Review of: "Mathematics Is Physical"

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If the author, with the title 'Mathematics is Physics', wanted to summarise the content of the article, it seems to me that he has not succeeded in his intention. Although the reading is fluent and enriched by valuable historical quotations, the central theme appears to be the contraposition between classical mechanics and quantum mechanics. This contrast is made explicit mainly in the comparison between the treatment of classical information, i.e. that which follows the modelling proposed in 1937 by Alan Turing and formalised more precisely by von Neumann in the 'First Draft of a Report on the EDVAC' of 1945, and the treatment of quantum information.

In addition to the numerous repetitions of concepts that at times make for tedious reading (just to give a few examples, reference is made here to the numerous times when the definition of Gödel's theorem is used, or when the concept 'classical information is clonable, while quantum information is not t' is repeated) and which the author is advised to revise and redefine, there are expressions used that do not convince me:

- why does the author, in describing Turing's machine, specify that the tape on which to represent the symbols and on which the read/write head runs is 'semi-infinitely' long? The power of the MdT is precisely that of having a system on which one can continue to work indefinitely, through which Turing succeeds in demonstrating the untruthfulness of Hilbert's third problem, namely that 1937 mathematics is not decidable;
- 'Turing, his contemporaries, and subsequent scientists did not realize that these computational models assumed that the information directly processed by the machines was recorded on media that could be read or copied accurately at once.' Perhaps the author does not realise that the process of building modern computers is still far to come and that in 1937 the structure of computers was not even predictable;
- the references given seems to me to be very poor when compared with the exucursus made by the author, which considers studies on classical mathematics and those on quantum theory. We recommend, for example, the reading of David Deutsch's work ("Quantum theory as a universal physical theory", Int J Theor Phys 24, 1-41, 1985) in which Feynman's ideas are formalised in his Quantum Universal Turing Machine, which represents the theory of quantum computability in relation to the Universal Turing Machine for classical computability and which leads to the modern conception of quantum computation;
- It would be worth going into more detail and explaining the differences between bits and quantum bits (qbits) and then treating two-state logic representations (classical integrated circuit computing) in relation to quantum logic, which proposes an entirely different computer.

The absolutely new element I read in the article is the study cited in [18] conducted by the author and his colleagues who ‘developed a new computer model called the Lorentz quantum computer, where some of its logic gates are Lorentz transformations on the complex domain. Our results demonstrate that this computer model is indeed more powerful than a quantum computer. These findings show that there is still room for innovation in the field of computing and that new types of information can lead to more powerful computer models beyond the limits of quantum computing’. News of this interesting work ends here, while, in my opinion, the discussion on the subject of 'classical mechanics vs. quantum mechanics' would be invigorated with such a deepening.

Ultimately, the author should intervene with a thorough revision, starting with the title and continuing in the direction suggested in the comments above. As it is presented, the article does not proposed significant innovations, although there are interesting ideas in it.