

BOOK REVIEW

Our Mathematical Universe: My Quest for the Ultimate Nature of Reality by Max Tegmark. New York: Alfred A. Knopf, 2014. 424 pp. \$30 (hardcover). ISBN 978-0307599803.

Max Tegmark is a well-known physicist who has authored or co-authored more than 200 papers on the subjects he writes about in *Our Mathematical Universe* (OMU). In the opening chapters of OMU he takes us on a journey with often humorous anecdotes into *our* universe as if it were only one of an infinite number of parallel universes—a subject I wrote about in 1988 (Wolf 1988)—that I believe the author says consists of what he labels as *external reality* (ER). After taking us on this journey into our own known universe, he points out why it is that we don't see these other universes in our everyday reality we experience as “out there.” It is due to a discovery he made (but was scooped by other physicists) called *decoherence theory* (for those of you a little more adept at quantum physics, this theory shows how density matrices get stripped of their off-diagonal terms when interactions with the environment are taken into account) that shows how ordinary but often invisible and uncontrollable environmental processes (like cosmic rays and neutrinos) as well as ordinary processes such as air movement and heat tend to spoil the many interference effects that parallel universes would indicate as present in our everyday world. This doesn't throw away the existence of parallel universes; it just makes them hard to see. Nevertheless, they are there.

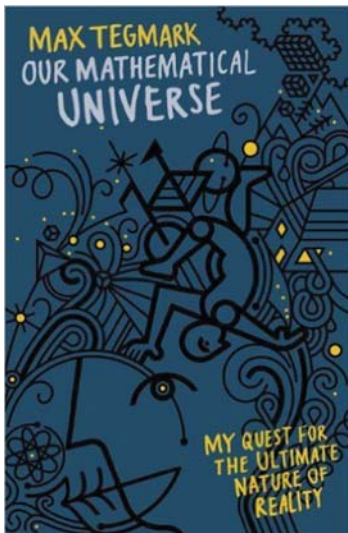
The middle-to-end chapters (8, 9, 10, 11) deal with the subject's title. My review forward concentrates mostly on these chapters. Here is how I see them: We ourselves are entwined into ER in two distinct ways that Tegmark labels as: *consensus reality* (CR) and *internal reality* (IR). Tegmark believes that the parallel-universes interpretation of quantum physics is the best description of how ER works to answer what Douglas Adams (Adams 1983) called the “ultimate question of life, the universe, and everything,” namely, how CR arises from ER. As Tegmark sees this problem: It is the job of physics to explain how CR arises from ER and the job of cognitive science is to derive IR from CR. In brief, he believes, as I would suspect many of us do, that $ER \Rightarrow CR \Rightarrow IR$. Or, in ordinary language, IR is a subset of (i.e. implies) CR, which in turn is a subset of ER which

holds them both. Thus it is entirely logical that ER contains elements of reality that transcend our beliefs and observations found in CR about ER and our mental representations, dreams, hopes, and thoughts, etc., found in the IR, of those beliefs and observations found in the CR. Perhaps Bishop Berkeley would have put it the other way round with $IR \Rightarrow CR \Rightarrow ER$, with perhaps the complete vanishing of ER altogether since no one has any idea of what it “really” is. Tegmark’s belief is that the ER is Mathematics (capital M), pure and not so simple.

The author writes OMU in a style I admire and in fact have used myself in my many books—one of personal, anecdotal, and humorous description of a rather resoundingly full account of our present CR physical view of the yet unmappable, and probably unimaginable, ER. As he now resides at MIT as a tenured professor, he includes such meanderings into the question of consciousness and the subject matter of OMU fearlessly, although he himself faced challenges from unnamed established professors who emailed him that he, in his academic career, “should stop or you’ll ruin your career” warnings, and indicates how the boundary separating mainstream science from such “arcane” subjects as witchcraft, telekinesis, alchemy, low-fat diets, and creationism has continually shifted and will do so in the future.

Having said that, I now wish to laud Tegmark for having the courage to even include the subject of mind and consciousness in his book, since little is known that would indicate that IR operates from a purely mathematical basis at all, if any. In fact, Penrose (1989, 1994) in his books argues for the contrary view. So what the author is really referring to is the remarkable success physics has had in gaining a foothold, a CR, on the ER through the use of mathematics. Hence OMU is really Tegmark’s CR map of ER that has been drawn with mathematical concepts, and indeed the map is strewn with great details that are very accurate within certain specific areas but are certainly not overlapping—the biggest gaps in the map, as Tegmark willingly points out, are between the fields of the general theory of relativity and quantum physics. So, as Alfred Korzybski would put it, has the author confused the map with the territory?

Tegmark posits that the universe, the big multiversal territory consisting of parallel universes galore, is ER, which in turn is Mathematics (capital M) not just made describable by mathematics; but instead ER and Mathematics are completely equivalent, $ER \Leftrightarrow M$ —a kind of a possibly “madcap” Platonic universe of ideals of course completely expressible as mathematical concepts. In brief, ER consists of M in some way that we mortals can only describe by the mathematical tools we have come up with in our meanderings through the unknowable wilderness of the ER to make



our maps, consisting of CR, which we visualize as IR.

Maybe, however, there is something clearly missing in all of this that the author relegates to the universe of the cognitive scientists; namely conscious experience. Not just the waking conscious experience, but the continual ongoing conscious experience of life itself as certainly felt by me (even when sleeping, but not when under deep anesthetics) and I would assume by all living animal creatures and even perhaps living plants. And what of art and deep spiritual experience? Certainly mathematics can be viewed as forming the skeletal structure of all of art including music, sculpture, painting, poetry, and

other forms of art as our digital age and devices so aptly indicate. Clearly there is a non-mathematical world of experience that is fleshed out from this skeleton to provide not only joy and appreciation, but also a sense of the mystery of all that is, even the mystery of the joy of mathematical discovery.

Would an overlap of the mathematics of quantum physics and the general theory of relativity explain the mystery of such conscious experiences? Decoherence theory would indicate that conscious experience plays no role in quantum physics, and from this one would think plays no role in ER other than being a subset of CR. It may indeed play no role in ER, if in fact there is no such thing as ER and in the Berkeleyan sense all we have is $IR \Rightarrow CR$. Thus it is that mathematics is a derivation from a fundamental chaotic Mind (with a capital M) that arose as a way of dealing with its own chaos by attempting to place events in formal order, resulting in humans thinking about the universe in terms of mathematics and physics in order to better survive, for example. This chaos may itself be necessary in order that anything possibly dreamed of in IR may come to exist as CR. Thus even the thought of an abstract realm called the ER may be constructed, as Tegmark has admirably done.

OMU is a big book (more than 400 pages), and it is indeed very well-written for both the nonphysicist and physicist alike and has gained the support of many well-known physicists, as I garner from the back-of-the-book blurbs. It is well worth a read if you are at all curious about how today's physicists are breaking ground at the frontiers of the physical

universe both figuratively and ontologically, and as well striving to understand consciousness. It may even make you marvel at OMU as both a grand skeletal construction and a remarkable creation from the IR.

FRED ALAN WOLF

Parallel Universes: The Search for Other Worlds

The Dreaming Universe: A Mind-Expanding Journey Into the Realm Where Psyche and Physics Meet

The Spiritual Universe: One Physicist's Vision of Spirit, Soul, Matter, and Self

The Spiritual Universe: How Quantum Physics Proves the Existence of the Soul

Mind into Matter: A New Alchemy of Science and Spirit

Time-loops and Space-twists: How God Created the Universe

References Cited

- Adams, D. (1983). *Life, the Universe and Everything*. New York: Harmony Books.
Penrose, R. (1989). *The Emperor's New Mind*. New York: Oxford University Press.
Penrose, R. (1994). *Shadows of the Mind*. New York: Oxford University Press.
Wolf, F. A. (1988). *Parallel Universes*. New York: Simon & Schuster.