Review of: "Mathematics Is Physical"

Harrie de Swart[1]

1 Tilburg University

Potential competing interests: No potential competing interests to declare.

Already in the abstract I encounter some questions/problems: It says: “the number of mathematical statements is uncountable, meaning that there will always be mathematical statements that cannot be proved true or false.” The word uncountable has a very precise meaning, being that there cannot exist a bijection or one-to-one correspondence from the set of natural numbers to the set in question, here the set of all mathematical statements. But in so far mathematical statements are formulated in some mathematical language with countably many symbols, it seems to me that the set of mathematical statements is also countable. The author of this paper seems to give a new meaning to the notion of uncountable: given any proof system, there will always be mathematical statements that cannot be proved true or false in the given proof system. The latter is true for every consistent extension of Peano's arithmetic, as we know from Godel’s incompleteness theorem.

However, further on at page 3, the author says himself that “the set of all mathematical propositions has uncountably infinitely many elements, which means that it is impossible to establish a one-to-one correspondence between the two sets”. And next he concludes that since the number of provable propositions is countable, there must be mathematical propositions that are impossible to be proved. This is another argument than the one of Godel, but I doubt that the set of all mathematical statements is uncountable.

The author argues that quantum mechanics enabled to discover quantum information. Hence, quantum computers, which process quantum information, can greatly expand the scope and power of mathematics, illustrating the profound relationship between mathematics and physics.

Although I find these ideas very challenging and worth studying, I am not familiar with the notion of quantum information and quantum computers and hence must refrain from further comments.