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Perspectives

GOD, THE WORLD, AND DIGITAL PHYSICS



**Christ's Body and Christianity's
Embodiment**

The Thirteenth Apostle

**Tales of Grace: Dandelions and
Fishing Lures**

**In Review:
Mark Salzman and Richard Wilbur**

PERSPECTIVES

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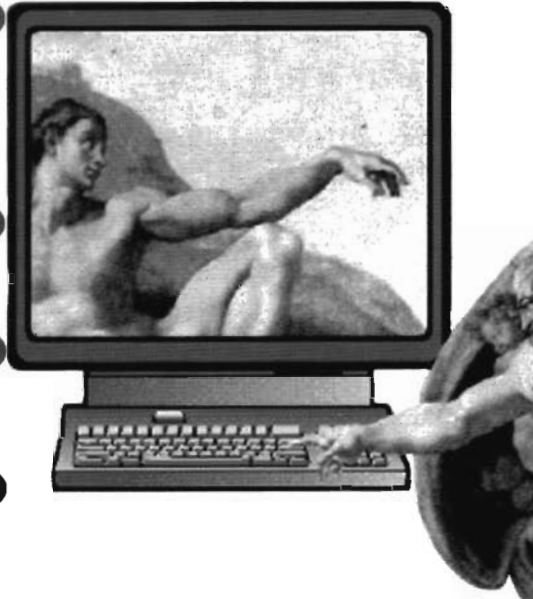
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DP AND ME

by Ross Rhodes

Digital Physics ("DP") is a suitably neutral scientific term for a breathtaking philosophical concept. It refers to the hypothesis that all of physics—which is to say, all of our universe—can be rendered by a digital computer. Everything from melting ice in our backyard to black holes in the cosmos should be expressible as a computer program, according to digital physics. The reason this should be so is that our universe itself is the manifestation of a computer program, being run on some ultimate computer—not so very different, in principle, from our own computer games and virtual reality simulations.

Digital physics arose at the intersection of physics and computer science. Physicists have long noted that, at the most elementary level, our universe operates according to mathematical principles. In many respects, the fundamental behaviors observed on the quantum level defy common sense when interpreted as tiny specks of matter. The interpretation of quantum mechanics ("QM") that seems best to fit the facts is that these behaviors are related to the mathematical principles in some unimaginably fundamental way. As the science popularizer John Gribbin puts it, "nature seems to *make the calculation* and then present us with an observed event."

Meanwhile, computer science has demonstrated ever greater success at "modeling" the behaviors of natural phenomena. That is, by programming a computer with a series of step-by-step instructions for taking one set of information (say, the position of an electron) and changing that information according to a mathematical formula, computer scientists have been able to simulate on the computer monitor the same puzzling behaviors observed by the physicists in the laboratory.

At some point in the development of both physics and computer science we could begin

to speak of a convergence. Physicists became more and more convinced of the essential mathematical nature of "particle" behavior, and computer scientists became more and more confident of their ability to mimic the natural world through the strict mathematical rules of computer programming.

It was left to an unorthodox scientist whose career straddled both physics and computer science to put two and two together and suggest that there might be a very good reason for this convergence: it might be that the physicists are actually studying some underlying computer program, while the computer scientists are "reverse engineering" that same program. That is to say, it might be that the natural world as we know it is actually a simulation being run on a computer, and that the computer scientists' programming is actually a kind of re-invention of the existing programming that generates the simulation that we know as our universe.

The physicist/computer scientist who first articulated the connection is Edward Fredkin. Fredkin started his career in the early 1950s as one of the original computer hackers on one of the original computers. He helped to establish one of the world's most prominent research laboratories in computer theory at MIT, and he also found time to study with some of the greatest physicists of our time, including the Nobel Prize-winning theorist Richard Feynman. In his work, Fredkin made fundamental contributions to both disciplines, frequently driven by his unwillingness to accept conventional wisdom in either field. Chance and a native curiosity had placed Fredkin in a unique position to discover the Rosetta Stone that would connect the seemingly unrelated fields of physics and computer science.

The link for Fredkin turned out to be cellular automata—a method of programming according to a small number of simple rules which, when repeated over a large number of cycles, can develop the same dense complexity we observe in the physical systems of

the natural world. Cellular automata programs have been written to mimic the behavior of gas volumes, electrons traveling down a copper wire, ant colonies, and most famously the evolution displayed in the "Game of Life." Fredkin saw applications of the cellular automata computer architecture everywhere he looked in physics. He began to believe that the match couldn't be a mere coincidence, and he formed the idea that has come to be known as the "Fredkin Hypothesis": the universe is a computer, programmed according to cellular automata principles. In his seminal papers on the subject written in 1992, Fredkin outlined a conceptual basis for harmonizing the finite, digital and deterministic world of computers with the seemingly infinite, continuous and random world of quantum mechanics. With that stroke, Fredkin offered the prospect of a new world-view.

I came to essentially the same conclusion as Fredkin by a somewhat different route. I grew up in the church and readily accepted the moral and social teachings of Jesus. However, I also grew up in the scientific age and I could not easily accept those parts of the scriptures that spoke casually of physical miracles and other things that were obviously impossible in the real world. In my twenties, I underwent something of a conversion while meditating on the resurrection of Christ. Rather than directly asking the question whether such a thing was possible, I asked only what it implied for the physical world if Christ actually had risen from the dead. In an instant, the world to me was transformed from the strictly scientific matrix of cause-and-effect into a manifestation of the word of God. The vision, in brief, was that a tree was not a tree, a stone was not a stone, unless God willed it to be. For many years, this thought remained with me without any basis apart from revelation. Then I became oddly fascinated with the operation of quantum mechanics.

The most widely credited interpretation of QM holds that there is no underlying physical existence associated with the fundamental

units of our world. According to this interpretation, we may examine the world in closer and closer detail to find what lies beneath, and we will find that the math is the bottom layer. Making no connection between this bizarre concept and my earlier vision, I resisted it. I searched for the gears and wheels below the surface of this material world, which I still thought of, at some level, as real—as having significance in itself.

While puzzling over a particular quantum mechanical conundrum—the effect of conscious measurement on some properties which were previously known—it occurred to me that this could be analogous to the inconstant qualities of computer variables. Since no other conceptual model of the workings of QM was offered by any of my texts (the eminent physicist Erwin Schrödinger once suggested that no such conceptual model is available to the human mind), I latched onto this "interpretation" of the physics: the universe is a computer program. I then re-read all of my source material and found nothing contradicting the interpretation; in fact, I found that a great deal of the inexplicable was thereby explained. I then began to think in terms of a convergence.

"In the beginning was the Word. And the Word was with God and the Word was God. He was with God in the beginning. All things came into being through him, and without him not one thing came into being" (John 1:1-3).

Further reading in Digital Physics

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