NOMINATION OF PROF. RUGGERO MARIA SANTILLI FOR THE 1993 NOBEL PRIZE IN PHYSICS

As well known, the representational capabilities of the contemporary classical physics is essentially restricted to the so-called "exterior dynamical problem" (Lagrange, Hamilton, Jacobi), that is, the approximation of particles as point-like while moving in the homogeneous and isotropic vacuum. In fact, conventional Lie symmetries (such as the Galilei and Lorentz symmetries) are linear, all contemporary geometries (such as the symplectic, affine and Riemannian geometries) are local-differential, and the familiar Hamiltonian mechanics is potential-canonical. An illustration of the exact applicability of the Galilean, special and general relativities in the arena considered is given by a satellite in a stable orbit in vacuum around our Earth.

In an unprecedented series of discoveries conducted over the past two decades, Prof. R. M. Santilli achieved a generalization of contemporary algebras, geometries, mechanics, symmetries and relativities for the structurally more general "interior dynamical problem", i.e., for extended - and therefore deformable - particles while moving within inhomogeneous and anisotropic physical media, thus resulting in the most general known physical systems which are nonlinear in all variables and their derivatives (including the nonlinearity in the velocity as necessary to represent drag forces), nonlocal-integral (as necessary to represent the extended character of the particle), and nonpotential-nonhamiltonian (as necessary to represent the contact forces between extended particles and the medium in which they move).

The discoveries have been unprecedented because no mathematical methods was available in the pure mathematical literature for the quantitative treatment of the systems considered in the form needed for the construction of "coverings" of conventional physical theories. In fact, while at the Department of Mathematics of Harvard University under research support from the U.S. Department of Energy, Prof. Santilli, a theoretical physicist, first had to discover the needed nonlinear, nonlocal and noncanonical generalizations of contemporary mathematical structures, including fields, vector spaces, algebras, groups, transformation-representation theories, geometries, etc. Only after achieving these novel mathematical methods, Prof. Santilli was in a position to achieve the desired coverings of conventional physical theories.

These discoveries resulted in what appears to be one of the most diversified and comprehensive scientific edifice ever conceived by one single mind, encompassing nonlinear, nonlocal and noncanonical generalizations of the Galilean, special and general relativities, today called "Santilli's isogalilean, isospecial and isogeneral relativities", not only at the classical level, but also for operator and statistical formulations. A typical example of the exact applicability of Prof. Santilli's covering relativities is given by the same satellite considered above, but during re-entry in Earth's atmosphere, with a continuously decaying angular momentum for which the inapplicability (and not the violation) of conventional relativities is beyond credible doubts because of several, independent, topological, algebraic, analytic and other reasons.

Moreover, Prof. Santilli achieved his discoveries via the so-called "isotopies", which are <axiom-preserving>, nonlinear, nonlocal and noncanonical generalizations of any given mathematical or physical structure. Prof. Santilli's generalized relativities, by construction, are therefore based on the same axioms of the corresponding conventional relativities, and they coincide with the latter at the abstract, realization-free level. As an illustration, Prof. Santilli has proved that the abstract axioms of the conventional notions of parallel transport, geodesic, curvature, etc. persist for the satellite in the transition from motion in vacuum to motion within our atmosphere, provided that such transition is represented via the isotopies.

Finally, the isogalilean relativity has been proved to be exactly valid for all classical interior systems via rigorous theorems on the so-called "inverse problem" for which the isogalilean symmetry is constructed from the equations of motion considered. The isospecial and isogeneral relativities have been similarly established in a number of ways, including: 1) their abstract identity with the conventional relativities; 2) their compatibility with the isogalilean relativity; 3) the capability of recovering identically conventional relativities for the exterior problem, thus verifying all currently available experiments (which are of exterior type in vacuum); and other evidence.

As a result of these manifestly unique achievements, Prof. Santilli's discoveries have been called "epoch making" (Prof. H. Leipholz, Canada), "absolutely historical" (Prof. J. D. Kadeisvili, Kazakhstan), "truly revolutionary for all of science" (Prof. D. F. Lopez, Brasil), etc. Also, the enclosed historical chart prepared by the Estonian Academy of Sciences lists the name of "Ruggero Maria Santilli" among the most illustrious applied mathematicians of all times, such as "Karl Friederich Gauss", "William Hamilton", "Henry Poincare´", "Arthur Eddington", etc. (quite significantly and correctly, the name of Albert Einstein is not included in this historical chart because Einstein found available from the mathematical literature all the mathematical methods needed for the construction of his theories, e.g., the "Lorentz and Poincare´ symmetries", the "Riemannian geometry", etc.).

The Nobel Committee should be aware that the above classical discoveries were conceived and worked out by Prof. Santilli merely as the necessary background for his corresponding isotopic generalizations of quantum mechanics called "hadronic mechanics", which is now stimulating a completely new scientific horizon in particles physics. In particular, the operator discoveries have indicated the apparent existence of a new technology which he called "hadronic technology", in the sense of originating, not in the structure of molecules, atoms and nuclei as the current technologies are, but in the structure of individuals hadrons, such as protons and neutrons. Prof. Santilli is scheduled for additional Nominations for the Nobel Prize in Physics for these operator studies which are currently under experimental finalization. This Nomination is entirely restricted to his "classical discoveries of isotopic type".

It is known in the scientific community that Prof. Santilli has been Nominated for the Nobel Prize in Physics a number of years preceding 1993. In order to avoid the repetition of documents already available at the Nobel Foundation, it is here requested that the technical material of the preceding Nominations (such as memoirs, books and monographs) is considered as a formal part of this Nomination.

The chronology of the discoveries is the following.Back in 1967-1969 during his Ph.D. studies at the University of Turin, Italy, Prof. Santilli published three papers [1,2,3] in which he discovered the applicability of the covering of Lie algebras known as "Lie-admissible algebras" for the very pillar of physical theories, the brackets of the most general possible time evolution, that originating from Hamilton's equations with external terms. In fact, in the enclosed historical chart from the Estonian Academy of Sciences, the birth of Lie-admissible algebras in physics is correctly associated with paper [1] and the year 1967. The ensuing theories are of the so-called "genotopic" type, and result to be a covering of the "isotopies" of this Nomination.

Ten years later when at Harvard University, Prof. Santilli published in 1978 two memoirs [4,5], today widely admitted as of historical character, in which he presented: a) comprehensive mathematical studies on his "Lie-admissible formulations" encompassing algebraic, geometric, analytic, and other aspects; b) realizations of such Lie-admissible formulations in both classical and operator mechanics, including the "Birkhoffian generalization of classical Hamiltonian mechanics", and the "hadronic generalization of quantum mechanics"; and 3) the discovery of the "isotopic formulations" as intermediate between the conventional Lie and the most general possible Lie-admissible formulations, which yielded corresponding, classical and quantum covering theories.

Memoirs [4,5] therefore implied the birth of two sequential generalizations of contemporary Lie-type theories in physics, one of isotopic type (which apply for isolated systems with conserved total energy under nonlinear, nonlocal and noncanonical internal forces), and the still more general covering theories of genotopic type (which apply for open-nonconservative systems under the most general conceivable external interactions).

Subsequently, in the series of monographs [6] published by Springer-Verlag of Heidelberg, Germany (copies of which were apparently mailed by the Publisher to the Nobel Committee for preceding Nominations), Prof. Santilli presented in detail his classical isotopic theories, while his more general, classical, genotopic theories were presented in detail in the separate series of monographs [7] published by Hadronic Press of Tarpon Springs, FL, USA.

Studies [1-7] achieved "direct universality" for all possible physical systems that are arbitrarily nonlinear and noncanonical, yet still in their local-differential approximation owing to certain topological–geometrical requirements. But a primary need existed for nonlocal-integral theories as classical counterpart of a nonlocal-integral treatment of strong interactions as expected from the deep mutual penetration of the wavepackets/charge distributions of hadrons. In his unprecedented series of discoveries, Prof. Santilli therefore embarked in a second layer of generalizations of the entirety of his preceding, algebraic, geometric and analytic formulations to achieve the direct universality inclusive of nonlocal-integral systems.

In fact, in four equally historical memoirs of 1988 [8] Prof. Santilli did indeed reach the final formulation of his isotopic and genotopic formulations which consist of the most general known nonlinear, nonlocal and noncanonical formulations of fields, vector spaces, algebras, groups, representation and transformation theories, geometries, mechanics, symmetries, etc., which were then applied for the construction of corresponding coverings of the Galilean, special and general relativities. The mathematical part of the latter discoveries were separately published by Prof. Santilli in the mathematical literature via the two memoirs [9]. The classical applications, including a comprehensive presentation of his isogalilean, isospecial and isogeneral relativities, were published in the new series of monographs [10] (copies of which have been separately mailed by their publisher to the Nobel Committee as part of this Nomination). Independent reviews are available in monograph [11] by the Russian mathematician J. D. Kadeisvili and in monograph [12] by the physicists A. K. Aringazin (Kazakhstan), A. Jannussis (Greece), D. F. Lopez (Brasil), M. Nishioka (Japan) and B. Veljanoski (Bosnia) (copies of monographs [11,12] have been apparently mailed to the Nobel Committee by their Publishers jointly with preceding Nominations).

Even though not a formal part of this Nomination, the Nobel Committee should be aware that the above classical discoveries are the true, ultimate foundations of momentous advances in particle physics, including:

Theoretical evidence on the cold fusion of elementary particles at large and, in particular, of protons and electrons into neutrons (plus neutrinos) [13] which is at the basis of the emerging new "hadronic technology" indicated earlier. The cold fusion of particles [13] has been preliminary verified via the direct experiment [14], and the indirect experimental backing in the Cooper Pairs in superconductivity [15]. The Nobel Committee should be aware that the cold fusion of elementary particles is inconceivable for quantum mechanics and its point-like approximation of particles (which would imply the academic abstraction of the electron freely orbiting "inside" the proton like a tiny little atom), but it is rigorously established for the covering hadronic mechanics via additional nonlinear–nonlocal–nonhamiltonian internal effects due to the total immersion of the wavepacket of the electron inside the densest object measured in laboratory until now, the proton. In turn, these basically novel technological possibilities at the ultimate layer of the structure of matter illustrate the far reaching implications of Prof. Santilli's classical discoveries under this Nomination, as well as their comprehensive character for the entirety of contemporary physics.

Theoretical and experimental evidence on the nonlinear, nonlocal and noncanonical structure of the strong interactions at large, achieved by Prof,. Santilli via a comprehensive study of the Bose-Einstein correlation [16]. The Nobel Committee should be aware that the phenomenon of the Bose-Einstein correlation is, strictly speaking, outside the representational capability of quantum mechanics because the axiom of expectation value does not permit the inclusion of cross terms essential for the correlation itself. On the contrary, the correlation becomes fully treatable from first axioms in a quantitative way verifying experimental data if treated via Prof. Santilli's isotopic covering of quantum mechanics.

The Nobel Committee is aware that current quarks theories admit a finite non–null transition probability for free quarks which is evidently contrary to experimental evidence (see, e.g., the explicit calculations of ref. [17]). In yet another discovery, Prof. Santilli has identified an isotopic generalization of quark theories with an explicitly computed transition probability for free quarks which is rigorously proved to be identically null, while preserving all conventional quantum numbers of current quark theories [18,19]. The achievement is permitted by the incoherence of the internal and external Hilbert spaces originating from the exact validity of conventional, local–

differential quantum mechanics in the exterior problem, and the validity of the covering nonlinear–nonlocal–noncanonical hadronic mechanics in the interior structural problem. As a consequence of the isotopic character of his theory on the hadronic structure, Prof. Santilli is also capable of recovering convergent perturbative series for strong interactions.

The above and a number of other fundamentally novel applications of the Prof. Santilli's theories in particle physics are reviewed in monograph [19] currently in press, and which is scheduled for submission to the Nobel Committee as part of expected, additional, independent Nominations of Prof. Santilli for the Nobel Prize in Physics in future years.

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NOTE: The publications marked with [*] are apparently on file at the Nobel Committee. All remaining publications are available on request.

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