

The Thirst for Symmetry: A Story of You

By Kevin Fan

At the most fundamental level of reality, symmetry is nothing less than the defining feature of our universe—including the internal universe that is you.

Your journey from assortment of isolated particles to entropy-defying being has been long and circuitous. For billions of years, your constituent particles were separated from one another, scattered across impossibly distant stretches in the frozen abyss of space. Each emitting gravitational waves that propagated outwards in a symmetrical, expanding sphere, they strove despite their infinitesimality to be part of a larger collective: to attract, and to be attracted to others. When your particles fortuitously coalesced into you on a watery planet in the Milky Way Galaxy, they rejoiced: for those interminable years of seclusion would be replaced with the sheer uniqueness of constituting an integral component of a larger entity; the ineffability of *being*. Now, with every passing moment, your particles emit gravitational waves in unison, unified into the entity known as you, your sphere of attractive influence racing away from you at light speed back out to the vast unknown from whence your many parts once came.

But still you strive for greater symmetry: malcontents are we humans who, being whole, strive to be part. As the atheistic intellectual Ivan Karamazov proclaims through the parable of the Grand Inquisitor in Dostoyevsky's *The Brothers Karamazov*, "Men have always striven to be organized into a universal whole," their having "an unquenchable thirst for unity." Dostoyevsky perceives in us as individuals the desire for a Faustian bargain: the surrender of free will for the perfection of harmony, happiness, and an existence liberated from the debilitating freedom that forces you to choose, at every moment, between good and evil. The fear induced by this freedom is his prescient diagnosis to which the dictators of the twentieth century would come to prescribe totalitarianism. What Dostoyevsky may not have foreseen was the proliferation and fragmentation—of knowledge, authority, and ideology—characteristic of the twentieth century, replacing the dualism of his Christianity with the symmetrism of countless ideologies. This is the world in which you find yourself: like a pencil balanced perfectly upon its tip, susceptible to falling in any direction, you encounter the ostensible equivalence of a vast number of decisions, each one a step in a new direction: what to believe, which life path to choose, who to love. Looking up at the unfathomable night sky of your future with eyes still tender, do not many stars sparkle equally brightly?

In the midst of the existential chaos engendered by ideological symmetrism, there arises the universal yearning for music: a resplendently symmetric art form in its fundamental structure. From the Circle of Fifths, so essential to Western tonal harmony, to the recurring rhythms, phrases, and melodies endemic to it, the motifs of music reflect a balanced, Platonic vision of life, in which even the most chaotic of memories—those tiny universes populated with people, aspirations, and possibilities—sing their lines in counterpoint, achieving the harmonic coherence that you seek of your own life in retrospect. For yours is an existence broken of its symmetry, never to be restored, as you choose with every passing moment to let the pencil fall in one of infinitely many directions.



The creative impetus towards symmetry, as reflected in literature and music, appears to be primeval. Perhaps it is indicative of the striving towards the still grander symmetries underlying reality. Indeed, by the dictates of physics, symmetry underlies every interaction in our universe: a tenet codified in Noether's Theorem, discovered by the German physicist and mathematician Emmy Noether 101 years ago. The foremost principle underlying advances in theoretical physics over the ensuing century, the theorem states that for every symmetry in the laws of physics, there is a corresponding conservation law. To illustrate, the fact that the balls in a game of billiards have exactly the same collision trajectories on a table in your basement as on one in Antarctica implies the symmetry of the laws of physics upon translation across space, corresponding to the conservation of momentum. Similarly, that these collisions transfer exactly the same amount of energy whether you play yesterday or yesteryear implies the symmetry of these laws upon translation across time, corresponding to the conservation of energy.

Conversely, if physical laws were mutable across space and time, it would be conceivable for you to bounce higher upon a trampoline with each successive bounce, even having exerted no additional force yourself. What a strange universe that would be! The scientific method itself would break down, with the repeatability that is so essential to the verification of scientific experiments becoming impossible. Furthermore, fundamental scientific breakthroughs would come to a grinding halt, the existential consequences of which are all too harrowingly explored in Cixin Liu's *The Three-Body Problem*. Forsaken by a capricious universe in which general physical laws have become meaningless, the novel describes the descent of renowned scientists into nihilism and suicide, alienated by the absurdity of asymmetry. It is possible that in a world devoid of temporal symmetry, even your heartbeat—that comforting, immutable rhythm that speaks to you the intangible language of love, that is the most persistent reminder of your vitality until you are *you* no longer—would degenerate into the chaos of arrhythmia.



Symmetry is our preeminent tool with which to explore the universe, without which our attempts to understand nature would devolve to stabs in an eternal darkness. Nonetheless, though it has allowed us to reap immeasurable rewards aesthetically and scientifically, it will be the final resting place to which we inevitably return. By the theory of heat death detailing the ultimate fate of the universe, the universe shall attain by 10^{100} years into the future a state of complete symmetry: eternal uniformity throughout its vast expanse, all but empty in its abject sparsity.

As disparate particles you once came to be whole, so to disparate particles shall you return—flying irrevocably apart from one another for all time, never again to become part of something greater.