

## LIVING INSIDE THE MATH

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We sometimes associate our deepest knowledge of nature with Indigenous sensibilities and wisdom. Ancient people experienced, and many Indigenous people today experience, intimacy with nature, a mysterious abiding cosmic presence in all, and that Earth in all its dimensions is alive.

The “New Story,” is however, not only these sensibilities and understandings; it is a scientific story that could not be known until late in the 20<sup>th</sup> century, and thus for only a snippet of time in human history and one barely noticeable in cosmic history. Yet, that the New Story has come to be known by *Homo sapiens* is a monumental achievement in the entire history of the universe; so says Brian Swimme in *Cosmogenesis*.



This new scientific story can be, and often is, understood as a product of empirical observation and mathematics.<sup>1</sup> The empirical part is easy to

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<sup>1</sup> There is more of course, including the scientific method and both deductive and inductive reasoning. The scientific method is, however, not relevant to the origin of the universe, theories concerning which are not falsifiable.

understand—it is what we know through the five senses and through instruments that measure things that would be available to our five senses if we had greater sensitivity. The math part may seem easy to understand too, it is arithmetic plus higher math. You one might wonder what mathematical cosmologists “know” through this *higher* math.

I certainly have. While adept at math and educated in integral and differential calculus, I have not kept up with math and can't remember the meaning of the symbols in complex equations. I read books on physical cosmology and skip over the formulas. I ask myself, “What more would I know if I knew the math?” From Swimme's auto-cosmology, I now have a sense of what I would know.

## Mathematics

Witness Freeman Dyson's and Swimme's conversation in the book as they try to find the right everyday language to describe the “fine-tuning” of the universe.<sup>2</sup> They agree that the terms “anthropic principle” and “fine-tuning” are “bad,” the latter because in Swimme's words: “As soon as the phrase ‘fine-tuning’ is used, people slide right back into a Newtonian mindset of an unmoved mover who has ‘fine-tuned’ a universe of objects to work as it does. Which misses the whole amazing truth we've discovered” (81).

In response, Dyson shrugs his shoulders and says, “It's early . . . eventually we'll get a deeper mathematical understanding, and that's when we'll get the English right.

(Really? Once we get the math right we will get the ordinary English language that describes the math?)

In this conversation, Dyson and Swimme labor over what the universe knows, in particular over what it means to say the universe must have “known we were coming.” As I read their dialogue, I labored over what math knows . . . perhaps over how the universe knows through math.

I had known before reading the book that Swimme (whom I will now call by his first name, Brian) at a point in his life had become disenchanted with the

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<sup>2</sup> [Fine Tuning is the idea] that the occurrence of life in the universe is very sensitive to the values of certain fundamental physical constants [sometimes known as the cosmological constants] and that other values different from the observed ones are, for some reason, improbable. If the values of any of certain free parameters in contemporary physical theories had differed only slightly from those observed, the evolution of the universe would have proceeded very differently and life as it is understood may not have been possible.

academic study of physical cosmology. I imagined that he had moved from the bland world of math to, through his encounters with Matthew Fox and Thomas Berry, the enchanted world of philosophical cosmology and, one might say, narrative cosmology—the telling of the story of the universe.<sup>3</sup> Further, which I will cover later, I thought Berry learned the New Story from Brian Swimme.

I was wrong about Brian. In Brian’s auto-cosmology I found that early in his life he learned, absorbed, became entranced with, was set on fire by the New Story from math long before he met Fox and Berry. Brian had his first job as a professional mathematician at the University of Puget Sound in 1978. In his inaugural lecture there, following a talk by Professor Delores Maro featuring the Greek poet, Hesiod, depicting the *primal light as divine*, Brian launched into an account of how Arno Penzias and Robert Wilson working at Bell Labs in New Jersey had, in 1964, confirmed the presence of microwave background radiation and thus the *scientific “primal light.”* Brian reports that as he was presenting this, his “Heart was beating and my visual field pulsated. . . . with each sentence I [grew] more excited” (17), much more excited than his audience.

The difference between him and his audience, I believe, is explained by the story he tells about the student Oona Fitzgerald, who had scored a perfect 1600 on her SATs. Oona attended a class where Brian lectured on Einstein’s special theory of relativity and in doing so filled the blackboard with mathematical equations regarding the invariance of the space-time interval. Oona, then surprisingly asked, “What is the meaning of life?” Brian recalled having asked one of his professors this same question and that the professor said, “Science doesn’t have any meaning,” leaving Brian feeling put down and foolish (24).

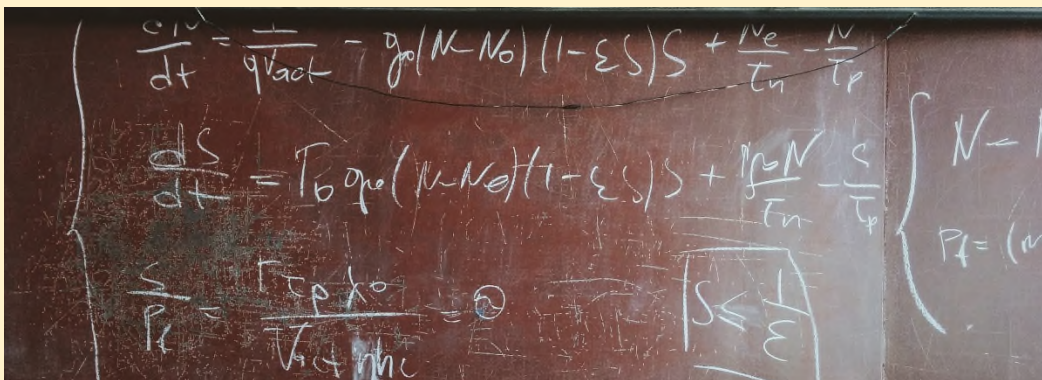


Photo by [Roman Mager](#) on [Unsplash](#)

Brian, in contrast, took Oona’s question seriously. He was already *living* the New Story and it had profound meaning for him. He said to Oona that we do not know our true identity. We think of ourselves as Chinese or American, male or female, but these are secondary. In the deepest sense, we are the universe. The

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universe made us. And then he blurted out, “*To take this in, you need to ride inside the mathematical symbols*” (24, italics added).

Brian didn’t know then, and probably could not exactly put into language today, what he meant by this. Yet he repeatedly evidenced in the book that he was living *inside the math* (mostly). The equations disclose a universe to him in a way that I will never know. Yet, I gained an understanding of this type of knowing that I had not had before reading the book.

Let us for a moment digress and reflect on “math.” Brian mentions Alfred North Whitehead as being one of his sources and he is one of mine too. Brian’s colleague, Matthew David Segall, teaches Whitehead at the university where Brian teaches, the California Institute of Integral Studies. I recently read a paper written by Segall that covered the issue of living *outside* and *inside* the math.

In the late 19<sup>th</sup> century, certain philosophers sought to develop the same precision in philosophical thought as that being achieved in positivistic science. Gottlob Frege attempted to take any intuitive element out of arithmetic and establish it as purely logical. This is a task Whitehead and his PhD student, Bertrand Russell, also took up when they wrote their famous three-volume series on the principles of mathematics—*Principia Mathematica*, volumes 1, 2, and 3. After completing the project, Whitehead acknowledged its failure, essentially on the ground that the project excluded the inside of math, which takes some explanation. As Segall writes, “[Whitehead] problematizes his and Russell’s attempt to reduce arithmetic to logic by defining numbers as static groups. ‘In this way process seems to [have been] absent in our treatment of arithmetic.’”<sup>4</sup> “Process” is at the heart of Whitehead’s philosophy of organism—and in Brian’s and Berry’s thought as well when they speak of a “time-developmental universe,” and a “communion of subjects.” For Whitehead, Brian, and Berry math participates in a world in motion.

Segall continues, “Whitehead sought in his later metaphysics a harmony between the ‘life and motion’ of process and the ‘changeless world of form’: The philosophy of organism thus construes ‘the mathematical modes of fusion, such as ‘addition,’ ‘multiplication,’ ‘serial form,’ and so on . . . as forms of process.’”<sup>5</sup>

The professor who told Brian that “science had no meaning” was thinking of science, especially of mathematical cosmology, as a world of formal logic that provides no insight into the world of motion in which we live and seek meaning. As Whitehead observes, however, while that detached world of static form is an

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<sup>4</sup> Matthew David Segall, “Whitehead’s Philosophy of Organism: Turning Idealism Inside Out,” 15 (unpublished paper, 2023),” in part quoting Alfred North Whitehead, *Modes of Thought* (1938, repr. New York: The Free Press, 1968), 97.

<sup>5</sup> Segall, 17, in part quoting Alfred North Whitehead, *Modes of Thought* (New York: The Free Press, 1938), 97.



aspect of math, we rarely deal with math in a purely abstract manner.<sup>6</sup> A very simple example is that “two” cats is not the same as “two” dogs; and “two cats plus two goats” in real life is more than “four” animals and is likely to be very messy indeed.<sup>7</sup>

We might imagine that when Oona asked, “What is the meaning of life?” after Brian’s lecture on Einstein’s special theory of relativity, she was caught up in the immensity of it all—the meaning of form (math) in the midst of process (the swirl of relative motion) in a universe of life and motion. And Brian rightly picked up on the conflict between “life and motion” and the “apparently changeless world of mathematical form,” when he invited Oona to “live *inside* the math”—by which I would venture he meant live in the ineffable harmony between the two just as when one listens to a piece of music one hears harmony in the abstract individual notes of a single chord which is followed by yet other chords blending into a song, all together constituting a movement (process), not a succession of discrete notes (form).

This quote from Segall’s paper, helps in understanding this:

Number and geometry thus map remarkably well to patterns thought finds exemplified in the physical sense world. But the effort to reduce mathematical intuitions of such patterns to deductive logical procedures betrays a lack of appreciation for the creative unrest introduced by process. The world-rhythm is not a bloodless dance of digits computing a closed chain of causes but a living harmony open to emergent evolution.<sup>8</sup>

After Whitehead and Russell completed their work on *Principia Mathematica*, Russell and much of modern science and philosophy continued to pursue an understanding of science, and its adjunct math, as being logical and as formalistically interpreting empirical “facts” disclosed to us by the senses. In criticism of this, Segall writes:

[This] isolation of the atomic facts of sensibilia from their relevance to the overall texture of experience stands in conflict with Whitehead’s sense that

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<sup>6</sup> “We hardly ever apply arithmetic in its pure metaphysical sense, without the addition of presumptions which depend for their truth on the character of the societies dominating the cosmic epoch in which we live.” Alfred North Whitehead, *Process and Reality: An Essay in Cosmology*, corrected ed., ed. David Ray Griffin and Donald W. Sherburne (1929; corrected ed., New York: The Free Press, 1978), 199.

<sup>7</sup> “All mathematical notions have reference to process of intermingling. . . . There is no such thing as a mere static number. There are only numbers playing their parts in various processes conceived in abstraction from the world-process [i.e., the universe-process].” Whitehead, *Modes of Thought*, 93.

<sup>8</sup> Whitehead, *Process and Reality*, 17.

every proposition, in proposing a finite fact, must implicitly refer to a cosmic background exhibiting some systematic metaphysical character. The complete analysis of a factual proposition must include the general character of the universe required for that fact.<sup>9</sup>

Throughout the first part of his book, Brian writes about the character of the universe he encountered through math. As he studied, worked on, or presented long equations “describing” the universe, he was filled with and expressed amazement and appreciation of beauty. In his inaugural lecture at the University of Puget Sound, he exclaimed, “Don’t you see . . . *don’t you see?!?*” “We are in *physical contact* with the very origin of the universe”! (17). When he responded to Oona’s questions, he, working himself into what he described as a “trance,” said, “The universe’s creativity is happening now. The exact same dynamics are at work. Our bodies churn with creativity rooted in the beginning of time.” Oona must have felt herself going into her own trance, for on hearing this she announced she was changing her major to physics.

Reflecting on the class with Oona, Brian talks with his wife, Denise, and observes that he and his students had been bathed by the primal light of the universe but until now they (“they” being all humans including his students) could not know it was present.

We were completely ignorant of its existence. But now, because of mathematical science, we were able to listen to the story these ancient photons tell.

That’s why mathematics exists. And philosophy; and ideas in general. Ideas are how humanity evolves. [Think about how different humans were after they understood Copernicus’s discovery that Earth spins around the sun.]

It’s the same now. This new idea of the universe creating itself through time is transforming humanity. It blows my mind. . . . The only thing that separates us from our most primitive ancestors are *ideas!* Philosophical and mathematical and technological *ideas*. Isn’t that incredible? Humans from the Stone Age are *identical* to us *except for ideas*. (30-31)

In Chapter 16, Brian writes about attending a lecture given by Professor Sheldon Schlimmer who filled five blackboards with equations related to the Big Bang and then he became lost in thought carried into his own mind in search of further insight. After fifteen minutes of waiting, Brian’s mind began to roam. He realized he was doing what he always dreamed of, “doing the mathematics of

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<sup>9</sup> Segall, 21 (footnote omitted).

cosmic evolution.” He thought of the lineage of math going back to Pythagoras that had brought him to this moment. And then:

A shift took place. It came to me that these equations as they existed now in my mind were *the mathematical form of the early universe itself*. . . . From the perspective of the brain, this meant that the complex flow of electricity in my nervous system, in complicated ways, was somehow related to the equations of the early universe. . . . I suddenly realized that the nature of the early universe was shaping the flow of electricity in my nervous system because I happened to be reflecting on the mathematics of the beginning.

What I understand Brian to be saying is that our human minds are so patterned and energized (by the universe itself) as to be able to understand the mathematical form and flow of the universe through—and here’s the real mystery—human symbolic consciousness and conscious self-awareness.

### **Philosophy, Poetry, and Song**

While Brian was able to grasp the New Story through math early in his career, he learned that he could not express the full reality of the New Story only through math. After his inaugural lecture at the University of Puget Sound, which was inspiring to him but not so much to his audience, Professor Maro called him out by asking if his use of “primal light” had been cunning or confusion—cunning if Brian understood the relationship between Hesiod’s use of primal light, of which Maro had spoken prior to Brian’s speech, or confusion if Brian had simply borrowed the expression without seeing the connection between ancient Greek philosophy and contemporary mathematical cosmology. Brian requested a conversation with Maro.

When they met, Maro said to Brian, “You suffer from intellectual arrogance. In your quest for the true cosmogony, you see no need to consult the works of philosophy or poetry” (20). She

quoted Aristotle’s summation of Pythagoras’s central insight as, *he harmonia ton sphairon*, “the music of the spheres” [and explained how Pythagoras] had discovered a fundamental relationship between mathematics and the order of the universe. . . . If the ratios of the frets [in a lute] were rational numbers, a feeling of harmony resulted. If the ratios were not, an experience of dissonance emerged. For these ancient minds, mathematics bridged the outer order of the universe with the inner qualities of mind and soul. . . .

The cosmos created music as harmonious as the Greek lyre.  
Everything in the universe worked together to give birth to song, a song  
utterable in the symbolic form of mathematics. (21)



[Pythagoreans Celebrate the Sunrise](#) (1869) by Fyodor Bronnikov

This conversation began a new journey for Brian and an expansion of his understanding of the meaning of the New Story and how to give expression to it. It was both more than math, because it needed philosophy and poetry for expression and also it needed connection to the reality of the multiple dimensions of the universe, and it was *just* math outside and in . . . “*you have to live inside the mathematical symbols.*”

### **Thomas Berry and Story**

Thomas Berry it turns out, to my surprise, *knew* the New Story before he met Brian. He met Brian in 1982 and Berry had written his famous essay, “The New Story” in 1978.<sup>[10](#)</sup> Berry didn’t know the math. He did know the science in broad strokes and he was a fountain of philosophy and poetry. His teaching of Brian built on that by Professor Maro and also Matthew Fox.<sup>[11](#)</sup>

Yet there was a distinct difference. As recounted by Brian, Berry emphasized telling the concrete story of the sequence of events empirically verified by science of the time-developmental universe, largely without embellishment or interpretation by philosophy or theology. Berry says, rather than a philosophical interpretation of the universe,

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<sup>10</sup> The first version of the paper “The New Story” was written and distributed in mimeograph form in 1978. Its first formal publication was as a chapter in Thomas Berry, *The Dream of the Earth* (San Francisco, CA: Sierra Club Books, 1988).

<sup>11</sup> When Brian left the University of Puget Sound, he went to teach with Matthew Fox at Mundelein College in Chicago, and through Matthew Fox he met Thomas Berry.



I prefer to work with the empirically verified history of the universe. With the actual phenomena of galaxies, planets, oceans, primates. I am drawn to the cosmological vision of Teilhard de Chardin who stays with the language of science as he constructs his interpretations of the universe. . . .

I am interested primarily in concrete events, especially the universe's major transformations. These provide the context for my work. (193-94)<sup>12</sup>

Berry commissioned Swimme, uniquely gifted as he was as a scientist (245), to be a cosmological storyteller (208), not to tell the “how” things happen but to tell “why” things happen (254). Berry uses the example of gravity: Science tells us how gravity “pulls” a rock to the ground; cosmology, including our experience of the unfolding universe, tells us of gravity as a force of attraction, a “community-building dynamic” that is fundamental (for Berry the “third basic law of the universe”). Gravity is needed to create stars and galaxies and planets, “to carry out the universe’s aim of constructing communities of every sort” (254) including Brian’s experience of love (attraction) that he felt when he met his wife Denise, which led to a community of marriage and family (259).

The cosmological story tells us that matter is not inert, the cosmological story tells us that the universe is a life producer—through the creativity of stars carbon is produced, and only in that way, and through carbon life comes into being.<sup>13</sup> Stars act, carbon acts, the universe acts. Through the death of stars in supernovas, more elements come into being. The death of the stars is an act of generosity. The sun pours forth its energy as an act of generosity. Scientific language tells how this happens but it is inadequate in itself for telling the reality of our experience of the universe acting (226-27). It is inadequate for telling of our own sentience and indeed that of our planet and universe (277).

Yet, Brian carried over from culture and his scientific training, some inclination to live the outside of math. With all of these experiences and all of these conversations with Berry, in Chapter 55 he struggles with how to interpret Einstein’s field equations which predicted precisely when and how a dropped rock would “fall.” With them, he could not explain to himself why a rock falls and doesn’t ascend or move sideways. In desperation, he concluded that only his experience that the rock falls explained this: “The dropped rock was more fundamental than the theory” (251). When discussing this with Berry, Berry affirms and expands on this insight: “Theories do not explain our experience, our

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<sup>12</sup> Berry encouraged Brian to make telling the concrete journey of the universe his starting point. As documented in the book, Berry instructed Brian on religion, culture, history, and philosophy, too.

<sup>13</sup> Cf., Swimme, 282, “There is no such thing, then as ‘lifeless matter.’ Matter in its very structure and dynamism generates life.”

experience explains our theories. . . . Our experience of wonder leads to our theories. . . . Our experience as living beings explains all of our theories” (255-56).

### **Cosmogenesis**

In the end, as Brian so well conveys in this book, the universe is cosmogenesis, a cosmos creating itself, a cosmos acting and evolving, and we are the universe in human form. We are the universe acting. We are invited to step into the universe, not act as if we are outside observers of the universe. We fundamentally know the universe through our experience and relate this to the concrete story of the unfolding universe as we have come to know it through science.

Even those of us who are not mathematicians, inevitably live *inside* the math of the universe. We do so because, we, like Brian, are constructed with those same (mathematical) patterns and dynamics that were present in the early universe; and we do so now in the early 21<sup>st</sup> century as participants in the New Story as it is expressed in science, in math, in philosophy, in poetry, in drama, in music . . . and not in any one of these alone.

The story of the universe is an incredible, energizing story, because the universe is incredible and energized. Brian and Berry—and I would bring in here Brian’s co-conspirators too numerous to name but certainly including Mary Evelyn Tucker and John Grim—believe that as this new cosmic story insinuates itself into culture through deliberate transmission and otherwise, it will bring about the energy and creativity for the next stage of the human journey and, thus, for the journey of the universe too. On this hangs the future. As Berry says, “We live in a time that offers a significance only matched by the birth of life itself four billion years ago” (276).

The story of the universe and our participation in that story brings us back into an alignment with the universe Indigenous people intuitively knew. Yet the New Story is not exactly their story revived. It is different.

*“This new idea of the universe creating itself through time is transforming humanity.” We know this through experience and through ideas—and experiences giving rise to, flowing from, and associated with those ideas—that only became fully possible to know in the late 20<sup>th</sup> century.*

*We live within the math . . . .*

If you know what I mean.