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Foreword for isotopic generalizations of quantum theories

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Abstract

Here it is attempted to give a brief introduction to the work of Ruggero Santilli via a slightly more detailed discussion of two areas in which he has made major contributions. The motivation for his work is also discussed throughout and an attempt is made also to highlight some of the problems which have inspired him over the years. The two examples taken are, firstly, a fascination with the early work of Rutherford in viewing a neutron, which was undiscovered at the time, as a proton and an electron. This model was discarded because it wasn't allowed by conventional quantum mechanics. The second was a deep interest in the paradox introduced into physics by the appearance of the now famous article by Einstein, Podolsky and Rosen in 1935. Both these contributed to Santilli's realization that, for further progress to be made in physics, a new approach had to be adopted which would involve the use of as yet unused, or unknown, mathematical methods. Over the years, a huge body of new mathematics has emerged through the efforts of Santilli, helped to some extent by various other workers, but the main body has been due to him. This relatively short foreword has as its aim to promote this lifetime's work of Santilli and hopefully encourage others to be motivated to study it with truly open minds and, where necessary, carry out actual experiments to test independently some of the predictions made – especially the one relating to a possible method for the safe, rapid disposal of nuclear waste.

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1 Introduction

In the very last paragraph of his well-known book on quantum mechanics [1], the Nobel Prize Winner Paul Dirac states that:

"It would seem that we have followed as far as possible the path of logical development of the ideas of quantum mechanics as they are at present understood. The difficulties, being of a profound character, can be removed only by some drastic change in the foundations of the theory, probably a change as drastic as the passage from Bohr's orbit theory to the present quantum mechanics."

This is a powerful statement by an eminent, highly respected theoretician but echoes accurately concerns which have existed about quantum mechanics since the subject was born. This is not to decry its enormous achievements in the intervening years but merely to draw attention to the fact that it, like all other theories, cannot be accepted as the final answer; again like all other theories, it is not complete and depends crucially on any assumptions made in its beginnings.

Very often the queries about quantum mechanics have revolved around the role of the observer and over whether or not quantum mechanics is an objective theory. One man who has considered these points is Karl Popper, one of the best known philosophers of science. Contrary to the so-called Copenhagen Interpretation, he expresses the view that the observer, or as he prefers to call him, the experimentalist, plays exactly the same role in quantum mechanics as he does in classical physics – that is, he is there to test the theory.

As has been noted elsewhere, a great many eminent physicists have switched allegiance away from the pro-Copenhagen camp over the years. However, where does Popper fit into anything to do with Hadronic Mechanics? Quite simply, the answer lies in the fact that it was in his 1982 book [2] that he, Karl Popper, drew attention to the thoughts and ideas of Ruggero Santilli. In the 'Introductory Comments' to his book, Popper reflects on, amongst other things, Chadwick's model of a neutron. He notes 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 composition. Hence, in time, it became accepted as a new particle. Popper then notes that, around his (Popper's) time of writing, Santilli had produced an article in which the "first structure model of the neutron" was being 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, at the end of section IV of his 'Introductory Comments', Popper makes the following assertion:

"I should like to say that he (Santilli) – one who belongs to a new generation - seems to me to move on a different path. Far be it from me to belittle the giants who founded quantum mechanics under the leadership of Planck, Einstein, Bohr, Born, Heisenberg, de Broglie, Schrödinger, and Dirac. Santilli too makes it very clear how greatly he appreciates the work of these men. But in his approach he distinguishes the region of the arena of incontrovertible applicability of quantum mechanics (he calls it atomic mechanics) from nuclear mechanics and hadronics, and 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, seem to me to augur a return to sanity: to that realism and objectivism for which Einstein stood, and which had been abandoned by those two very great physicists, Heisenberg and Bohr".

Obviously, these comments of Popper will not be too well-received by some but, at the very least, they provide much food for thought and, considering his own well-deserved reputation, should convince people to assess Santilli's contributions with open minds at the very least.

2 Limitations of quantum mechanics?

As stated above, in more recent times, one man who has worried about the extent of the claims for much of conventional theory is Ruggero Santilli. He has devoted his life to studying and attempting to extend the theory to cover situations to which it was not, in its usually accepted form, truly applicable. The fact that it is, at the very least, not applicable in certain cases is something which is hidden from the public and from most students and Santilli's investigations have placed him squarely in opposition to the 'godfathers' of 'conventional wisdom'.

All this has put him at a grave disadvantage in the scientific world where questioning the currently accepted views on basic theory is still a perilous route to follow just as it was in the days of Waterston. It might be remembered that Lord Kelvin opined that, ignoring Waterston's work on the kinetic theory of gases, had probably delayed advances in the field by a great many years. This scientific blunder is well documented in Brush's two volume work 'The Kind of Motion we call Heat'. [3]. As already indicated, Ruggero Santilli has dedicated his life to examining the bases of not just quantum mechanics but relativity as well, feeling both theories to be incomplete.

3 The need for new clean nuclear power

Santilli's investigations have led, in recent years, to possibilities for new clean energies and it is this which is now so important to consider, especially at this time when the world is so troubled by the depletion of energy stocks and worries about environmental effects of the energy sources presently being utilised so widely. This whole problem of future energy supplies is probably far more serious than usually imagined. Present demand is increasing but, when countries such as those of both the Indian sub-continent and of Africa come on line fully and require as much energy as the countries of the present west, that demand will escalate enormously. Given the present state of orthodox fundamental knowledge, the only realistic solution to this problem is presented by nuclear power. To many, this is not an acceptable option.

Alternatives such as solar power, wind power, geothermal energy, wave energy, and others are all put forward but, in truth, these in total would come nowhere near satisfying the probable future demands for energy. No; as has been pointed out on more than one occasion, the only realistic answer at the world's disposal at present is nuclear power. [4] However, nuclear power is felt to pose two major problems and both are concerned with safety. The safety of the actual power stations is, not unreasonably, a tremendous worry for many. This is accentuated by incidents such as the Three Mile Island problem in the U.S.A. and, more recently, the disaster at Chernobyl. However, it is only the latter case that proved a true disaster; the first was fundamentally contained by the safety systems in place.

There is little doubt that, provided adequate funds are made available, nuclear power plants can be made extremely safe, although, as with all man-made structures, no-one can guarantee complete safety of anything and, whether those in authority like to admit it or not, genuine accidents will, and do, occur. Therefore, there can be no room for complacency but, if a sensible number of safety measures are incorporated into the plant, nuclear power stations should be safe.

4 The need for recycling nuclear waste

The disposal of nuclear waste is another matter, as has been highlighted by all the problems being faced in the U.S.A. over its proposed storage facility in Nevada. This brings the story back to Santilli for another outcome of his work has been the emergence of a possibility for the safe disposal of nuclear waste in-house; by which is meant, the safe disposal of the waste without any need for transportation. [5] The idea is still only at the theoretical stage and, as Santilli has been requesting for some time now, requires the performance of about three experiments to see if the theory actually works in practice. Such experiments would not be cheap to perform but, considering the enormous sums spent on some elementary particle work, the cost would not be too great and, if successful, the ensuing benefit for mankind would truly be out of all proportion to that cost!

Most will ask at this point why these experiments haven't been performed. This is a difficult, if not impossible, question to answer, but it may be noted that, on the one hand, the theory behind all this does not conform to 'conventional wisdom' and does, in fact, raise questions about the range of validity (at least) of the widely accepted theories of relativity and quantum mechanics, while, on the other hand, the theory has led already to the production of the new clean fuel, 'magnegas'! Hence, although the theory may be abstruse, may contain elements which some feel unacceptable, and may conflict with 'conventional wisdom', nevertheless something concrete has been produced already which can be, and has been, used. The theory definitely appears to have had a readily identifiable success already.

On the other hand, enormous profits are being made by people in the business of disposing of nuclear waste using the current somewhat crude and unsatisfactory methods. So the question arises as to whether, in some sense, 'conventional wisdom' and 'big business' have combined to prevent the performance of these experiments which, if successful, could have such a dramatic effect on both. Santilli has extended his work to cover a huge number of seemingly disparate fields but, as far as much of his basic work is concerned, he derived a large amount of inspiration from a relatively small number of sources.

5 Rutherford's synthesis of the neutron in a star

From the point of view of physics, it seems that Santilli obtained inspiration from early ideas of Rutherford. It was in 1920 [6] that Rutherford postulated the existence of a new particle, which was, in essence a 'compressed hydrogen atom'; that is, it was composed of an electron compressed entirely within the proton. This he called a neutron. Presumably Rutherford thought that, when a hydrogen atom is compressed, for example, in the core of a star, the high pressures involved could result in it being reduced in size to that of a proton, with an electrically neutral particle emerging finally. Twelve years later, Chadwick [7] established the existence of the neutron experimentally. However, Rutherford's original conception of this particle was dismissed by many of the founders of quantum mechanics for a variety of seemingly good reasons at the time: - the model would require a positive binding energy; both constituents possess spin ½ and so, the resulting particle would not be permitted to have spin ½ by normal quantum mechanics; orthodox quantum mechanics would also not allow the correct magnetic moment to follow in this model. Hence, the rejection of Rutherford's model of a neutron and this heralded a change in the direction of physics' research.

Up to that time, physics had been based on the notion that the constituents of so-called bound states have to be capable of being isolated and identified in laboratories. The rejection of Rutherford's conception appears to have altered this view. This then was the spur for Santilli and, having devised some totally new mathematical techniques, he first succeeded in producing a consistent model of the meson, π^0, as a bound state of an electron and a positron. This model is not possible in conventional quantum mechanics for a number of reasons, one of which concerns binding energy. Quantum bound states possess negative binding energies and this implies a total mass less than the sum of the constituent masses. For a π^0 meson, this would imply a rest energy appreciably less than its actual rest energy of $135\ Mev$.

This problem, as are all others, is resolved by hadronic mechanics or, at least, that is the claim with all the evidence clearly available for examination by those with a mind so to do. The model Santilli proposes does, in fact, explain all the characteristics of the said particle – zero spin, electrically neutral, null magnetic moment, a rest energy of $135\ Mev$, a mean-life of approximately $10^{-16}\ sec.$, a charge radius of about 1 fm (that is, $10^{-15}\ m$), decay according to $\pi^0 \rightarrow e^- + e^+$ - and this model of the smallest of hadrons has now been extended successfully to all mesons. Further, although the theory does not view quarks as actual physical particles, but rather as mathematical objects with a composite structure, this new model for hadrons does prove compatible with the current quark theories, always assuming that quarks have a composite structure. For those interested, further details of this model may be found in a variety of publications but especially in volume 4 of the Journal of New Energy. [8] In fact this reference is a veritable goldmine of information on this general topic of hadronic mechanics and its consequences both for physics itself and probably for mankind as a whole through its consideration of the possibilities offered by the theory for alternative new clean energies.

6 The need to generalise Heisenberg's uncertainty principle

Central to all of this was the generalization of Heisenberg's uncertainty principle of hadronic mechanics (for details of this refer to the summary in reference below [9]) because in its absence none of this would have been possible and the above mentioned new method for the recycling of nuclear waste could never have been contemplated.. Hence, it is his success in using the new hadronic mechanics to resurrect the Rutherford model for the structure of the neutron successfully which could conceivably turn out to be Santilli's most important achievement. This model recognises a neutron as being composed of a bound state of a proton and an electron at a distance of 1fm; that is, at a distance of 10-15 m. As mentioned earlier, such a model is prohibited by conventional quantum mechanics, so, if Santilli's ideas are valid, what are the consequences for physics? The answer is, quite simply, enormous! The abandonment of the original approach to the structure of physical particles will have had a profound and far-reaching effect on research in the area of particle physics obviously.

However, it is the possible ecological implications which are staggering and of so much direct relevance to absolutely everyone. The orthodox approach has conceivably prevented the study of the neutron as a major source of clean energy and actually seems to have obstructed the study of new forms of clean nuclear energy.

7 Recycling nuclear waste via stimulated decay

As for the actual proposal for a safe method of disposal of nuclear waste, that has been treated in a number of articles and more details may be found in these. The basic idea revolves around the fact that the nuclei concerned are large and naturally unstable. One idea is to expose the highly radioactive nuclear waste to an intense, coherent flow of photons with the required resonating frequency. It is felt that this may be achieved via a synchrotron of about three meters diameter; - a size which could be accommodated in nuclear power plants. A typical example is provided by uranium (92-U-238) which has a life-time of the order of $109-years$. A double stimulated transmutation of this element could change it into Plutonium (94-Pu-238).

Again, this is an unstable quantity and has harmful emissions as well, but its life-time is a mere 86 days and it could well be retained under suitable shields for that period of time. It may be superfluous to draw extra attention to this point, but it is worth noting the different life-times involved here – 86 days as against $109\ years$!

The phenomenal advantage of this stimulated transmutation is immediately evident. Will it work? The theory certainly suggests that it should, but only experimentation will give the actual answer to that question. Possibly the bigger, more relevant, question to ask at this time is whether or not the scientific community and national governments are prepared to finance the experiments necessary to test this thesis? There is little doubt powerful forces, both within the scientific establishment and in big business, will violently oppose the performance of these but can the possibility of the existence of such a prize be ignored any longer? As has been stated above, Santilli derived much inspiration for much of his work from the earlier ideas of Rutherford but that was merely one source of inspiration for the work that has occupied his entire working life.

8 The Einstein, Podolsky and Rosen paradox

Another important source was supplied by the well-known article by Einstein, Podolsky and Rosen [10] which appeared in 1935 and raised important questions concerning the completeness of quantum mechanics. As far as the Einstein-Podolsky- Rosen , or EPR, ideas are concerned, it is worth noting that questions concerning the completeness of quantum mechanics as a physical theory have been discussed at length ever since that famous article first appeared. Many experiments have been carried out in attempts to both prove and disprove the assertions it contains and much deep thought has gone into the theoretical investigations of such as Bell. In fact all the references to this work may be found in the collection of Bell's papers on quantum philosophy which may be found in 'Speakable and Unspeakable in Quantum Mechanics' [11] as published by Cambridge University Press in 1993. Less well-known is the resolution of the paradox advanced by Santilli in 1998 [12] and it is the lack of publicity for this work which poses a significant question for the scientific community as a whole.

However, when you read even the abstract for this paper, some possible answers become apparent. With talk of such concepts as nonlinear, nonlocal, non-canonical, axiom-preserving isotopies and spin-isospin symmetry and iso-spaces, some will be put off by the implied effort to understand properly what follows in the body of the article, while others will dismiss the work out-of-hand because it depends on concepts unfamiliar to them. Hence, the question facing the scientific community is 'when do we agree to examine openly and without prejudice radical new proposals aimed at producing solutions to age-old problems?'

It seems there was little concerted effort to deny investigating results emanating from the use of the methods of Riemannian geometry – and, at the time, these would have been a total mystery to many practicing physicists – as well as the uncertainties introduced into physics and chemistry by the advent of quantum mechanics some one hundred years ago, so why not afford the same respect to Hadronic Mechanics in this present time or are the basic tenets of quantum mechanics to remain sacrosanct even when they fail to answer some of the important questions facing the World today?

These are important questions generally but are particularly apposite when considering the so-called EPR paradox and work related to it. The EPR criticisms of quantum mechanics, together with those by others, led to the establishment of the notion of so-called local realism which is formulated via conventional mathematical ideas.

Santilli introduced a generalisation of this under the name iso-local realism which is based on his own covering theory of iso-mathematics. Basically, the EPR claim is that quantum mechanics is an incomplete theory because its description of physical reality does not include all elements of reality, while every element of physical reality should be precisely represented in a complete theory. Santilli's new approach has important consequences as far as the EPR argument is concerned. Traditionally, commuting quantities are believed to be independent but, in the so-called iso-topic completion of quantum mechanics, iso-commuting quantities can be mutually interacting, although it should be understood that such interactions are structurally different from those of action-at-a-distance/potential type. Fundamentally, quantum mechanics may be considered an incomplete theory in that it does not contain the element of reality given by the nonlocal structure of interactions expected from the mutual wave overlapping. Hadronic mechanics overcomes this problem.

However, as Santilli himself points out, hadronic mechanics is not intended to represent all elements of reality. It is not meant to be a final theory. Physics is, after all, a discipline which will never admit final theories. Hadronic mechanics simply provides one type of completion of quantum mechanics – that of axiom preserving type.

9 The limitations of von Neumann's, Bell's and other theorems

It should be noted at this point that Santilli has shown via his new mathematics that von Neumann's theorem on hidden variables is inapplicable under isotopies – note, not violated but inapplicable! He has established also that the oft quoted Bell's inequality is not valid universally but holds specifically for the conventional form of quantum mechanics. Of course, more recently the matter has resurfaced with the announcement of experimental results supporting the EPR assertions at Basel. [13] The team there noted that the phenomenon dated back to a thought experiment of 1935 and that it allowed measurement results to be predicted precisely. However, it is always important to remember that thought experiments are just that – thought experiments - and, as such, are very difficult to interpret due to the assumptions made not always being totally clear, possibly not even to the originators themselves. The essence of a good practical experiment is that it should be readily repeatable. It is relatively easy to see how this could be true but, equally, could be untrue of any thought experiment. It follows that important results derived via thought experiments should be viewed with extreme care. Nevertheless, as far as the thought experiment leading to the EPR paradox is concerned, it is one which has been viewed and examined over many years and has always led to a genuine paradox in physics. Basically, via a thought experiment, Einstein, Podolsky and Rosen showed that precise predictions are possible theoretically in certain circumstances. Such a notion may be explained briefly as follows;- they considered two systems in

an entangled state in which their properties are strongly correlated. In this case, the results of measurements on one system may be used to predict the results of corresponding measurements on the second system with arbitrary precision in principle. It was also the case that the two systems could be separated spatially. The resulting paradox is that an observer may use measurements on the first system to make more precise statements about the second system than an observer who has direct access to that second system but not the first.

The Basel team used lasers to cool atoms to a small fraction of a degree above the absolute zero of temperature. At such low temperatures, the atoms are thought to behave completely according to the rules of quantum mechanics and form a Bose-Einstein condensate. In this ultra-cold cloud, the atoms collide with one another constantly, causing their spins to become entangled. The researchers involved then took measurements of the spin in spatially separated regions of the condensate. By using high-resolution imaging, they were able to measure the spin correlations between the separate regions directly and simultaneously localise the atoms in precisely defined positions.

Hence, in this experiment, the researchers seem to have succeeded in using measurements in a give n region to predict precisely the results for another region. This writer is unaware of any objections being raised as yet about this work by the Basel team. If such have or, indeed, do in the future then the argument over the EPR paradox will, no doubt, rumble on. If that does not happen then it is conceivable that a new era might be opening up for physics since, if that does happen, it is likely that applications will follow which it is hoped will be of benefit to mankind rather than the opposite.

The whole issue of the EPR paradox was discussed at length recently at a teleconference held in Florida [14] and the proceedings of that conference provide an excellent source of references and information for the present situation concerning it. Also, a detailed summing up of the situation is to be found in a fairly recent review article. [15] Both of these publications draw attention to the pioneering work of Santilli and his numerous contributions.

10 Concluding remarks

This introduction has focussed on just two of the various issues that provided inspiration to Ruggero Santilli for all that has followed over the years. The abandoned original Rutherford model for a neutron has been resurrected and examination of the new proposals indicates that, if the theory is correct, great benefits by way of the safe disposal of nuclear waste and the possibility of new clean energies could be at hand. As for the suggested theoretical resolution of the well-known EPR paradox, that too could conceivably lead to advances which could benefit mankind although such may not be as immediately obvious as in the case of the resurrection of the Rutherford model of the neutron. Further details on both these topics as well as on other issues addressed by Ruggero Santilli may be found in the general texts listed below. [16] where references to the theoretical background may be found also. In short it seems now is the time for an unbiassed examination by the science community at large of this huge body of work. For too long have ideas been summarily dismissed purely because they conflict with ideas of presently accepted 'conventional wisdom'.

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