S-83 – Transmathematics and the Philosophy of Numbers

The History of Mathematics

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Abstract:

Numbers have long played a critical role in everyday life, commerce and the sciences. The recent development of transmathematics extends number systems so that they have no exceptional states.

This symposium provides a forum for discussion between professionals from different areas of knowledge, such as mathematics, logic, philosophy, history of science, computer science, physics, and any other specialism that is concerned with numbers, their contemporary or historical applications, or their geographical spread through societies.

The development of new number systems is a recurring event in the history of mathematics and science. Some categories of numbers, for example, negative, irrational, imaginary and infinitesimal numbers, were initially introduced as transient entities, which appeared during calculations but were not numbers themselves; their appearance was always conditioned to the "actual" numbers. But as these new objects became increasingly common, disparaging them was no longer tenable. Then people sought ways to interpret them, trying to fit them to the categories of numbers that were already accepted. Thus geometrical, algebraic, topological, computational and many other interpretations of arithmetic were developed, whose operations were similar to existing arithmetics. At several times in history, mathematics went through epistemological discussions legitimising its ideas. The very concept of number is steeped in these discussions. Now transreal numbers are being proposed and developed as an advance on our computational abilities and on our mathematical and scientific understanding.

It is a truism to say that the universe never stops; that all manner of physical interactions take place without the universe ever stopping to consult an external oracle to decide what should happen next. But this is precisely what does happen in computers that monitor or control aspects of the universe. Such computers generally fail on some kind of exception and, after exhausting any special programming, they halt in an error state, until they are reset by an external agency, typically a human being. Computer errors are such a normal part of our lives that we seldom doubt that it is in the nature of things that such errors exist. But we should doubt. If, as we suppose, the universe operates without exceptions, why should a small part of it, a computer, have the privilege of exceptional behaviour? How can computers have the power to fail? Can we arrange that they do...
not fail or that they fail less often? Does transmathematics provides this ability? Does it provide a mathematical route to understanding the physics of the universe, even at singularities?

Extemporaneous laws, like the prohibition of division by zero, always charge a price that appears as impossibilities, whose solution is the creation of what should always have been. Is transreal nullity, the unique number zero-divided-by-zero, like the presence of the undecidable; necessary for the good functioning of the real numbers? Did Gödel predicted the invention of the nullity, not in his famous theorems, but in the philosophical inventions arising from its results?

We invite papers on any aspect of transmathematics or the philosophy of numbers and look forward to a provocative and productive discussion at the symposium.

**Keywords:** Transmathematics – Philosophy of numbers – History of mathematics and science – Transreal numbers – Computer science.

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