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# *The State of Materialism:*

*How the idea of a clockwork universe is being displaced by a universe of uncertainty and freedom*

A Review by Jennifer Bayne Kile

*The Matter Myth: Dramatic Discoveries that Challenge Our Understanding of Physical Reality,* by Paul Davies and John Gribbin

In their book, *The Matter Myth: Dramatic Discoveries that Challenge Our Understanding of Physical Reality,* Paul Davies and John Gribbin confidently pronounce that "Materialism is dead" (13). The mechanistic concept of the universe is dying and taking its philosophical aspects with it to the grave. While a mechanistic paradigm was obviously helpful in many ways, the authors maintain that new discoveries are forcing the conception of a new paradigm that will have wide-spread ramifications. Davies and Gribbin take the educated layperson through the changes in the scientific paradigm and suggest that a self-organizing, open, wholistic universe is replacing the Newtonian view.

The book highlights the specific areas where work is being done which is causing or signaling a paradigm shift. From explaining basics about particles like electrons to the theories surrounding strings and wormholes, the authors indicate how these are part of the changing vision in science. For those with experience in these areas, the book is not likely to be revelatory. But for newcomers to the field, the explanations are given clearly, with the mathematical explanations left out and simple diagrams put in.

The authors also maintain that along with this paradigmatic shift comes a change in priorities which affects more than the discipline of science. The mechanistic worldview led to the idea that accumulation of material was important. But the authors believe that information and organization will be the new catch phrases of the era, supplanting the more materialistic view. The most controversial part of the book is not the illustration that a shift is occurring, but predicting where it may go. Will organization and information replace materialism, or will we merely consume and use those things for our material gain? Can the paradigm shift have the kind of effect Davies and Gribbin hope for?

Throughout the book, Davies and Gribbin touch briefly on the historical figures responsible for various discoveries and bring life to the account by telling stories surrounding the discovery. In one example, Scotsman John Scott Russell chases down on horseback a wave phenomenon that later scientists would characterize as a soliton. Some of the historical judgments or summaries are thin, provoking a wince from those who know that particular stories are laden with more controversy than is acknowledged, but the reader knows that the book is intended as a general overview.

Davies and Gribbin began by addressing a few basics, such as what paradigms and theories are, and how they relate to reality. A scientific layperson myself, I found the discussion a helpful reminder that many scientific investigations are mathematical or theoretical ones. I should not assume that people are seeing or detecting entities such as black holes, even if they regularly appear on Star Trek or in Science Fiction novels. Good theories are just that. And paradigms can be helpful without reflecting reality perfectly. Seeing through a mirror dimly is a step towards seeing things clearly. For

example, in chapter 5, the authors illustrate how incorrect models can still lead to discoveries. In his attempts to work on combining quantum mechanics with Einstein's special theory of relativity, Paul Dirac ran into a problem concerning negative energy states. He proposed an invisible sea of negative energy, a model which turned out to be wrong but allowed him to propose the idea of a positron. This led to the discovery of the positron by Carl Anderson in 1932.

The authors get into the specifics of their thesis by discussing systems that defy the old paradigm of a mechanistic universe. Because of new ideas such as quantum mechanics and chaos theory, the idea of a clockwork universe is being displaced by a universe that has a level of uncertainty and freedom. Nonlinear systems give rise to unpredictable results, and an analysis of the parts is insufficient to explain the whole system.

Davies and Gribbin discuss the difficulties in understanding seemingly simple concepts such as space and time. Describing space as absolute and time as an arrow may be common sense, but doesn't reflect the way science has reconceived these notions. In fact, the two concepts are tied closely together, forming a 4-dimensional spacetime. This is difficult to visualize, and the authors admit that understanding time is still a mystery. At this point, the common sense version of time is still practical to use, even if it has limits.

On the subject of time, the authors go on to discuss the beginning and end of the universe, and their relationship to one another. Theories from antimatter to cosmic strings are presented. Chapter 7 is appropriately titled "Quantum Weirdness" as Davies

and Gribbin describe quantum tunnels and intelligence, multiple universe theories, and the possibility of gaining information about multiple realities.

Having discussed ways in which the previous theories challenge the mechanistic universe, the authors move into discussing the idea of a network concept of the universe by extending quantum mechanics into field theory. The universe becomes a unified group of interactions. One of the obstacles to having a unified theory of the universe has been the difficulty in linking gravity to quantum mechanics. Will superstrings show the way? The authors are not certain but are hopeful.

Black holes, wormholes, time travel – these thought experiments illustrate ways in which people are able to play with and test the laws of physics. As Davies and Gribbin near the end of their work, they speculate on these theories and discuss how they point to the decreased importance of matter in the new paradigm as the major activity occurring at the quantum level gains significance.

Davies and Gribbon conclude by presenting a few issues confronting contemporary scientists, such as the mystery of life and the search for extra-terrestrial intelligence. The Gaia hypothesis, the idea that the earth is a single living organism, as opposed to a machine, blurs the line between living and non-living and presents the earth, perhaps event he universe as interdependent. Under the ideas of complexity and self-organization life may be more prevalent in the universe than previously thought, and may or may not resemble life on earth. Attempts to find other life in the universe will prove enlightening, one way or another.

One last things worth mentioning is an interlude earlier in the book where Paul Davies describes his own difficulties in understanding and envisioning the theories

discussed by Gribbin and himself. He writes, " . . . the reality exposed by modern physics is fundamentally alien to the human mind and defies all power of direct visualization." It is by giving up the need for perfect comprehension that we can use the models available to use. This is comforting for those of us enthralled but intimidated by modern science. Davies reminds us about the difficult nature of the discipline while he and Gribbin tell us how these difficult theories might be affecting our world.

*The Matter Myth* is a solid, readable introduction to some of the theories of contemporary science and ways in which they contribute to changing the scientific paradigm. What remains to be seen is how these changes will affect the popular worldview. Some terms are becoming quite common, like black holes and superstrings, and make appearances in modern literature, television, or film. But the far-ranging, philosophical effects are the real concern. Will information, organization, complexity, and unity become the new pillars in our worldview? As the authors say, the picture is not complete, but promises to be fascinating.