

## Is God a Mathematician?

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How many have seen the new film *Hidden Figures*? It's based on the lives of three African-American women who helped NASA compute orbits for John Glenn's space flight in 1962. It's based on actual events. A takeaway message is that math and technology can act as **powerful levelers** against entrenched social ills like sexism and racism. It's an uplifting message for our troubled times.

I was inspired to give this reflection after watching a film last summer called *The Man Who Knew Infinity*. It's a biopic of Indian mathematician Srinivasa Ramanujan, who was born in British India in 1887. He was a math prodigy who seemed to pull results from thin air. However, this gift made a terrible fit with his social circumstances, and so he was forced to take menial jobs. But eventually his genius attracted recognition, and finally he was invited to work at Cambridge University with the great English mathematician G.H. Hardy. Ramanujan proceeded to rock the world of mathematics! His work is still at the leading edge of both math and physics, nearly a century after his untimely death at the age of 32. His candle shone briefly but brilliantly.

When Ramanujan was asked about his amazing intuition, he explained that his Hindu family goddess delivered visions unto him. In these visions he would see scrolls unfolding, revealing startling equations. He summarized this by saying, "An equation for me has no meaning unless it expresses a thought of God." He was a devout orthodox Hindu, but he once remarked that "all religions seemed equally true" to him.

If Ramanujan were alive today, his brain would be hot property! Neuroscientists would be eager to tease out its secrets. For example, how differently was his brain wired from yours or mine? Which regions became most active during his visions? Of course, nothing like that was remotely possible at the time, and his brain has long since reverted to star-stuff.

At this point, you may be thinking that any scientific explanation for Ramanujan's gift would destroy the beauty and mystery of his religious interpretation. However, I want to make the case that a sense of beauty and mystery in the universe can be preserved, and even enhanced, by submitting to scientific inquiry. My case goes as follows.

First of all, math is the universal language of science, and science reveals the beauty and mystery of nature! Scientists have long puzzled over the "unreasonable effectiveness" of mathematics in describing the physical world. As Einstein put it, the most incomprehensible thing about the universe is that it's comprehensible. Today, leading physicists are exploring the hypothesis, suggested by string theory, that we live in a holographic universe, something akin to living in a giant quantum computer.

In addition to its role as the language of science, math has an intrinsic beauty. G.H. Hardy wrote that "The mathematician's patterns, like the painter's or the poet's must be beautiful; the ideas, like the colors or the words, must fit together in a harmonious way."

If you peek behind the curtain of the control booth of consciousness, you won't find a miniature version of "you" pulling levers and blowing smoke. Instead, you'll find mathematics embedded in DNA as finely tuned **information**. Information capable of generating the astonishing phenomenon of consciousness.

So are we just walking, talking mathematical constructs, as physicist Max Tegmark proposes in his book *Our Mathematical Universe*? Or put another way: Can consciousness be understood as an emergent property of insensate star-stuff? Full disclosure: It will be quite a long time before we have a detailed understanding of the human mind in terms of mathematical models or computer simulations. But we've begun that journey, and there's no obvious reason why it couldn't succeed in, say, two or three decades. Meanwhile, a leading model of consciousness, called Integrated Information Theory, can be interpreted as a scientifically grounded version of the ancient concept of **panpsychism** -- the idea that the universe is permeated by varying levels of mathematically defined consciousness. If you want to check this out, I recommend a slender volume by neuroscientist Christof Koch, called *Consciousness: The Philosophical and Scientific Investigation of a Hard Problem*.

Consciousness is such a profound mystery that it is hard even to define. However, there is widespread agreement that consciousness includes a sense of self-reference, in other words, ego. A baby enters the world without any sense that it is separate from its environment, but it soon figures things out and develops an ego. How a person manages their ego then becomes an important aspect of their personality.

Now to relate this back to panpsychism: If the entire universe is conscious, then one could logically expect it to have ego, as evidenced by an ability to talk about itself. But if the universe is mathematics, the question becomes, Can mathematics talk about itself, and if so, with what consequences?

The late mathematician Kurt Goedel found a way to construct and study self-referencing mathematical statements. Yes, equations can actually talk about themselves. To his amazement, Goedel found that this form of self-reference exposes a fundamental problem. To wax technical for a second: He proved that finite axiomatic systems are either incomplete or inconsistent. That may seem profoundly unsettling, but it tends to reinforce the concept of panpsychism. To wax poetic: If God is a mathematician, then out of logical necessity, he/she/it created an imperfect universe.

Does this situation have any parallel with the individual ego? A normally functioning ego allows us to cope with daily challenges, but it also causes suffering whenever we allow ourselves to wallow in self-pity. Thankfully, during meditation the ego relaxes its grip and yields to a sense of peace and universality. I find that reflecting on a panpsychic mathematically imperfect universe facilitates that process.

When I first heard the question, “Is God a Mathematician?”, in the title of a book by astrophysicist Mario Livio, I rejected it out of hand. However, it’s an idea that can grow on a person, whatever one may conceive God to be. Scientists have long puzzled over the unreasonable effectiveness of mathematics in describing the world. I would like to add my own variation, the **unreasonable seductiveness** of mathematics as a source of inspiration. In that spirit, I offer the following assessment of mathematics as a source of spiritual inspiration:

**Open-ended:** Whenever a hard math problem is solved, such as Fermat's Last Theorem, the door it opens leads to a hallway with still more unopened doors.

**Culture-independent:** Math is oblivious to skin color, gender, nationality, what have you. Go see *Hidden Figures!*

**Eternal:** For example, a trillion years from now, numbers will have the same significance they have always had.

**Ubiquitous:** Math is woven into the fabric of the universe.

**Abounds with beauty and mystery:** As outlined earlier.

**Is imperfect:** Stephen Hawking speculates that physical theory can never be complete, as a consequence of Goedel's results. But Hawking finds this a heartening prospect, because it implies a future of never-ending discovery.

**Easily explains the existence of "evil":** Thanks to quantum randomness, whatever can happen, will happen, given enough time and opportunity. We're forced to take the good with the bad, the yin with the yang, during this strange accident called life.