Book review

Foundations of hadronic chemistry with applications to new clean energies and fuels

Everything has a history—or two. When reviewing a pioneering treatise like the Italian–American phycicist Ruggero Maria Santilli's ground-breaking monograph, "Foundations of Hadronic Chemistry With Applications to New Clean Energies and Fuels", some epistemological reflections would seem to be extra warranted because of its virtual backwards-to-the-future renaissance of Physics, Chemistry and Mathematics as equivalent powers in the synopsis. A serious scientific dilemma nowadays is otherwise that the latter discipline has seized supreme command and that, as stated by William M. Honig [1], the ruling mathematical doctrine "since the 1920s? has had a stultifying effect on developments in physics".

This is not how it used to be, when Nature directed. It is of course a primordial conception that Existence springs from a synthesis of opposites/adjacents, like in the Nordic Mythology, where life whirls in the thin tempered interstice (Ginnungagap) between the outer, rectilinear, openly infinite deep-frozen darkness of Nilfeheim, and the inner, blazing, lighting-fast rotating, closely infinite fire-ball of Maspellsheim [2]. Even earlier, for instance, as expressed by the Yin-Yang symbol, a similar process was apprehended in the Orient of a spiraling transition between the complementary endless forms of Straight contracting into Round, the immense collective difference of which at the Cosmic level after long-winded journey (it is tempting to infer) disperses everywhere over the surface of the perfect sphere as the last decimal of π. In consequence, and with pronounced bearing to the mathematics which Professor Santilli has disclosed, there is inherent motion in this projection because the realisation comprises its own automatically congruent infinitesimal operator, or iso-unit.

Analogously it applies to the ancient Greek—but vice versa. They "are famous for a completely brilliant idea, namely, to use spatial images to represent numbers", where, however, "Euclid's Mathematics was closely associated with his concept of the world, which in accordance with Aristotle was that the Universe is enclosed in a sphere, in the interior of which space and the bodies full-fill the properties of Euclidean Geometry" [3]. So, in the Occident, Mathematics came to assume a perspective, falling from the vaulted firmament to the straight line and ultimately the vanishing intersection point as irreducible reference and elements. This orthogonal architecture of Western Mathematics where the static terms do not supply any kinetics (but a transcendental First Cause provided primum movens) persisted also after the Arabs replaced implicit figures and explicit constructions with algebraic letters and arithmetics, as can be seen, e.g. in the epoch-making doctoral thesis of Marius Sophus Lie, Over en class geometriske transformationer [4], from the English translation of which [5] the following is quoted:

"The Cartesian geometry, namely, translates any geometric theorem into an algebraic one and thus of the geometry of the plane renders a faithful representation of the algebra of two variables and likewise of the geometry of space a representation of the algebra of three variable quantities" ... "the geometrical transformation that is founded upon the Poncelet–Gergonne reciprocity can be perceived as consisting of a transition from a point to a straight line as element" ... "The in the following presented new theories are founded upon the fact that one can choose any space-curve which depends upon three parameters as the element of the space" ... "each point in space ... is associated with a cone, namely, the collection of tangents ... that go through the point in question" ... "A partial differential equation of the first order between x, y, z is ... equivalent to ... finding the general surface which in each of its points touches a cone associated with the point in question ..."

Now, Lie revolutionised the mathematical comprise and compass by expanding these operations back to spherical and related geometries and clarifying the sets of continuous transformation groups deployable in and between them. But the inherited defect persists in the cores of the functions, that their constituent lines and points are left without. When Nanotechnology at all fronts is now approaching the genuine footing of tangible reality, it discontinuously halts at the very threshold where the elementary particles substantially enter: what are they, and how are they? It is comparatively more and more surrealistic to accept them as primarily mechanical points/packets/waves rigidly oscillating/amorphously radiating in and from disparate ready-made quantum cavities as they were provisionally once depicted 50–100 years ago. It is true that spectroscopical observations soon necessitated inside arrangements but (the neighbourhood versions of) the established algorithms governed there, too, to quark and their orbits, partial charges and masses, fluxing gluons and so on.

The resulting inconsistencies are large and profound and actually the pragmatic impulse and reason; the effective white spot for Professor Santilli's exploration, in this case the chemical aspect of the panorama. And here I think we

need to ask also ourselves as readers: are we yet true scientists, open-minded, bold, curious as our vocation prescribes? Do we still delight in breaking new grounds—and taboos, above all those founded on superstition or prejudice or routine?

Refreshed blood, moreover, is getting a survival condition for scholarly Science, left astern by industrial and military research in a situation when bright young Chemistry as well as Physics graduates rather seek their fortune there or on Wall Street than join the increasingly ecclesiastical promotion ladders at dogmatically inveterate Academia. Indeed, given sufficient talent, there is nothing to stop the endeavor that Professor Santilli has undertaken. On the contrary, the facultative merit of his findings is that they are not only compatible with, but contributing to Quantum Chemistry and Mechanics, filling vital gaps that just lie beyond the definitions of these at a domain where they simply do not comply.

Professor Santilli initially identifies some of the major Quantum Chemistry shortcomings which can be resolved by his structural generalisation—covering under the name of "Hadronic Mechanics and Chemistry":

 (1) lack of exact representation of molecular data (on binding energies of the order of 2%, and bigger deviations for electric and magnetic moments which are at time wrong even in their sign);
 (2) inability to permit accurate thermochemical calculations;
 (3) the absence of an attractive valence force sufficiently strong to explain the strength of molecular bonds actually existing;
 (4) the inability to restrict valence bonds to electron pairs only;
 (5) the prediction that all molecules are paramagnetic;
 (6) and others

This accomplishment originates from the deduction that, unlike in local, linear and potential Quantum Mechanics and Chemistry, the novel "Santilli valence force" is non-linear (in the wavefunction), non-local-integral (over a volume), and of contact-non-potential type due to the deep overlapping of the wavepackets of valence electrons in singlet coupling. It is based on a new Mathematics, today known as "Santilli Isomathematics", with invariant real-valued, nowhere singular, yet arbitrary integro-differential units at all levels, from numbers to Schroedinger equations. The representation thus assures the invariance of the theory.

In short, he sets dynamics into realisation by isotopic operators not only enabling running transforms of conventional theories but also exposition of hidden variables, a generalization of Bell's inequality and a completion of Quantum Mechanics and Chemistry much along the celebrated argument by Einstein, Podolsky and Rosen of 1935. The "catastrophic inconsistencies of conventional Mathematics" in these and other respects are reviewed, including lack of invariance in time of basic units and numerical values with consequential lack of applicability to measurements, absence of preservation of Hermiticity with consequential absence of observables, violation of causality and probability laws as well as the basic axioms of Special Relativity. The elimination of such defects by Santillis Isomathematics should be most instructive reading for all true scientists. The new methods are specifically described for the study of molecular structures conceived as reversible systems isolated from the rest of the universe with Hamiltonian and non-Hamiltonian internal effects, and are presented as part of the "isotopic branch of Quantum Mechanics and Chemistry".

In addition, the first known invariant formulation of irreversibility at any level, from classical to operator systems is presented, founded upon Lagrange's and Hamilton's legacy of representing irreversibility by the reintroduction of those external terms in their celebrated equations which have otherwise been removed from the analysis throughout virtually the entire 20th century. By stating the retrieved "true analytic equations" in a corresponding form, Professor Santilli establishes a Lie-admissible structure in the sense of the American mathematician A. A. Albert. This is then extended from the classical to all subsequent levels of treatment, including quantisation and operator formulations. In this way irreversibility emerges as originating from the most elementary levels of nature (such as protons and electrons in the core of a star), thereby demonstrating the known impossibility of reducing a macroscopic irreversible classical system into a finite collection of elementary particles, each of which, as in Quantum Mechanics, is postulated to be in reversible condition.

Here, an additional new mathematics enters the exposition, today known as "Santilli Genomathematics" and characterised by two real-valued and nonsingular, yet nonsymmetric, generalized dynamic units interconnected by Hermitean conjugations, one of which is designated to move forward in time and the other to move backward in time. The differences between these basic units then guarantees irreversibility for all other reversible Hamiltonians. By recalling that all known potential interactions are strictly reversible, these nonsymmetric generalized units (known as "Santilli genounits") represent the interactions responsible for irreversibility, namely, Lagrange's and Hamilton's external terms, and are especially exemplified in the monograph as part of the "genotopic branch of Hadronic Mechanics and Chemistry" for an invariant representation of open irreversible processes, such as chemical reactions.

The book continues with an account of a third extended generalisation-covering Quantum Mechanics and Chemistry based on an even more general new Mathematics, today known under the name of "Santilli Hypermathematics," which is characterised by "multi-valued", real, non-singular and non-symmetric generalised units at all levels of study.

The need for the further generalization is shown by the concrete example of growth in time of sea shells where the single-valuedness of genotopic formulations does not assure the invariant treatment of the irreversibility of biological

systems. This third method is hence presented in the monograph as being specifically applicable to these (but also to other branches of Science, e.g. Cosmology).

The powerful theories get equally strong confirmation and harvest by the exciting discovery and extraction of a new, remarkably corresponding chemical species named "Magnecules", in which atoms are bonded together into stable clusters by internal attractive forces due to the magnetic and electric polarization of their orbitals. Impressive experimental data supporting the existence and properties of Santilli's Magnecules are given.

Finally, and crowning the preceding ground achievements, Santilli describes the application of the new methods and the chemical species of Magnecules to the industrial production of a new fuel he calls "MagneGas"^{TM} and whose combustion exhaust is so clean that it has been certified that it does not require catalytic converters.

The monograph proves the viewpoint repeatedly expressed by Santilli in his works, that there cannot be really new scientific theories without really new Mathematics, and there cannot be really new Mathematics without new, and active numbers. However, there is a mutual objective study and analysis of rendered Nature, which remains the firm and unquestionable basis and where, therefore, in their proper generating, assisting and interpretative powers, "the newer concepts in mathematics" are neither the "servants" nor the "masters" [1] but the equals. Seeing that a formula does the job spurs considerations on the phenomenon exhibiting such behaviour. But it is the patient and reflective observations and explorations of Reality that conducts the designated mind to the appropriate Mathematics. That Professor Santilli, repeatedly nominated for the Nobel Prize, is extremely well equipped and capable to both ends is amply documented, first and foremost by his work, but also by the biographic and bibliographic sections of the monograph which deserve to be briefly summarised as well.

He proposed Hadronic Mechanics already in 1978 jointly with its basic Lie-admissible structure when he was at Harvard University under US Department of Energy support. The study was continued by mathematicians, theoreticians and experimentalists too numerous to quote here (but included in the book's references). However, Santilli remains to this day the most active contributor, eventually bringing the venture to full mathematical maturity in 1996, physical maturity in 1997 and geometric maturity in 1998. Among the main contributors to the novel Hadronic Chemistry also the Physicists A.O.E. Animalu (co-work and verification on Cooper pair model) and A.K. Aringazin et al. (validation of the new Magnecule species and Chemistry), and the chemist D.D.S. Shillady (co-work on new molecular model) are prominent. No doubt many more will follow when rich, solid, convincing evidence and revenues are now accumulating of the greatest importance for Mankind in evermore desperate need of clean energies and enhanced understanding of the world.

References

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