trihedrons depending on a space-like ruled surface," Hadronic Journal **22**, 145–155 (1999).

[533] Yi-Fang Chang, "Test of Pauli's exclusion principle in particle physics, astrophysics, and other fields," Hadronic Journal **22**, 257–268 (1999).

[534] A. A. Grib and R. R. Zapatrin, "In search of quantum topology," Hadronic Journal **22**, 321–342 (1999).

[535] K. M. Beshtoev, "Impossible realization of neutrino resonance oscillations enhancement in matter," Hadronic Journal **22**, 477–487 (1999).

[536] J. Dunning-Davies, "Open, closed and isolated systems," Hadronic Journal **22**, 489–496 (1999).

[537] J. Dunning-Davies, "Thermodynamics of antimatter via Santilli's isodualities," Hadronic Journal **22**, 607–615 (1999).

[538] J. M. C. Montanus, "Proper time physics," Hadronic Journal **22**, 625–673 (1999).

[539] A. K. Aringazin and M. G. Kucherenko, "Exact solution of the restricted three-body Santilli-Shillady model of H2 molecule," Hadronic Journal **23**, 1–56 (2000).

[540] A. K. Aringazin, "On variational solution of the four-body Santilli-Shillady model of H_2 molecule," Hadronic Journal **23**, 57–113 (2000).

[541] J. A. de Wet, "Evidence of spin mutation with consequent non-unitary time evolution in C-13," Hadronic Journal **23**, 193–202 (2000).

[542] E. Recami and R. M. Santilli, "Experimental evidence of superluminal speeds," Hadronic Journal **23**, 279–293 (2000).

[543] M. R. Molaei, "Isosheaf cohomology isotheory," Hadronic Journal **23**, 373–383 (2000).

[544] Yin Rui, "Unification of forces according to relativity for rotations," Hadronic Journal **23**, 487–549 (2000).

[545] Yin Rui, "Experimental verification of relativity for rotations," Hadronic Journal **23**, 551–580 (2000).

[546] A. L. Choudhury, "Time dependent physical masses around a wormhole," Hadronic Journal **23**, 581–594 (2000).

[547] A. Wolf, "String inspired dilation torsion coupling to electromagnetism in the field of a cosmic string," Hadronic Journal **23**, 595–605 (2000).

[548] A. K. Aringazin and M. B. Semenov, "Isoelectronium correlations as a nonlinear two-dinmensional two-particle tunnel effect," Hadronic Journal **23**, 619–636 (2000).

[549] J. Dunning-Davies, "Entropy, Thermodynamics and biology," Hadronic Journal **24**, 1–10 (2001).

[550] M. Burton, P. J. Doncaster, and J. Dunning-Davies, "Thermodynamics: The second law revisited," Hadronic Journal **24**, 11–16 (2001).

[551] W. Wyss, "The energy-momentum tensor for gravitational interactions," Hadronic Journal **24**, 53-70 (2001).

[552] N. Motoyui and M. Yamada, "Exactness of BRS cohomology, sequence in Rx formulation of the Abelian Higgs mode," Hadronic Journal **24**, 71–85 (2001).

[553] M. Mizushima, "Generalized Galileo-Lorentz transformation," Hadronic Journal **24**, 107–112 (2001).

[554] M. R. Molaei, "Isotopic form of complex manifolds," Hadronic Journal **24**, 291–300 (2001).

[555] L. M. Chechin and T. B. Omarov, "Geodesic lines in the gravitational field of nolinear cosmic strings," Hadronic Journal **24**, 317–328 (2001).

[556] Y. Yayli and E. Soyturk, "On the commutative algebras in the Minkowski 3-space," Hadronic Journal **24**, 385–393 (2001).

[557] A. K. Aringazin, Yayli and E. Soyturk, "Toroidal configuration of the orbit of the electron of the hydrogen atom under strong external magnetic fields," Hadronic Journal **24**, 395–433 (2001).

[558] A. Schulze-Halberg, "The central symmetric screened coulomb potential in n dimensions," Hadronic Journal **24**, 519–530 (2001).

[559] E. Cohen and L. P. Horwitz, "Effect of non-orthogonality of residues in the Wigner-Weisskopf model of the neutral k-meson system on regeneration and interference in the exit channel," Hadronic Journal **24**, 593–608 (2001).

[560] Chun-Xuan Jiang, "A unified theory of the gravitational and strong interactions," Hadronic Journal **24**, 629–638 (2001).

[561] S. Banerjee, "A simple algorithm for obtaining bound state wave functions by solving the Dirac equations," Hadronic Journal **24**, 653–667 (2001).

[562] S. I. Muslih, "Hamilton-Jacobi quantization of particle constraned on a circle," Hadronic Journal **25**, 107–116 (2002).

[563] R. Camp-Stursberg, "Generalization of the embedding problem of dynamical systems into Lie algebras," Hadronic Journal **25**, 261–271 (2002).

[564] A. K. Aringazin and M. I. Mazhitov, "Combinatorial interpretation of Haldane-Wu fractional exclusion statistics," Hadronic Journal **25**, 387–394 (2002).

[565] P. O'Hara, "Rotational invariance and the Pauli exclusion principle," Hadronic Journal **25**, 407–429 (2002).

[566] N. Zh. Takibayev, "Nuclear fusion in the channelled ion beams in a crystal," Hadronic Journal **25**, 459–469 (2002).

[567] N. Gerami and G. R. Rezaee, "Grading of Santill's isovector spaces on isofields," Hadronic Journal **25**, 561–586 (2002).

[568] A. Bahrampour and M. H. Zandi, "Q-switching technique in the output of the injection locking TEA CO_2 laser," Hadronic Journal **26**, 567–580 (2003).

[569] A. O. E. Animalu, "A new theory on the structure of the Rutherford-Santilli neutron," Hadronic Journal **26**, 637–654 (2003).

[570] V. D. Krevchik, A. B. Grunin, A. K. Aringazin, and M. B. Semenov, “Photonic drag effect for one-dimensional electrons in a longitudinal magnetic field with $D(-)$-centers participation,” Hadronic Journal **26**, 681–706 (2003).

Papers Published in *Algebras, Groups and Geometries*

[571] S. Okubo, “Super-composition algebras,” Algebras, Groups and Geometries **1**, 62–108 (1984).

[572] G. M. Benkart, “Bimodules for flexible Lie-admissible algebras,” Algebras, Groups and Geometries **1**, 109–126 (1984).

[573] S. González and A. Elduque, “Flexible Lie-admissible algebras with A and A^- having the same lattice of subalgebras,” Algebras, Groups, and Geometries **1**, 137–143 (1984).

[574] B. A. Kupershmidt, “Isotopic Lie algebras and matrix Lax equations,” Algebras, Groups and Geometries **1**, 144–153 (1984).

[575] A. A. Sagle, “Mutation algebras related to connections on homogeneous spaces,” Algebras, Groups and Geometries **1**, 164–175 (1984).

[576] E. Kleinfeld, “An extension of the class of right alternative rings,” Algebras, Groups and Geometries **1**, 213–216 (1984).

[577] K. Mc. Crimmon, “Strong prime inheritance in Jordan systems,” Algebras, Groups and Geometries **1**, 217–234 (1984).

[578] H. F. Smith, “Nilpotency in flexible derivation alternator rings,” Algebras, Groups and Geometries **1**, 236–246 (1984).

[579] A. Elduque, “On the Frattini subalgebra of a Lie-admissible algebra,” Algebras, Groups and Geometries **1**, 267–276 (1984).

[580] H. C. Myung, “Bimodules for flexible Malcev-admissible algebras,” Algebras, Groups and Geometries **1**, 277–285 (1984).

[581] R. H. Oehmke, “Idempotents in powerassociative algebras,” Algebras, Groups and Geometries **1**, 286–304 (1984).

[582] A. Elduque, S. Gonzalez and C. Martinez, “Unit element in mutation algebra,” Algebras, Groups and Geometries **1**, 386–398 (1984).

[583] J. M. Osborn, “Lie-admissible noncommutative Jordan loop rings,” Algebras, Groups and Geometries **1**, 453–489 (1984).

[584] T. Schwartz, “Automorphism groups of Jordan pairs,” Algebras, Groups and Geometries **1**, 490–509 (1984).

[585] T. Schwartz, “Special simple Jordan triple systemss,” Algebras, Groups and Geometries **2**, 117–128 (1985).

[586] S. González and C. Martinez, “Lie mutation of an associative algebra,” Algebras, Groups and Geometries **2**, 129–138 (1985).

[587] A. A. El Malek and A. Micali, "Sur les algebres Malcev-admissibles," Algebras, Groups and Geometries **2**, 167–193 (1985).

[588] S. González Jiménez, "Sur les algebres Malcev-admissibles," Algebras, Groups and Geometries **2**, 194–208 (1985).

[589] S. Okubo, "[Construction of non-associative algebras from representation modules of simple Lie algebra]," Algebras, Groups and Geometries **3**, 60–127 (1986).

[590] J. Schue, "Structure theorems for the restricted enveloping algebra of a solvable Lie p-algebra," Algebras, Groups and Geometries **3**, 128–147 (1986).

[591] A. A. Sagle, "Invariant Lagrangian mechanics, connections, and nonassociative algebras," Algebras, Groups and Geometries **3**, 199–263 (1986).

[592] J. Marshall Osborn, "What are nonassociative algebras?" Algebras, Groups and Geometries **3**, 264–285 (1986).

[593] N. C. Hopkins, "Decomposition of Lie module triple systems," Algebras, Groups and Geometries **3**, 399–413 (1986).

[594] M. El Agawany and A. Micali, "Superalgèbres de Lie et le théorème de Poincaré-Birkhoff-Witt," Algebras, Groups and Geometries **4**, 1–44 (1987).

[595] H. C. Myung and D. S. Shin, "Note on Malcev-admissible mutations of an alternative algebra," Algebras, Groups and Geometries**4**, 139–143 (1987).

[596] S. Okubo, "Non-associative differential geometry," Algebras, Groups and Geometries **4**, 215–263 (1987).

[597] N. Jacobson, "Jordan algebras of real symmetric matrices," Algebras, Groups and Geometries **4**, 291–304 (1987).

[598] W. C. Waterhouse, "Nonassociative quarternion algebras," Algebras, Groups and Geometries **4**, 365–378 (1987).

[599] S. Walcher, "On derivations of simple algebras," Algebras, Groups and Geometries **4**, 379–382 (1987).

[600] A. C. Vico and A. F. Lopez, "Prime noncommutative Jordan algebras with nonzero socle and central closure," Algebras, Groups and Geometries **5**, 129–136 (1988).

[601] S. D. Nimmo, "Anticommutative derivation alternator rings," Algebras, Groups and Geometries **5**, 273–295 (1988).

[602] A. Krieg, "Associative triple systems of Hecke type," Algebras, Groups and Geometries **5**, 341–357 (1988).

[603] P. Jimenez Garijo and A. Rodriquez Palacios, "Rational identities in Jordan algebras," Algebras, Groups and Geometries **5**, 411–420 (1988).

[604] T.-I. Suh, "Nucleus of nonassociative rings with an invertible or nilpotent valued derivation," Algebras, Groups and Geometries **5**, 27–32 (1988).

[605] I. R. Hentzel and L. A. Peresi, "Counterexamples in nonassociative algebra," Algebras, Groups and Geometries **5**, 109–128 (1988).

[606] S. V. Tsaranov, "On a generalization of Coxeter groups," Algebras, Groups and Geometries **6**, 281–318 (1989).

[607] J. Dorfmeister and E. Neher, "Isoparametric triple systems with special Z-structure," Algebras, Groups and Geometries **7**, 21–94 (1990).

[608] A. K. Aringazin, A. Jannussis, D. F. Lopez, M. Nishioka, and B. Veljanoski, "Need for mathematical studies on Santilli's Lie-isotopic relativities," Algebras, Groups and Geometries **7**, 211–300 (1990).

[609] B. Veljanoski, "Addendum et Errata for the article 'Need for mathematical studies on Santilli's Lie-isotopic relativities', " Algebras, Groups and Geometries **7**, 211–300 (1990). Algebras, Groups and Geometries **8**, 77–83 (1991).

[610] D. L. Rapoport-Campodonico, "On the construction of Lie-isotopic relativistic stochastic mechanics and Lie-isotopic potential theory from the Lie-isotopic geometry associated to a torsion potential," Algebras, Groups and Geometries **8**, 1–60 (1991).

[611] B. Kimelfeld, "On Isometries of left invarient metrics on semisimple Lie groups," Algebras, Groups and Geometries **8**, 89–112 (1991).

[612] J. Y. Min, "Note on flexible Malcev-admissible algebras with a simple Levi factor," Algebras, Groups and Geometries **8**, 113–130 (1991).

[613] R. M. Santilli, "Isotopies of contemporary mathematical structures, I: Isotopies of fields, vector spaces, transformation theory, Lie algebras, analytic mechanics and space-time symmetries," Algebras, Groups and Geometries **8**, 159–167 (1991).

[614] H. Rund, "The Freud identity in Riemannian geometry," Algebras, Groups and Geometries **8**, 267–273 (1991).

[615] R. M. Santilli, "Isotopies of contemporary mathematical structures, Part II: Isotopies of symlectic geometry, affine geometry, Riemannian geometry and Einstein's gravitation," Algebras, Groups and Geometries **8**, 267–273 (1991).

[616] T. Singh and G. Arcidiacono, "On a Birhoffian-type theorem in general projective relativity," Algebras, Groups and Geometries**9**, 29–34 (1992).

[617] Gr. Tsagas and A. Kobotis, "Characteristic elements of a category of nilpotent Lie algebras of dimension 8," Algebras, Groups and Geometries **9**, 137–256 (1992).

[618] J. V. Kadeisvili, "Elements of functional isoanalysis," Algebras, Groups and Geometries **9**, 283–318 (1992).

[619] J. V. Kadeisvili, "Elements of Fourier-Santilli isotransforms," Algebras, Groups and Geometries **9**, 219–342 (1992).

[620] E. Castrandas, "A multiparameter strongly superadditive ergodic theorem in von Neumann algebras," Algebras, Groups and Geometries **9**, 343–361 (1992).

[621] K. K. Wan and J. J. Powis, "Nonlocality of quantum mechanics and geometric quantization," Algebras, Groups and Geometries **10**, 263–272 (1993).

[622] R. M. Santilli, "Isonumbers and genonumbers of dimensions 1, 2, 4, 8, their isoduals and pseudoduals, and 'hidden numbers' of dimensions 3, 5, 6, 7," Algebras, Groups and Geometries **10**, 273–322 (1993).

[623] A. U. Klimyk and R. M. Santilli, "Standard isorepresentations of iso/Q-operator deformaitions of Lie algebras," Algebras, Groups and Geometries **10**, 323–332 (1993).

[624] J. A. C. Mira, A. G. Martin and C. M. Gonzalez, "Prime associative superalgebras with nonzero socle," Algebras, Groups and Geometries **10**, 359–369 (1993).

[625] K. Moneyhun, "Isoclinisms in Lie algebras," Algebras, Groups and Geometries **11**, 9–22 (1994).

[626] I. I. Kachurik and A. U. Klimyk, "Operator spectra for quantum algebras and q-orthogonal polynomials," Algebras, Groups and Geometries **11**, 229–252 (1994).

[627] J. A. C. Mira, A. G. Martin, and C. M. Gonzalez, "Prime associative superalgebras with nonzero socle, " Algebras, Groups and Geometries **11**, 359–369 (1994).

[628] G. Tsagas and D. Sourlas, "Isomanifolds and their isotensor fields," Algebras, Groups and Geometries **12**, 1–66 (1995).

[629] G. Tsagas and D. Sourlas, "Isomappings between isomanifolds," Algebras, Groups and Geometries **12**, 67–87 (1995).

[630] L. V. Sabinin and L. Sabinin, "Traces on $SU(2.1)$ and complex hyperbolic ideal triangle groups," Algebras, Groups and Geometries **12**, 139–156 (1995).

[631] V. A. Groza, "The q-deformed algebra $Uq(sor, s)$ and its representatives," Algebras, Groups and Geometries **12**, 165–180 (1995).

[632] G. Gibson and A. A. Stitzinger, "Isomorphisms of Lie algebra extensions," Algebras, Groups and Geometries **12**, 181–191 (1995).

[633] A. K. Aringazin, D. A. Kirukhin, and R. M. Santilli, "Isotopic generalization of the legendre, Jacobi, and Bessel functions," Algebras, Groups and Geometries **12**, 255–305 (1995).

[634] S. M. B. Kashani, "Hypersurfaces in $IR1n$ satisfying $Ox = Ax + B$," Algebras, Groups and Geometries **13**, 81–91 (1996).

[635] G. Tsagas, "Studies on the classification of Lie-Santilli algebras," Algebras, Groups and Geometries **13**, 129–148 (1996).

[636] G. Tsagas, "Isoaffine connections and Santilli's isoriemannian metrics on an isomanifold," Algebras, Groups and Geometries **13**, 149–170 (1996).

[637] J. V. Kadeisvili, "An introduction to the Lie-Santilli isotheory," Algebras, Groups and Geometries **13**, 171–281 (1996).

[638] Noriaki Kamiya, "A characterization of pseudoisofields," Algebras, Groups and Geometries **13**, 283–294 (1996).

[639] D. A. Towers, "On power associative Bernstein algebras of arbitrary order," Algebras, Groups and Geometries **13**, 295–323 (1996).

[640] M. Abel, "Noncommutative Jordan locally pseudoconvex q-algebras," Algebras, Groups and Geometries **13**, 171–281 (1996).

[641] S. Gomoyo, "Realization of the exceptional simple graded Lie algebras of the second kind," Algebras, Groups and Geometries **13**, 431–464 (1996).

[642] J. A. Leslie, "Lie's third theorem in supergeometry," Algebras, Groups and Geometries **14**, 359–406 (1997).

[643] E. Trell, "Isotopic proof and re-proof of Fermat's last theorem verifying Beal's conjecture," Algebras, Groups and Geometries **15**, 229–318 (1998).

[644] Chuan-Xuan Jiang, "On the Fermat-Santilli isotheorem," Algebras, Groups and Geometries **15**, 319–350 (1998).

[645] Chuan-Xuan Jiang, "Foundations of Santilli's isonumber theory, Part I: isonumber theory of the first kind," Algebras, Groups and Geometries **15**, 351–393 (1998).

[646] Erik Trell and R. M. Santilli, "Marius Sophus Lie's doctoral thesis Over en classe geometriske transformationer," Algebras, Groups and Geometries **15**, 390–445 (1998).

[647] Erik Trell, "The eightfold eightfold way application of Lie's true geometriske transformationer to elementary particles," Algebras, Groups and Geometries **15**, 447–471 (1998).

[648] R. M. Santilli, "Isotopic, genotopic and Hyperstructural liftings of Lie's theory and their isoduals," Algebras, Groups and Geometries **15**, 473–496 (1998).

[649] J. V. Kadeisvili, "Comments on a recent paper by Morosi and Pizzocchero on the Lie-Santilli isotheory," Algebras, Groups and Geometries **15**, 497–508 (1998).

[650] Chun-Xuan Jiang, "Foundations of Santilli's isonumber theory, Part II: Isonumber theory of the second kind," Algebras, Groups and Geometries **15**, 509–540 (1998).

[651] R. Aslander and S. Keles, "Infinitesimal motions on Santilli-Sourlas-Tsagas isomanifolds," Algebras, Groups and Geometries **15**, 545–561 (1998).

[652] M. R. Molaei, "On Santilli's one-dimensional isodynamical systems," Algebras, Groups and Geometries **15**, 563–568 (1998).

[653] M. Anástásiei, "On the nonlinear connection of a second order Finsler space," Algebras, Groups and Geometries **16**, 1–10 (1999).

[654] R. Miron, "The nonholonomic manifold in the higher order Lagrange spaces," Algebras, Groups and Geometries **17**, 283–292 (2000).

[655] T. Nagano, "Singular Finsler spaces," Algebras, Groups and Geometries **17**, 303–310 (2000).

[656] S. V. Zuev, "Geometric quantization of generalized oscillator," Algebras, Groups and Geometries **17**, 11–16, (2000).

[657] N. Kamiya, "Radicals of triple systems," Algebras, Groups and Geometries **18**, 17–26 (2001).

[658] A. J. Calderón Martín, "Coherent direct systems of L^*-triples," Algebras, Groups and Geometries **19**, 19–29 (2002).

[659] H. Boujemaa, M. Rachidi, and A. Micali, "On a class of nonassociative algebras: a reduction theorem for their associated quadratic systems," Algebras, Groups and Geometries **19**, 73–83 (2002).

[660] F. Zitan, "Some results on baric algebras," Algebras, Groups and Geometries **19**, 109–128 (2002).

[661] E. E. Vassiliou and G. N. Galanis, "On associated Frêchet vector bundles," Algebras, Groups and Geometries **19**, 277–288 (2002).

[662] M. R. Molaei and F. Farmitani, "Santilli isomanifolds in arbitrary dimensions," Algebras, Groups and Geometries **19**, 347–355 (2002).

[663] Chuan-Xuan Jiang, "Prime theorem in Santilli's isonumber theory," Algebras, Groups and Geometries **18**, 475–494 (2001).

[664] R. M. Falc'on and J. N'unez, "Tsagas-Sourlas-Santilli isotopology," Algebras, Groups and Geometries **20**, 1–100 (2003).

[665] L. Kluge and E. Paal, "Operads and cohomology," Algebras, Groups nd Geometries **21**, 1–7 (2004).

[666] S. C. Althoen, K. D. Hansen, and L. D. Kugler, "A survey of four-dimensional C-associative algebras," Algebras, Groups and Geometries **21**, 9–27 (2004).

[667] T. Guédénon, "Invariants of Bass, catenarity and Tauvel's height formula in some extensions of filtered rings," Algebras, Groups and Geometries **21**, 57–88 (2004).

[668] A. Temizyurek, "On free Lie product of Lie p-algebras," Algebras, Groups and Geometries **21**, 115–126 (2004).

[669] B. Gokden, "Study of a formalism modeling massive particles at the speed of light on a machian basis," Algebras, Groups and Geometries **21**, 153–179 (2004).

Papers Published in the *Hadronic Journal Supplement*

to be included

Monographs by R. M. Santilli

[670] R. M. Santilli, *Foundations of Theoretical Mechanics*, Vol. I, Springer–Verlag, Heidelberg–New York (1978).

[671] R. M. Santilli, *Lie-admissible Approach to the Hadronic Structure,* Vol. I, Hadronic Press, Palm Harbor, Florida (1978).

[672] R. M. Santilli, *Lie-admissible Approach to the Hadronic Structure,* Vol. II, Hadronic Press, Palm Harbor, Florida (1981).

[673] R. M. Santilli, *Foundations of Theoretical Mechanics*, Vol. II, Springer–Verlag, Heidelberg–New York (1983).

[674] R. M. Santilli, *Ethical Probe of Einstein's Followers in the U.S.A.: An Insider's View,* Alpha Publishing, Newtonville, MA (1984).

[675] R. M. Santilli, *Documentation of the Ethical Probe,* Volumes I, II and III, Alpha Publishing, Newtonville, MA (1986)

[676] R. M. Santilli, *Isotopic Generalizations of Galilei and Einstein Relativities,* Vol. I, Hadronic Press, Palm Harbor, Florida (1991).

[677] R. M. Santilli, *Isotopic Generalizations of Galilei and Einstein Relativities,* Vol. II, Hadronic Press, Palm Harbor, Florida (1991).

[678] R. M. Santilli, *Elements of Hadronic Mechanics*, Vol. I, Ukrainian Academy of Sciences, Kiev, Second Edition (1995).

[679] R. M. Santilli, *Elements of Hadronic Mechanics*, Vol. II, Ukrainian Academy of Sciences, Kiev, Second Edition (1995).

[680] C. R. Illert and R. M. Santilli, *Foundations of Theoretical Conchology,* Hadronic Press, Palm Harbor, Florida (1995).

[681] R. M. Santilli, *Isotopic, Genotopic and Hyperstructural Methods in Theoretical Biology*, Ukrainian Academy of Sciences, Kiev (1996).

[682] R. M. Santilli, *The Physics of New Clean Energies and Fuels According to Hadronic Mechanics,* Special issue of the Journal of New Energy, 318 pages (1998).

[683] R. M. Santilli, *Foundations of Hadronic Chemistry with Applications to New Clean Energies and Fuels,* Kluwer Academic Publishers, Boston-Dordrecht-London (2001).

[684] R. M. Santilli, *Isodual Theory of Antimatter, with Applications to Cosmology, Antigravity and Spacetime Machines,* Springer, in press for 2006.

[685] R. M. Santilli, *Elements of Hadronic Mechanics,* Vol. III, in preparation.

Monographs by Other Authors

[686] H. C. Myung, *Lie Algebras and Flexible Lie-Admissible Algebras,* Hadronic Press (1982).

[687] A. K. Aringazin, A. Jannussis, D.F. Lopez, M. Nishioka, and B. Veljanoski, *Santilli's Lie-isotopic Generalization of Galilei's and Einstein's Relativities,* Kostarakis Publishers, Athens (1991).

[688] D. S. Sourlas and G. T. Tsagas, *Mathematical Foundations of the Lie-Santilli Theory,* Ukrainian Academy of Sciences, Kiev (1993).

[689] J. Lôhmus, E. Paal and L. Sorgsepp, *Nonassociative Algebras in Physics*, Hadronic Press, Palm Harbor, FL, USA (1994).

[690] J. V. Kadeisvili, *Santilli's Isotopies of Contemporary Algebras, Geometries and Relativities*, Second Edition, Ukrainian Academy of Sciences, Kiev, Second Edition (1997).

[691] R. M. Falcon Ganfornina and J. Nunez Valdes, *Fondamentos de la Isoteoria de Lie-Santilli,* (in Spanish) International Academic Press, America-Europe-Asia, (2001), also available in the pdf file
http://www.i-b-r.org/docs/spanish.pdf.

[692] Chun-Xuan Jiang, *Foundations of Santilli's Isonumber Theory,* with Applications to New Cryptograms, Fermat's Theorem and Goldbach's Conjecture, International Academic Press, America-Europe-Asia (2002), also available in the pdf file http://www.i-b-r.org/docs/jiang.pdf.

Conference Proceedings and Reprint Volumes

[693] H. C. Myung and S. Okubo, Editors, *Applications of Lie-Admissible Algebras in Physics,* Vol. I, Hadronic Press (1978).

[694] H. C. Myung and S. Okubo, Editors, *Applications of Lie-Admissible Algebras in Physics,* Vol. II, Hadronic Press (1978).

[695] H. C. Myung and R. M. Santilli, Editor, *Proceedings of the Second Workshop on Lie-Admissible Formulations,* Part I, Hadronic J., Vol. 2, issue no. 6, pp. 1252–2033 (l979).

[696] H. C. Myung and R. M. Santilli, Editor, *Proceedings of the Second Workshop on Lie-Admissible Formulations,* Part II, Hadronic J., Vol. 3, issue no. 1, pp. 1–725 (l980).

[697] H. C. Myung and R. M. Santilli, Editor, *Proceedings of the Third Workshop on Lie-Admissible Formulations,* Part A, Hadronic J., Vol. 4, issue no. 2, pp. 183–607 (l981).

[698] H. C. Myung and R. M. Santilli, Editor, *Proceedings of the Third Workshop on Lie-Admissible Formulations,* Part B, Hadronic J., Vol. 4, issue no. 3, pp. 608–1165 (l981).

[699] H. C. Myung and R. M. Santilli, Editor, *Proceedings of the Third Workshop on Lie-Admissible Formulations,* Part C, Hadronic J., Vol. 4, issue no. 4, pp. 1166–1625 (l981).

[700] J. Fronteau, A. Tellez-Arenas and R. M. Santilli, Editor, *Proceedings of the First International Conference on Nonpotential Interactions and their Lie-Admissible Treatment,* Part A, Hadronic J., Vol. 5, issue no. 2, pp. 245–678 (l982).

[701] J. Fronteau, A. Tellez-Arenas and R. M. Santilli, Editor, *Proceedings of the First International Conference on Nonpotential Interactions and their Lie-Admissible Treatment,* Part B, Hadronic J., Vol. 5, issue no. 3, pp. 679–1193 (l982).

[702] J. Fronteau, A. Tellez-Arenas and R. M. Santilli, Editor, *Proceedings of the First International Conference on Nonpotential Interactions and their Lie-Admissible Treatment,* Part C, Hadronic J., Vol. 5, issue no. 4, pp. 1194–1626 (l982).

[703] J. Fronteau, A. Tellez-Arenas and R. M. Santilli, Editor, *Proceedings of the First International Conference on Nonpotential Interactions and their Lie-Admissible Treatment,* Part D, Hadronic J., Vol. 5, issue no. 5, pp. 1627–1948 (l982).

[704] J. Fronteau, R. Mignani, H. C. Myung and R. M. Santilli, Editors, *Proceedings of the First Workshop on Hadronic Mechanics,* Hadronic J., Vol. 6, issue no. 6, pp. 1400–1989 (l983).

[705] A. Shoeber, Editor, *Irreversibility and Nonpotentiality in Statistical Mechanics,* Hadronic Press (1984).

[706] H. C. Myung, Editor, *Mathematical Studies in Lie-Admissible Algebras,* Vol. I, Hadronic Press (1984).

[707] H. C. Myung, Editor, *Mathematical Studies in Lie-Admissible Algebras,* Vol. II, Hadronic Press (1984).

[708] H. C. Myung and R. M. Santilli, Editor, *Applications of Lie-Admissible Algebras in Physics,* Vol. III, Hadronic Press (1984).

[709] J. Fronteau, R. Mignani and H. C. Myung, Editors, *Proceedings of the Second Workshop on Hadronic Mechanics,* Volume I, Hadronic J., Vol. 7, issue no. 5, pp. 911–1258 (l984).

[710] J. Fronteau, R. Mignani and H. C. Myung, Editors, *Proceedings of the Second Workshop on Hadronic Mechanics,* Volume II, Hadronic J., Vol. 7, issue no. 6, pp. 1259–1759 (l984).

[711] D. M. Norris et al., *Tomber's Bibliography and Index in Nonassociative Algebras,* Hadronic Press, Palm Harbor, FL (1984).

[712] H. C. Myung, Editor, *Mathematical Studies in Lie-Admissible Algebras,* Vol. III, Hadronic Press (1986).

[713] A. D. Jannussis, R. Mignani, M. Mijatovic, H. C. Myung B. Popov and A. Tellez Arenas, Editors, *Fourth Workshop on Hadronic Mechanics and Nonpotential Interactions,* Nova Science, New York (l990).

[714] H. M. Srivastava and Th. M. Rassias, Editors, *Analysis Geometry and Groups: A Riemann Legacy Volume,* Hadronic Press (1993).

[715] F. Selleri, Editor, *Fundamental Questions in Quantum Physics and Relativity,* Hadronic Press (1993).

[716] J. V. Kadeisvili, Editor, *The Mathematical Legacy of Hanno Rund*, Hadronic Press (1994).

[717] M. Barone and F. Selleri, Editors, *Frontiers of Fundamental Physics,* Plenum, New York, (1994).

[718] M. Barone and F. Selleri, Editors, *Advances in Fundamental Physics,* Hadronic Press (1995).

[719] Gr. Tsagas, Editor, *New Frontiers in Algebras, Groups and Geometries,* Hadronic Press (1996).

[720] T. Vougiouklis, Editor, *New Frontiers in Hyperstructures,* Hadronic Press, (1996).

[721] T. L. Gill, Editor, *New Frontiers in Hadronic Mechanics,* Hadronic Press (1996).

[722] T. L. Gill, Editor, *New Frontiers in Relativities,* Hadronic Press (1996).

[723] T. L. Gill, Editor, *New Frontiers in Physics*, Vol. I, Hadronic Press (1996).

[724] T. L. Gill, Editor, *New Frontiers in Physics*, Vol. II, Hadronic Press (1996).

[725] C. A. Dreismann, Editor, *New Frontiers in Theoretical Biology,* Hadronic Press (1996).

[726] G. A. Sardanashvily, Editor, *New Frontiers in Gravitation,* Hadronic Press (1996).

[727] M. Holzscheiter, Editor, *Proceedings of the International Workshop on Antimatter Gravity,* Sepino, Molise, Italy, May 1996, Hyperfine Interactions, Vol. **109** (1997).

[728] T. Gill, K. Liu and E. Trell, Editors, *Fundamental Open Problems in Science at the end of the Millennium,* Vol. I, Hadronic Press (1999).

[729] T. Gill, K. Liu and E. Trell, Editors, *Fundamental Open Problems in Science at the end of the Millennium,* Vol. II, Hadronic Press (1999).

[730] T. Gill, K. Liu and E. Trell, Editors, *Fundamental Open Problems in Science at the end of the Millennium,* Vol. III, Hadronic Press (1999).

[731] V. V. Dvoeglazov, Editor, *Photon: Old Problems in Light of New Ideas,* Nova Science (2000).

[732] M. C. Duffy and M. Wegener, Editors, *Recent Advances in Relativity Theory* Vol. I, Hadronic Press (2000).

[733] M. C. Duffy and M. Wegener, Editors, *Recent Advances in Relativity Theory* Vol. I, Hadronic Press (2000).

Postscript

In the history of science some basic advances in physics have been preceded by basic advances in mathematics, such as Newtons invention of calculus and general relativity relying on Riemannian geometry. In the case of quantum mechanics the scientific revolution presupposed the earlier invention of complex numbers. With new numbers and more powerful mathematics to its disposition, physics could be lifted to explain broader and more complex domains of physical reality.

The recent and ongoing revolution of physics, initiated by Prof. Ruggero Maria Santilli, lifting the discipline from quantum mechanics to hadronic mechanics, is consistent with this pattern, but in a more far-reaching and radical way than earlier liftings of physics made possible from extensions of mathematics.

Santilli realized at an early stage that basic advances in physics required invention of new classes of numbers and more adequate and powerful mathematics stemming from this. His efforts to develop such expansions of mathematics started already in 1967, and this enterprise went on for four decades. Its basic novelties, architecture and fruits are presented in the present volume. During this period a few dozen professional mathematicians world wide have made more or less significant contributions to fill in the new Santilli fields of mathematics, but the honor of discovering these vast new continents and work out their basic topology is Santillis and his alone. These new fields initiated by Santilli made possible realization of so-called Lie-admissible physics. For this achievement Santilli in 1990 received the honor from Estonia Academy of Science of being appointed as mathematician number seven after world war two considered a landmark in the history of algebra.

With regard to Sophus Lie it may be of some interest to note that the Norwegian examiners of his groundbreaking doctoral thesis in 1871 were not able to grasp his work, due to its high degree of novelty and unfamiliarity. However, due to Lie already being highly esteemed among influential contemporary mathematicians at the continent, it was not an option to dismiss his thesis. As in other disciplines, highly acknowledged after Thomas Kuhns publication of The structure of scientific revolutions in 1962, sufficiently novel mathematics implies some paradigmatic challenge. Therefore, it is not strange that some mathematicians and physicists have experienced difficulties taking the paradigmatic leap necessary to grasp the basics of hadronic mathematics or to acknowledge its far-reaching implications. Such a challenge is more demanding when scientific novelty implies a reconfiguration of conventional basic notions in the discipline. This is, as Kuhn noted, typically easier for younger and more emergent scientific minds.

Until Santilli the number 1 was silently taken for granted as the primary unit of mathematics. However, as noted by mathematical physicist Peter Rowlands at University of Liverpool, the number 1 is already loaded with assumptions, that can be worked out from a lifted and broader mathematical framework. A partial and rough analogy might be linguistics where it is obvious that a universal science of language must be worked out from a level of abstraction that is higher than having to assume the word for mother to be the first word.

Santilli detrivialized the choice of the unit, and invented isomathematics where the crux was the lifting of the conventional multiplicative unit (i.e. conservation of its topological properties) to a matrix isounit with additional arbitrary functional dependence on other needed variables. Then the conventional unit could be described as a projection and deformation from the isounit by the link provided by the so-called isotopic element inverse of the isounit. This represented the creation of a new branch of mathematics sophisticated and flexible enough to treat systems entailing sub-systems with different units, i.e. more complex systems of nature.

Isomathematics proved necessary for the lifting of quantum mechanics to hadronic mechanics. With this new mathematics it was possible to describe extended particles and abandon the point particle simplification of quantum mechanics. This proved highly successful in explaining the strong force by leaving behind the non-linear complexities involved in quantum mechanics struggle to describe the relation between the three baryon quarks in the proton. Isomathematics also provided the mathematical means to explain the neutron as a bound state of a proton and an electron as suggested by Rutherford. By means of isomathematics Santilli was also able to discover the fifth force of nature (in cooperation with Professor Animalu), the contact force inducing total overlap between the wave packets of the two touching electrons constituting the isoelectron. This was the key to understanding hadronic superconductivity which also can take place in fluids and gases, i.e. at really high temperatures. These advances from hadronic mechanics led to a corresponding lifting of quantum chemistry to hadronic chemistry and the discovery of the new chemical species of magnecules with non-valence bounds. Powerful industrial-ecological technology exploiting these theoretical insights was invented by Santilli himself from 1998 on.

Thus, the development of hadronic mathematics by Santilli was not only motivated by making advances in mathematics per se, but also of its potential to facilitate basic advances in physics and beyond. These advances have been shown to be highly successful already. Without the preceding advances in mathematics, the new hadronic technology would not have been around. The mere existence of this technology is sufficient to demonstrate the significance of hadronic mathematics. It is interesting to note that the directing of creative mathematics into this path was initiated by a mathematical physicist, not by a pure mathematician. In general this may indicate the particular potential for mathematical advances by relating the mathematics to unsolved basic problems in other disciplines, as well as to real life challenges.

In the history of mathematics it is not so easy to find parallels to the achievements made by Santilli, due to hadronic mathematics representing a radical and general lifting, relegating the previous mathematics to a subclass of isomathematics, in some analogy to taking the step from the Earth to the solar system. However, the universe also includes other solar systems as well as galaxies.

In addition to isonumbers Santilli invented the new and broader class of genonumbers with the possibility of asymmetric genounits for forward vs. backward genofields, and designed to describe and explain irreversibility, characteristic for more complex systems of nature. Quantum mechanical approaches to biological systems never achieved appreciable success, mainly due to being restricted by a basic symmetry and hence reversibility in connected mathematical axioms. It represented an outstanding achievement of theoretical biology when Chris Illert in the mid-1990s was able to find the universal algorithm for growth of sea shells by applying hadronic geometry. Such an achievement was argued not to be possible for more restricted hyperdimensional geometries as for example the Riemannian. This specialist study in conchology was the first striking illustration of the potency as well as necessity of iso- and genomathematics to explain irreversible systems in biology.

Following the lifting from isomathematics to genomathematics, Santilli also established one further lifting, by inventing the new and broader class of hyperstructural numbers or Santilli hypernumbers. Such hypernumbers are multivalued and suitable to describe and explain even more complex systems of nature than possible with genonumbers. Due to its irreversible multivalued structure hypermathematics seems highly promising for specialist advances in fields such as genetics, memetics and communication theory. By the lifting to hypermathematics hadronic mathematics as a whole may be interpreted as a remarkable step forward in the history of mathematics, in the sense of providing the essential and sufficiently advanced and adequate tools for mathematics to expand into disciplines such as anthropology, psychology and sociology. In this way it is possible to imagine some significant bridging between the two cultures of science: the hard and the soft disciplines, and thus amplifying a tendency already represented to some extent by complexity science.

The conventional view of natural scientists has been to regard mathematics as a convenient bag of tools to be applied for their specific purposes. Considering the architecture of hadronic mathematics, this appears more as only half of the truth or one side of the coin. Besides representing powerful new tools to study nature, hadronic mathematics also manifests with a more intimate and inherent connection to physics (and other disciplines), as well as to Nature itself. In this regard hadronic geometry may be of special interest as an illustration:

Isogeometry provided the new notions of a supra-Euclidean isospace as well as its anti-isomorphic isodual space, and the mathematics to describe projections and deformations of geometrical relations from isospace and its isodual into Euclidean space. However, these appear as more than mere mathematical constructs. Illert showed that the universal growth pattern of sea shells could be found only by looking for it as a trajectory in a hidden isospace, a trajectory which is projected into Euclidean space and thereby manifest as the deformed growth patterns humans observe by their senses. Further, the growth pattern of a certain class of sea shells (with bifurcations) could only be understood from the addition and recognition of four new, non-trivial time categories (predicted to be discovered by hadronic mechanics) which manifest as information jumps back and forth in Euclidean space. With regard to sea shell growth, one of this non-trivial time flows could only be explained as a projection from isodual spacetime. This result was consistent with the physics of hadronic mechanics, analyzing masses at both operator and classical level from considering matter and anti-matter (as well as positive and negative energy) to exist on an equal footing in our universe as a whole and hence with total mass (as well as energy and time) cancelling out as zero for the total universe. To establish a basic physical comprehension of Euclidean space constituted as a balanced combination of matter and antimatter, it was required to develop new mathematics with isonumbers and isodual numbers basically mirroring each other. Later, corresponding anti-isomorphies were achieved for genonumbers and hypernumbers with their respective isoduals.

Thus, there is a striking and intimate correspondence between the isodual architecture of hadronic mathematics and the isodual architecture of hadronic mechanics (as well as of hadronic chemistry and hadronic biology). Considering this, one might claim that the Santilli inventions of new number fields in mathematics represent more than mere inventions or constructs, namely discoveries and reconstructions of an ontological architecture being for real also outside the formal landscapes created by the imagination of mathematics and logic. This opens new horizons for treating profound issues in cosmology and ontology.

One might say that with the rise of hadronic mathematics the line between mathematics and other disciplines has turned more blurred or dotted. In some respect this represents a revisit to the Pythagorean and Platonic foundations of mathematics in the birth of western civilization. Hadronic mathematics has provided much new food for thought and further explorations for philosophers of science and mathematics.

If our civilization is to survive despite its current problems, it seems reasonable to expect Santilli to be honored in future history books not only as a giant in the general history of science, but also in the specific history of mathematics. Hadronic mathematics provided the necessary fuel for rising scientific revolutions in other hadronic sciences. This is mathematics that matters for the future of our world, and hopefully Santillis extraordinary contributions to mathematics will catch fire among talented and ambitious young mathematicians for further advances to be made. The present mellowed volume ought to serve as an excellent appetizer in this regard.

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