

The Consolations of Uncertainty

Time, Change, and Complexity

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It has become something of a commonplace, though one that remains insufficiently explored, to say that the longing for order, perfection, and certainty has deep roots in western culture (Rubino, 1993, 2000). That yearning received its first and perhaps most evocative formulation in Homer's *Iliad*. Achilles, the poem's central and paradigmatic figure, chooses to sacrifice his short life in exchange for an immortal glory that is free from change and decline. Here, in Achilles' words spoken at Troy, are the stark terms of the choice he must make:

*My mother Thetis, a moving silver grace,
Tells me two fates sweep me on to my death.
If I stay here and fight, I'll never return home,
But my glory will be undying forever.
If I return home to my dear fatherland
My glory is lost but my life will be long,
And death that ends all will not catch me soon.
(Iliad 9.412-16 = Homer, 1997: 171)*

Achilles also tells us that the kind of honor he wants will come from the god Zeus himself (Iliad 9.607 = Homer, 1997: 176). This is fitting, since the Homeric poems associate immortality and deathlessness with divinity: We humans are mortal, subject to death and age, while the gods, the immortals, live forever and do not age. Achilles' choice therefore involves giving up his humanity in order to bequeath a sort of immutable heroic essence to posterity.

Some 400 years after Homer, the longing for order, perfection, and certainty was given an explicit and definitive philosophical formulation by Plato, for whom our imperfect, mutable, and disorderly world is at best only a poor copy of an extraterrestrial world of perfectly ordered and immutable reality. It might be argued that Plato's rejection of our fallible and imperfect world stems from an agonizing disillusionment that struck him twice, first when he realized the corrosive failings of Athenian political life, and again when he saw his master Socrates, the best of the Athenians, condemned to death by his fellow citizens. Such a thing could not happen in a world given to truth and justice, and thus for Plato the world of truth and justice—the only real world—lies elsewhere. That Platonic world is, as we know, a perfect world of immutable and timeless essences or forms.

The world envisioned by Plato is also a world of perfect order, as he tells us in the *Timaeus*, a dialog that is sometimes described as his treatise on physics:

God, therefore, wishing that all things should be good, and so far as possible nothing be imperfect, and finding the visible universe in a state not of rest but of inharmonious and disorderly motion, reduced it to order from disorder, as he judged that order was in every way better. (Timaeus 30a = Plato, 1965: 42)

For Plato and his followers, the real world is a world of order and rest, not one of motion and disorder. Thus the world of truth and certainty is a world of timeless, immutable, ordered reality, a motionless universe bereft of spontaneity and unpredictability.

Plato's dream of a perfectly ordered world did not die with him or with the end of ancient Greek civilization. On the contrary, it survived into the scientific revolution and remains alive and well in our era. Here, for example, is Roger Hausheer's summary of Isaiah Berlin's ideas on the founders of the scientific revolution:

They sought all-embracing schemas, universal unifying frameworks, within which everything that exists could be shown to be systematically—i.e. logically and causally—interconnected, vast structures in which there should be no gaps left open for spontaneous, unattended developments, where everything that occurs should be, at least in principle, wholly explicable in terms of immutable general laws. (Hausheer, 1980: xxvi)

The dream of timeless order and certainty reached dizzying heights in 1814, with Laplace's vision of what to him would be the ultimate scientific intelligence. Laplace's demon, a being of supreme intelligence, would be able to comprehend the exact position at any time of every particle in the universe and of all the forces acting on it. For such an intelligence, says Laplace, nothing would be uncertain, and both the future and the past would become the present (Laplace, 1902: 4). In our own time, Einstein, writing on the occasion of an old friend's death, says that for those "who believe in physics, this separation between past, present, and future is only an illusion, however tenacious" (Einstein, 1972: 539; trans. in Bernstein, 1991: 165). The tireless work of Ilya Prigogine, however, has called our attention to the shortcomings of this view. If time is an illusion, change, novelty, and surprise are rendered impossible. If there is no difference between past, present, and future, everything is simply a given, a mere function of the present (Prigogine, 1987, 1997).

The notion that we can somehow conquer time, the bearer of corruption and death, promises us a measure of immortality—even of divinity. When Napoleon asked Laplace about God's place in his system, the great savant replied that he had no need for such a "hypothesis" (Koyré, 1957: 276). Nor did Einstein shrink from presuming to speak for God: Witness his famous saying that "God does not play dice with the world" (Bernstein, 1973: 215-21). Remember, too, Leon Lederman's (1993) musings about the "God particle" and Steven Weinberg's (1992) speculations about a "final theory."

A universe of perfect and immutable order is one in which we can know and predict future events with certainty. Such a world is, of course, also a deterministic world in which everything happens with absolute regularity. The ancient Epicureans were among those who clearly sensed the shortcomings of such a world, and they called attention to the fundamental importance of indeterminacy and uncertainty. Lucretius, the Epicurean poet in whose work Michel Serres (1977) locates the birth of physics, underlines the significance of the *clinamen*, the "swerve" that interrupts the regular motion of atoms at indeterminate times and places, thereby making our universe—the complex world in which we live—possible. Were it not for this swerve, Lucretius says:

everything would fall downwards like rain-drops through the abyss of space. No collision would take place and no impact of atom on atom would be created.

Without the swerve, without this fundamental indeterminacy, he concludes, "*nature would never have created anything*" (*De rerum natura* 2.216-24 = Lucretius, 1951: 66, emphasis added).

The world of Lucretius is a world of motion, not rest, and it is a world in which complexity and indeterminacy play a fundamental role (Prigogine & Stengers, 1984: 303-5). It is the *clinamen* that makes our universe possible. That universe is a universe marked by chance, spontaneity, and unpredictability; by chaos as well as order. Our world, unlike the perfect universe envisioned by Plato, is not a world in which order is "in every way better." It is a world in which disorder plays an indispensable role and must not be banished.

Where Plato urges us to transcend our mortality and become like gods, Lucretius admonishes us to understand and respect the limitations of our mutable world. Imagining and attempting to become part of an immutable and perfectly ordered divine cosmos can only lead to failure, frustration, and despair; even, as Karl Popper (1945) has argued, to the intolerable sociopolitical consequence of totalitarianism. Lucretius exhorts us to abandon the quest for certainty and immortality, settling instead for the unmistakable virtues of the human and mutable.

The world described by visionaries like Lucretius has often been called a world without hope, a nihilistic world bereft of values and human feeling. In Sartre's novel *Nausea*, for example, the protagonist, sickened by his existence, has a "vision" of his own while sitting on a park bench contemplating a chestnut tree. His vision evokes a profound sense of alienation, leading him to feel that everything in the park, including himself, is "in the way" of everything else. Being "in the way" is the only relationship he can establish between the trees, the gates, the stones, and everything else in the park. To exist, he concludes, is merely to be "in the way" (Sartre, 1964: 126-8).

Nightmarish visions like these, I would maintain, are but one more unpleasant consequence of imagining ourselves to be privileged, godlike beings who are somehow set apart from nature. We should instead follow the lead of Yeats, in a wonderfully lyrical poem published only ten years before the appearance of Sartre's novel:

*O chestnut tree, great rooted blossomer,
Are you the leaf, the blossom or the bole?*

O body swayed to music, O brightening glance,

How can we know the dancer from the dance?

(Yeats, 1983: 217)

We are embedded in nature, not set apart from it, playing the role of spectators; and this should be a cause for rejoicing, not despair.

Consider, for example, the phenomenon of evolution. The occurrence of evolution compels us to admit the reality of time, change, spontaneity, and uncertainty. As Peirce argues, the laws of classical mechanics cannot account for the “inexhaustible multitudinous variety” produced by the evolution of species: “that variety,” he says, “can spring only from spontaneity” (Peirce, 1935: 41). There is no way to reconcile the theory of evolution, which defines a universe of inexhaustible variety marked by spontaneous developments, in which time is always moving forward and the future remains open, with a world in which “everything is given,” where there is no room for chance and spontaneity, where time is an illusion and the future is implied in the present.

Another of Peirce’s prophetic observations points in the direction of thermodynamics. “The dissipation of energy by the regular laws of nature,” he writes, “is by these very laws accompanied by circumstances more and more favorable to its reconcentration by chance” (Peirce, 1986: 551). Prigogine’s pioneering work on the behavior of nonlinear systems far from equilibrium has confirmed the wisdom of Peirce’s observation. Force, the driving principle of classical mechanics, is dissipative, while chance, an essential constituent of the thermodynamic process, is concentrative. Thus entropy, the measure of disorder in a system, now becomes a creative principle by which systems reorganize themselves to face the future.

It seems fitting to end with a reference to Stephen Jay Gould, who passed away only a short time ago. In his book *Wonderful Life*, he presents a study of the Burgess Shale, a small limestone quarry in British Columbia that holds the remains of an enormous variety of life (Gould, 1989). The study of this extremely rich fossil site leads him to some striking conclusions about evolution, time, contingency, and unpredictability. Imagining the possibility of “replaying life’s tape,” he argues that the fauna of the Burgess Shale support the conclusion that “any replay of the tape would lead evolution down a pathway radically different from the road already taken” (Gould, 1989: 51). He subsequently offers the following observation about what the site has to tell us about our own history:

It also fills us with a new kind of amazement (also a frisson for the improbability of the event) at the fact that humans ever evolved at all. We came this close (put your thumb about a millimeter away from your index finger), thousands and thousands of times, to erasure by the veering of history down another sensible channel. Replay the tape a million times from a Burgess beginning, and I doubt that anything like Homo sapiens would ever evolve again. It is, indeed, a wonderful life. (Gould, 1989: 289)

That last sentence, which some may find it surprising, deserves our careful appreciation. Gould’s consideration of contingency does not lead him to conclude, as Sartre’s hero does, that we are merely “in the way.” Taking his lead from the 1946 Frank Capra film to which his book’s title refers, Gould is concerned to show that our existence does make a difference, that the story of life would not have been the the same without us. He does not find contingency nauseating or depressing. On the contrary, for him life in our diverse and unpredictable universe is full of wonder.

As Gould and Prigogine have shown us, then, the acceptance of our human condition—of mutability, disorder, and “the end of certainty”—should prompt not despair but an abiding confidence about the future and our place in it. We stand on the threshold, as Prigogine says, of “a period of multiple experimentation, of an increased awareness of both the incertitude and the great possibilities implied by our human condition” (Prigogine, 1980: 7).

Such are the consolations—and the hopes—born of uncertainty.

References

1. Bernstein, Jeremy (1973) *Einstein*, New York: Viking.
2. Bernstein, Jeremy (1991) *Quantum Profiles*, Princeton, NJ: Princeton University Press.
3. Einstein, Albert (1972) *Correspondance avec Michele Besso 190,3-1955*, Pierre Speziali (ed.), Paris: Hermann.
4. Gould, Stephen Jay (1989) *Wonderful Life: The Burgess Shale and the Nature of History*, New York: Norton.
5. Hausheer, Roger (1980) “Introduction” to Isaiah Berlin, *Against the Current: Essays in the History of Ideas*, Henry Hardy

- (ed.), New York: Viking: xiii-liii.
6. Homer (1997) *Iliad*, trans. Stanley Lombardo, Indianapolis, IN: Hackett.
 7. Koyré, Alexandre (1957) *From the Closed World to the Infinite Universe*, Baltimore: Johns Hopkins University Press.
 8. Laplace, Pierre Simon de (1902) *A Philosophical Essay on Probabilities*, trans. F W. Truscott & F L. Emory, New York: Wiley.
 9. Lederman, Leon (1993) *The God Particle*, Boston: Houghton Mifflin.
 10. Lucretius (1951) *On the Nature of the Universe*, trans. R. E. Latham, Harmondsworth, UK: Penguin.
 11. Peirce, Charles Sanders (1935) "The doctrine of necessity examined," in Charles Hartshorne & Paul Weiss (eds), *Collected Papers of Charles Sanders Peirce*, Volume 6, Cambridge, MA: Harvard University Press: 28-45.
 12. Peirce, Charles Sanders (1986) "Design and chance," in Christian J. W. Kloesel (ed.), *Writings of Charles S. Peirce: A Chronological Edition*, Volume 4, Bloomington, IN: Indiana University Press: 544-54.
 13. Plato (1965) *Timaeus and Critias*, trans. Desmond Lee, Harmondsworth, UK: Penguin.
 14. Popper, Karl (1945) *The Open Society and its Enemies*, London: Routledge.
 15. Prigogine, Ilya (1980) "Probing into time," *Discovery: Research and Scholarship at The University of Texas at Austin*, 5.1(September): 4-7.
 16. Prigogine, Ilya (1987) "Only an illusion," in Jefferson Hane Weaver (ed.), *The World of Physics: A Small Library of the Literature of Physics from Antiquity to the Present*, Volume 2: *The Einstein Universe and the Bohr Atom*, New York: Simon and Schuster: 691-708.
 17. Prigogine, Ilya (1997) *The End of Certainty: Time, Chaos, and the New Laws of Nature*, New York: Free Press.
 18. Prigogine, Ilya & Stengers, Isabelle (1984) *Order out of Chaos: Man's New Dialogue with Nature*, New York: Bantam.
 19. Rubino, Carl A. (1993) "Managing the future: Science, the humanities, and the myth of omniscience," *World Futures: The Journal of General Evolution*, 38: 157-64.
 20. Rubino, Carl A. (2000) "The politics of certainty: Conceptions of science in an age of uncertainty," *Science and Engineering Ethics*, 6: 499-508.
 21. Sartre, Jean-Paul (1964) *Nausea*, trans. Lloyd Alexander, New York: New Directions; French original (1938) *La Nausée*, Paris: Gallimard.
 22. Serres, Michel (1977) *La naissance de la physique dans le texte de Lucrèce: Fleuves et turbulences*, Paris: Editions de Minuit; in English as (2000) *The Birth of Physics*, trans. Jack Hawkes, Manchester, UK: Clinamen Press.
 23. Yeats, William Butler (1983) "Among School Children," in Richard J. Finneran (ed.), *The Poems of W B. Yeats: A New Edition*, New York: Macmillan: 215-17.
 24. Weinberg, Stephen (1992) *Dreams of a Final Theory*, New York: Pantheon Books.