



The Culture of Science Divided Against Itself

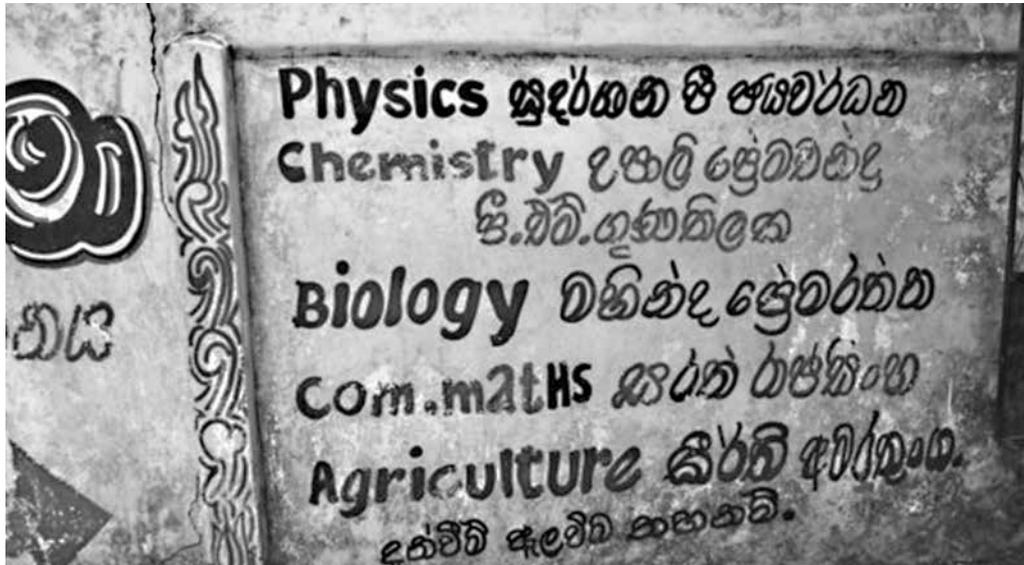
LEE SMOLIN

In a lecture at Cambridge in 1959, C. P. Snow famously complained of the division of the intellectual and university worlds into two cultures, that of the sciences and that of the humanities. He put his point bluntly:

A good many times I have been present at gatherings of people who, by the standards of the traditional culture, are thought highly educated and who have with considerable gusto been expressing their incredulity at the illiteracy of scientists. Once or twice I have been provoked and have asked the company how many of them could describe the Second Law of Thermodynamics. The response was cold: it was also negative. Yet I was asking something which is the scientific equivalent of: Have you read a work of Shakespeare's?

Snow was a biologist and a novelist and so was that rare individual who bridged the cultures. As anyone who encompasses two cultures or two identities will know, being a member of two communities that don't communicate with each other can be a special source of irritation.

More recently, literary agent and impresario of ideas John Brockman proclaimed the advent of "the third culture," into which he classed public intellectuals whose roots are in science,



technology, and the arts, primarily musicians and visual artists. In a polemical introduction to a collection of essays by some of those he anoints as third-culture intellectuals, he celebrated the decline of the influence of public intellectuals such as historians, philosophers, and literary critics, and opposed to them the growing influence of scientists, technologists, and artists in the emerging public culture of North America and Europe. His challenge to intellectuals from the humanities was put in strong terms: “What we are witnessing is a passing of the torch from one group of thinkers, the traditional literary intellectuals, to a new group, the intellectuals of the emerging third culture”; and was staked on book sales as a measure of influence. “The recent publishing successes of serious science books have surprised only the old-style intellectuals. . . . The emergence of this third-culture activity is evidence

that many people have a great intellectual hunger for new and important ideas and are willing to make the effort to educate themselves.”

Brockman’s slogan, condensed from Stewart Brand, is “Science is the only news, all the rest is just politics.” Brand, you may recall, is the environmental activist who founded and edited the *Whole Earth Catalog* and later helped to found the Global Business Network, an elite consultancy helping business and government scenario-ize about their futures.

A classic third-culture project is the Clock of the Long Now, which is designed to tick for ten thousand years to impress on us the span of human history and encourage us to think of our future on the same scale. The clock is a collaboration of Stewart Brand with Brian Eno, a musician, producer, and visual artist, and Danny Hillis, a computer scientist and inventor.

Indeed, one does find in some cities an engaging social world in which scientists, the digerati (another Brockman word), and artists mingle freely. The third-culture circuit now includes the annual TED conferences and Sci Foo—a meeting of diverse scientists held every year at Google. But one rarely meets a novelist and, even more seldom, a literary critic, in that world. The few exceptions that prove the rule include Ian McEwan, who sometimes takes scientists as his protagonists; Neal Stephenson, who is mischaracterized as a science-fiction writer; and Janna Levin, who is, as Snow was, a novelist and scientist.

So the division C. P. Snow worried about has not been healed, rather it has just been renamed. We scientists have promoted ourself from the second culture into the third, so we can claim alliance with visual artists, musicians, architects, and so on. Literary critics and scholars remain, in our view, stuck in the first culture.

There has been in the last decades just one brief engagement between the third and the first cultures, the so-called Science Wars. One day in the 1990s scientists woke up to discover, to our horror, that someone was taking us seriously as the subject of study. These practitioners of “science studies” seemed, shockingly, to not concur in the basic metaphysical assumptions that many of us feel underlie science. To our naive readings they seemed to be saying that nature and science were merely “socially constructed.” Reacting in horror to what we understood as naive relativism, scientists tried to strike back. Most of us were, however, limited in our effectiveness because hardly any of us could penetrate the key texts that were required reading for literary intellectuals,

such as the works of Hegel, Heidegger, Derrida, Lacan, Irigaray, and so on. Of course we took the difficulty of these texts as evidence of incoherence, for why should anyone other than a scientist need a technical language?

One scientist who was not so handicapped was Alan Sokal and the high point—at least comedically—of the Science Wars was his publication of an essay in the journal *Social Text* entitled “Transgressing the Boundaries: Towards a Transformative Hermeneutics of Quantum Gravity.” This was a cleverly constructed montage of assertions about science from postmodern literary theorists, liberally mixed with assertions about quantum physics and mathematics, some of which were outright nonsense, others just false. The editorial collective of *Social Text* failed to recognize they had been hoaxed and published the piece, and apparently were none the wiser until Sokal outed himself in an essay published in *Lingua Franca* in May 1996. It was front page news across the world and led to innumerable discussions, symposia, and conferences.

The one time I was invited to speak at one of these Sokal conferences, I tried to explicate the disagreement as a consequence of how different disciplines confront their material. Literary intellectuals read and write texts and so engage their material with their fingertips, while artists, scientists, and engineers are immersed in nature body and soul. For the first, everything is a text, and hence amenable to the varieties of interpretation, while for the latter, everything is a phenomena, largely recalcitrant to our will, to be understood, after great effort, imperfectly.

The best of the sociologists of science, people such as Harry Collins and Bruno Latour, have since emphatically made the point that their views are not, as they were accused of being, relativist, nor do they doubt the existence of an objective reality or the progress of science. If they are to take a scientific, detached, view of the objects of their study, they must take a neutral view as to the metaphysical commitments the scientists they study may have. So while they must be methodological relativists, this does not conflict with their metaphysical realism.

Since then, the third culture and the first have continued to go on ignoring each other. Most of the more intellectual magazines, with the notable exception of the *New Yorker*, ignore science. Many of us scientists read fiction, but hardly any of us read literary critics or contemporary philosophy.

While I have been at home in the third culture and felt fortunate to be classed among them, I have always felt that the heady environment was diminished by the absence of literary intellectuals and, especially, fiction writers. So I would hope here to serve as a kind of ambassador from the scientific world to the literary world.

To me the best way to invite you into our world is to speak of our own internal issues. Just as new friends develop empathy by sharing troubles, I would hope to share some of our deepest worries and internal conflicts.

To talk, as I have been, of a war of misunderstandings between science and the humanities, of two cultures passing in the night un-hailed, is to ignore a more troubling feature of the present intellectual climate, which is that the culture of science

is itself badly divided. We differ on certain metaphysical and philosophical commitments, which lead us to divergent views on the key fundamental questions science currently faces.

There are several such questions, but I suspect there is really only one.

Here are some conflicting metaphysical beliefs that different scientists will assert. I frame it as a conversation all too typical of many conversations I have experienced, in which two highly educated people, each very good at half the art of conversation, talk past each other.

Bob: The universe is a computer. At least it is so like a computer that were the universe to be replaced by one running the right software, nothing would change. Everything in nature is made up of atoms that obey deterministic laws. Any deterministic law corresponds to a mathematical function that is computable, and anything computable can be simulated on a Turing machine, which is a universal model of a digital programmable computer. Hence it is impossible to tell nature apart from a simulation on a computer. Hence, it is one.

Alice: The universe is nothing like a computer. A computer is an artifact human beings invented to compute an algorithm. An algorithm is a human construction of a procedure to solve a problem. The results of a computation are only meaningful to one who can code and decode the algorithm. Nature does not compute any algorithm, it is just an interconnected network of processes that simply

happens. Besides, computers crash all the time, while nature never crashes.

Bob: Consciousness is an illusion. The brain is basically a computer. Conversely, a large-enough computer will behave like a person and will also have the illusion of consciousness.

Alice: Consciousness is a mystery to be solved when we know more. The brain is nothing like a computer; it is for sure a physical system, but some of the principles by which it works remain to be discovered. Artificial intelligence, in the sense of programming a computer to think like a human being, remains at best a distant goal. So far computers simulate some human tasks but by doing them very differently than we do. Besides, there is a fact of the matter about whether your experience of colours is the same as mine, which we so far have no way to explicate.

Bob: Mathematical truths concern the properties of real objects that live in a timeless, Platonic, world, distinct from the physical world where we live. When we do mathematics, we use logic and intuition to explore a world that owes nothing to our existence.

Alice: The truths of mathematics are generalizations drawn from observations of the natural world. They are both human constructs and objective truths about fictional worlds that share many properties of our one real world.

Bob: The lesson of quantum mechanics is that there are an infinite number of parallel universes. According to this many-worlds interpretation, the universe splits every time a quantum process has a range of possible outcomes, with varying probabilities.

Alice: Quantum mechanics is confusing because it is only an approximation to a deeper



theory that will make more sense once we find it. The aim is not to interpret the theory but to replace it with this better theory. The many-worlds interpretation is absurd.

Bob: The universe is vastly bigger than we can see. Indeed, it is probably infinite in spatial extent. Within this vastness anything that can happen will happen, an infinite number of times. This includes an infinite number of copies of ourselves, making all the different mistakes and wise moves we contemplate or regret.

Alice: The universe is vastly older than we can see and existed long before the Big Bang. The universe has a deep history, knowledge of which may help explain its otherwise inexplicable features.

Bob: The anthropic principle, which is the statement that many features of the universe are explained only by their being necessary to make the universe hospitable to intelligent life, is the future of science. The universe is not only infinite, it is one of a vast or infinite number of universes, each with randomly chosen properties and laws. We live in one of the few that has laws and conditions hospitable to intelligent life. Thus, much of what we would like to explain is just due to chance.

Alice: To make use of the anthropic principle would be the end of science. The multiverse is a science-fiction fantasy that cannot lead to any predictions by which it could be tested because we do not observe any other universes. To the extent it is relied upon, no falsifiable predictions can be generated.

Bob: The universe is fated to end up in a timeless equilibrium, within which the only thing that happens is random fluctuations around a dead, uniform eternity. Life is an accidental anomaly and is uncommon.

Alice: The universe naturally develops increasing levels of complexity and structure as time goes on. The universe is hospitable to life, and we will discover that life is plentiful.

Bob: Time, in the sense of the awareness of the flow of present moments, is an illusion. What is really real and true is so outside of time.

Alice: Nothing in our experience of the world is more real, or less an illusion, than time. All that is real and true is so in a present moment, which is one of a succession of moments.

Bob: With enough information the future is completely determined and predictable.

Alice: All that is predictable is the content of the adjacent possible—the next combinations and arrangements of molecules, phenomena, or technologies that could emerge in the next steps of evolution and self-organization.

Bob: Novelty is impossible. All that really happens in the world is the rearrangement of elementary particles. Anything else is illusion.

Alice: Novelty and surprise are everywhere. New kinds of complex systems emerge from time to time, along with new laws to govern them.

The divide between Alice and Bob is profound and consequential. The hopes and hypotheses expressed

here lead to very different paths for the future of science and for the future of our civilization, fuelled as it is, materially and spiritually, by the metaphysical claims of science.

I do not mean to imply that every scientist agrees either with all of Bob's views or all of Alice's. But in my readings and conversations, I find there are prevalent clusters of views. Many scientists I know believe in the many-worlds interpretation of quantum theory, the anthropic principle, and the strong artificial intelligence hypothesis. Many people disbelieve all three.

Thus it is interesting to ask if there is an underlying disagreement that has these views clustering on one side or the other. I believe there is, and it is the view of time. Alice's views all are friendly to a picture of the world in which time is real, in which the present exists and so is different from the past, which no longer exists, and the future, which has yet to exist.

Bob's views are all friendly to a picture in which time is an illusion and all that is real or true is so timelessly.

This deep cultural divide within science is one that we all should be concerned with because it affects how we think about the future. If what is real and true is timeless, then the future is already determined. It is a short step from this to a variety of fatalism, which may be no less dangerous for being highly intellectualized. If, on the other hand, the future is not yet real, if novelty is possible, then the future is at least partly open and amenable to our efforts to construct it. This doesn't mean we get everything we want—nature is still largely recalcitrant to our will. But it means that we have a fighting chance to avert known dangers such as those of climate change.

And it means ideas matter. The main limitation we face is lack of imagination. Which is one more reason why we scientists and humanists should heal our divisions and be in closer touch.