Organic Mathematics

And the 6 th 'problem of Hilbert

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We discuss here the Sixth problem of Hilbert and link it to the theory Laws of Form published by George Spencer Brown.

Organic Mathematics is an extension of the ordinary language of mathematics with the observation of the human act of creating math. The inspiration came to me from the end of David Hilbert's famous lecture in Paris in 1900.

"The organic unity of mathematics is inherent in the nature of this science, for mathematics is the foundation of all exact knowledge of natural phenomena. That it may completely fulfill this high mission, may the new century bring it gifted masters and many zealous and enthusiastic disciples"

Hilbert

1. Socrates

The ordinary mathematics is based on the famous "modus ponens" logical rules:
1.All man are to die 2.Socrates is a man imply 3. Socrates will die
But from Socrates himself we have learnt the famous sentence:

I know that I don't know

This paradox made Socrates himself to be someone who will remain forever in man's conscience.

2. Hilbert

2,500 years after Socrates, David Hilbert made one of the most important lectures ever made. Leading the mathematician community he declared a list of 23 open problems. In term of Socrates Hilbert modified it to:

I know what I don't know

It made his lecture influential and inspired the math community to try and solve his problems.

3. Gödel

One of the problems of Hilbert (the 2nd problem) was after the success made on Geometry was ***to find the compatibility of the arithmetical axioms***. 30 years later Gödel proved that arithmetic is incomplete and therefore it is impossible to fulfill Hilbert's task. He described a mathematical sentence that declares.

I can't be proven

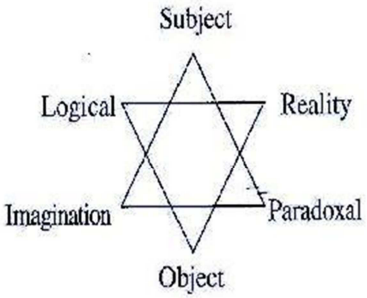
As the 2 nd problem, most of the problems in Hilbert's list have been solved during the past century. One of the few that are still open , is the 6 th problem.

4. The 6 th problem

The 6 th problem of Hilbert was about a *mathematical treatment of the axioms of physics:* " the investigation on the foundation of geometry suggest the problem : to treat in the same manner, by means of axioms, those physical sciences in which mathematics plays an important part ; in the first rank are the theory of probabilities and mechanics

Hilbert

This is the willing to establish the right connection between mathematics and physics. Since mathematicians themselves belong to the physical world the 6 th problem is the only problem in the list, that has an organic quality, since a solution to the problem should be replaced by organic quality, as a solution to the problem contains inherently the formulation of the problem itself. Similar to the invention of calculus we need to develop a new language that emphasizes not just the value of a mathematical result but also the way that it changes. So we need to find a way to immerge those two aspects of math and the real world.



5. Organic mathematics

The Klein bottle invented by Felix Klein, is a mathematical model that demonstrates the quality of merging two opposite sides. The two different sides look separates only from the local point of view but from the global point of view the are one. Using this ability, an organic mathematics language should make the bridge between 3 polarities.

But We know that this ability as the model of Klein bottle can be reached only in the 4 th dimension. by an observation on what can't be observed in infinite we reach the goal :

I can be observed

6. Law of Form

Most mathematicians are really Platonists and think that mathematics is the process of discovering something outside of us. In the beginning of the 20th century Brouwer tried to develop a new mathematics which he named intuitionism. His new idea was that a mathematical object is legitimate if and only if you can create it in a finite number of logical manipulations. Brouwer claimed that the statement "A or not A" is not always true like it is in traditional mathematics. Despite the great support that he got he didn't succeed in creating new mathematics. The reason for that is simply that he didn't suggest any real new praxis with mathematical symbols.

Ramanujan is still very inspiring for thinking about different ways of doing mathematics. He discovered about 4,000 wonderful formulas in number theory and he didn't prove them. He simply saw them like a drawing. But he himself couldn't really explain the process of discovery.

Following the shock of Gödel's incompleteness theorem (1931) there was an important seminar in 1939 take place at Cambridge University led by Wittgenstein named "Foundation of mathematics". As a philosopher, Wittgenstein recognized the significance of the parenthesis operation as pointing on object.

A significant turning point happened in 1969 when the book Laws of Form was published by George Spencer Brown. The theory is based on a single operation named Distinction. This is the simple operation of pointing on an object and separates it from its environment. These operations have a unique symbol which is: ⌝

Following the challenge of the Sixth problem the universe satisfies two axioms:

⌝⌝=⌝

⌝=

The traditional logic is only one interpretation of this system. But laws of form are more general than the traditional logic because their objects have two dimensions. The number of forms of order n are given by the sequence 1,2,4,9,20,48,115,…which can be calculate by a recursion over the partitions of n.

B. Russell tried unsuccessfully to unify mathematics by logic in his famous book Principia Mathematica. He knew Spencer personally and wrote a recommendation for the publication of Spencer's book. "Not since Euclid's Elements have we seen anything like it". Laws of form complete the relativity theory which was developed by Einstein in physics (1905), now applied to mathematics. Laws of form certainly fulfill the great vision of Leibniz to develop a new language with more flexible logic than true/false logic. Laws of Form include traditional logic as a special case but they can deal also with paradoxical situations.

Finally, re-examination of the foundations of mathematics enables us today to reconsider also the foundations of relativity theory and its dangerous applications. Laws of form are simple: children in kindergarten can study them. In fact, kindergarten is an excellent place to study and develop the foundations of mathematics.

Reference:

1] G.Spencer Brown : Laws of Form (1969)

2] Klein Moshe :Interview with Saharon Shelah , Wolf prize in Mathematics - World Scientific volume 4 (2012)