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Computation, Mathematics or Aesthetic Realism: Revisiting the foundations of modern biology and agriculture

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A B S T R A C T

In this article, we visit the foundations of modern biology and agriculture. Various hypotheses such as Mathematical Universe Hypothesis, Computational irreducibility and Aesthetic realism are examined. In the end a new hypothesis to explain modern biology and agriculture is proposed.

According to the mathematical universe hypothesis also known as the Ultimate Ensemble proposed by Max Tegmark (Tegmark a, b) “our external reality is a mathematical structure”. In other words our physical universe can be described by mathematics or more rigorously *is* mathematics. Tegmark’s theory is also consistent with multiverse theory. If the multiverse theory is correct then our universe is one of the many universes that exist.

Many philosophers thought that the basic laws are not immutable and undergo evolution. American philosopher C.S. Pierce wrote that “laws of nature “are like habits. “Its (habits) first gems arose from pure chance. There were slight tendencies to obey rules that had been followed, and these

tendencies were rules which were more and more obeyed by their own action”. Pierce thought that “law of habit is the law of mind” and thought that universe is alive. Friedrich Nietzsche proposed that “laws of nature” not only evolved but were also subjected to some sort of natural selection. American philosopher and psychologist William James wrote similarly about “laws of nature” (Sheldrake, 1988).

On the computational side Stephen Wolfram has given the concept of computational irreducibility. It refers to the programs which cannot be simplified/ reduced further. In many cases of computational irreducibility there are no laws governing the output of these programs, only observation and experiment can give information about the output of these

programs. The complex systems such as biological organisms are thought to be describable by such programs. (Wolfram, 2002)

In essence we have three positions vis-à-vis the working of the universe which can be interpolated to biological organisms. First, there are mathematical structures governing the working of the universe. Second, that the laws governing the working of biological organisms (and universe) are evolving. Third, the computationally irreducible programs describe the working of complex systems such as biological organisms and universe.

Let us consider the first position namely mathematical universe hypothesis. We believe that this theory is incomplete without aesthetics. We propose that this hypothesis at best can be partially correct. To describe the working of the biological organisms (and the universe) both mathematics and aesthetics have to be considered. It is notable that mathematicians consider mathematics as “beautiful” and “aesthetic”. However our position considers aesthetics as more than aesthetics of mathematics.

Modern science is based on a mechanistic world view. Newton proposed that universe is a giant machine. However the emergence of quantum theory changed that and the deterministic Newtonian world view was changed to a probabilistic quantum world view. Nevertheless quantum theory is a mathematical theory and has been applied to biological systems. We believe that quantum theory is incomplete without, besides other things, aesthetics.

The second position that the “laws of nature” are evolving continuously intuitively supports the role of aesthetics in these laws. The third position described above namely

that of computational irreducibility states that complex systems cannot be described by simple laws. We postulate that aesthetics, perhaps in combination with mathematics would be needed to describe the computationally irreducible programs which are used to describe complex systems like biological organisms.

Our thoughts agree with the philosophy of aesthetic realism founded by Eli Siegel. Siegel believed that arts and sciences reveal that reality has an aesthetic nature (Campbell, 1983) Siegel wrote, "If...the structure of the world corresponds to the structure [of art], that much the world may be beautiful in the deepest sense of the word; and therefore can be liked." According to this philosophy “emotion changes into logic: there is no rift between the two” (Catling 1952).

It is common knowledge that mind has two kinds of capacities: intuitive and rational. During the course of modern technological evolution the intuitive mind has been reduced and the rational mind has gained prominence. Zizzi has proposed that there is an analogy between very early universe and humanminds. Thus the biological organisms (and the universe) can be regarded as both intuitive and rational. Using this analogy we propose that the universe can be described by combination of rational thinking, intuition and aesthetics.

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