

Isaac Sequeira Memorial Lecture

Science, Technology and Literary Imagination: The Twentieth-Century Perspective

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The relationship between science, technology, and literary imagination, of which literature is a product has a complex and fascinating history in the Western world, for it is intertwined with the making and unmaking of disciplinary boundaries and taxonomies, which stabilised only towards the middle of the nineteenth and early twentieth centuries. Though science and literature existed before that for centuries, their boundaries were hazy and kept on changing. Technology developed independently of science for centuries and connected with science and literature around the middle of the nineteenth century. Even though Aristotle gave his threefold classification of disciplines in his time, he had his moments of unease, which he negotiated by putting all of them under the broad category of philosophy (Moran 3-5). Until 1833, science was natural philosophy. Literature had no recognisable boundary till the middle of the nineteenth century, for along with the work of poets and dramatists, it also included the work of historians and philosophers. It was recognised as a distinct product of the imagination only in the nineteenth century, and as an academic discipline at the University of Oxford, it had to wait till 1896. Despite this, the shadow of Aristotle's unease has proved so durable that advanced research degrees across disciplines are still designated PhD, the Doctor of Philosophy.

Two clarifications are needed before dealing with the relationship between science, technology, and literary imagination in the twentieth century. One, that, the complex nature of this relationship can be understood in its fullness only if we know about science and literature as modes of knowledge. And two, what this relationship looks like in the twentieth century cannot be appreciated in isolation from what it was like in times before that because most of its features are a carryover of what it was like then, with several extra edges of complexity to them.

A close look at the way writers, scientists, and technologists function reveals that they share many things because they are both social and technological animals. Writers' use of technology has increased steadily with time, from quill pens to typewriters to personal computers, iPads, and what have you. The growth of printing technology changed the very idea of a writer, for it gave new professional visibility to authors by enabling them to live on their writings. New and exciting developments in the growth of science and technology have expanded the possibilities of new writings by scientists that engage with issues and problems of our times in novel ways.

By now, it is also known that literature and science are not as distant from each other as they might look. Both writers and scientists engage with nature and represent it in their respective works. Since literature is the product of language, which, with its codes and signals, is like technology, a writer is also a kind of technologist. We also know by now that the idea of science as purely objective knowledge, which is unmediated by the scientist, is no longer true, as has been confirmed by Heisenberg's Uncertainty Principle. Experts of science have stated that the idea of science as "reductive realism," which implies that a "true physical reality underlies appearances" and can be articulated in a language that is "achromatic, imparting no colours of its own to the picture it projects," is questionable (Weininger 39). This has increasingly been confirmed by researchers in the fields of Chemistry, Physics, and Medicine. (James J Bono, Joseph W Slade and Judith Yaross Lee, Jeremy Campbell, and Lisa M Steinman) So, one can say that there are many commonalities in the processes in which writers and scientists read nature.

The relationship of science and literature is both direct and indirect. It is indirect when advances in the corpus of science permeate the intellectual climate of the times and affect the writers' mode of apprehending and engaging with the world around them and are reflected in the nature and quality of their writings. It is direct when it stimulates the growth of new forms of writing, which also evaluate both science and technology for their value in human lives.

The first major moment of the interpenetration of science and literature happened close to the time of the Renaissance when there was a revolutionary change in the structure of the universe, the

growth of new knowledge in the fields of cosmology and astronomy, and innovations in maritime technology. Cumulatively, they contributed to the slow dismantling of the medieval worldview and the social edifice based on that. But changes took time to be accepted and absorbed by the society of the day, as is clear from what happened to the people associated with the new Heliocentric Theory: Copernicus had to wait for decades to make it public for fear of being punished; Galileo had to suffer imprisonment for voicing it openly, and Bruno had to pay with his life for propagating it vigorously. Because of this, the intellectual climate of the major part of the late sixteenth and early seventeenth century in Europe and England was one in which the birth of the new existed with what clung to the old. Quite interestingly, this contributed to the richness of the literature produced during the time, in which the influence of the new knowledge of science collided with the old one that had been controlled by the Church for centuries.

The plays of the time, of Christopher Marlowe and William Shakespeare, are emblematic of this tension between the old and the new. Marlowe created Faustus to embody a new being who loves to live a life of voluptuousness on this earth by mastering new knowledge and seeking a life of “profit and delight” but cannot get over the residue of the old thinking instilled by the Church. Faustus’s yearning soul wrestles with its medieval moorings, leading to his sad end, but not before going through an agonising wrench.

The growing influence of science among writers is reflected, without such tragic implications, in the writings of Francis Bacon and John Donne. Bacon popularised the image of a scientist as a provider of useful knowledge, spun a theological argument to promote science, and paid with his life to advance its cause. In the field of poetry, advances in scientific knowledge led to extraordinary developments. Till then, poetry was dominated by the tradition of courtly love, a product of what C S Lewis calls the “realising imagination,” as different from “transforming imagination” or “penetrating imagination” (206). The poets were bound by set conventions, which provided no scope for articulating anything original or new. The artifice of the courtly tradition was breached by the breaking of the old chain of being. It resulted in the rise of the sonnet, a short but forceful medium

for voicing the personal, and the use by Donne of the new knowledge of cosmology, astronomy, and planetary motion to weave elaborate conceits to energise poetry that had become worn out and effete because of its artificiality.

The second moment is when the growth of science touched a new high because of the work of Isaac Newton, which led to the rise of the scientific temper that had both literary and aesthetic dimensions and a strong bearing on the drive towards human perfection, marked by the rise of reason. All these had a major influence on the shaping of neo-classical aesthetics of the eighteenth century, with a string of values for literature and a search for perfection in human life.

If Newton could apprehend the universe as a clockwork mechanism characterised by order that is understandable, then artistic creations should also be well organised and deal with common human experiences. The result was the view of art characterised by order, symmetry, and proportion, in which, to use John Dryden's phrase, imagination is tempered by reason, and the poet, according to Alexander Pope, writes poetry about the ordinary but in a way that was never so well expressed. Because of this, Gary Day observes that "Neo classicists had some affinity with scientists because they both saw order in nature, because they both believed in reason, and because they were both committed to clarity" (172).

The primacy of reason in human life that followed the rise of science strengthened the view that human beings could strive for perfection in their lives. The writers were inspired to produce art that gave delight and instructed people to help them get better. The literature of the times got a pronounced public stance, which gave rise to satirical compositions that cut across generic categories. Writers examined the society of the day and attacked everything that came in the way of making it better than it was. The attack touched all aspects of life: social, political, religious, literary, even scientific. Dryden, Pope, Samuel Johnson, Joseph Addison, Richard Steele, Henry Fielding, and Jonathan Swift wrote satires in dramatic, poetic, novelistic, and other non-narrative forms, like the essay. The main impulse behind such writings was to help people improve the quality of their lives.

Another interesting angle of the relationship between science and the poetry of the eighteenth century is seen in the readiness of the poets to greet science with hope and promise. Several poets composed poems on Newton, acknowledging his genius and admitting that his work had freed their imagination as well. Because of this, they felt that science, instead of coming in their way, helped them to rejuvenate their poetic spirit.

The optimistic attitude of the writers towards science changed during the Romantic Age. In Edgar Allan Poe's sonnet addressed to Science, science is a vulture who "peyest...upon the poet's heart" (Otis 3). It eats into his imaginative flights and prevents him from imagining Naiad in the flood and the elfin in the grass and dreaming under the tamarind tree. In this lament, science, as a mode of knowing, is pitted against the poet's soaring imagination.

Even when the romantic writers accepted science as a source of knowledge, they did not consider it a source of moral development. The advent of the machine was seen as a threat to both humanity and art. William Blake's statement that "Art is the Tree of Life, science is the Tree of death" sums up the distrust of the writers towards science and technology. However, the impression of science on their poetic compositions, especially in their use of imagery, has been documented by critics like MH Abrams and Desmond King-Hele.

This moment is also significant because science and technology were scrutinised with grave concern vis-à-vis their impact on people's lives. Mary Shelley's *Frankenstein* exemplifies both the influence of science on a writer and the writer's response to its effect on the well-being of humans. She modelled the scientist on the German physiologist John Wilhelm Ritter but sounded a clear warning: that scientific passion is like a craving for reckless knowledge that could pose a serious threat to life, a tendency that grew steadily during the twentieth century.

Charles Darwin's theory of evolution gave a distinct melancholic tone to the late Victorian poetry of Alfred Tennyson and Matthew Arnold and a tragic nuance to the fiction that was appropriately called literary Darwinism, which grew in Britain, France, and America. Social Darwinism also encouraged the growth of disturbing theories of retrogressive evolution, such as the

one of Cesare Lombroso, who came up with the view that crime is a form of innate physiological debility, which led to the production of novels like Bram Stoker's *Dracula* and Sherlock Holme's story "The Creeping Man" (Cartwright et al, Ch 8).

The relationship between science, technology, and literature in the twentieth century carries forward these strands more intensively and with some interesting additions too. The focus in what follows will be on four major ones that are closely related to the exponential growth of technology and its deepening link with science during this time when scientists depended on technology for their advancement and technology grew because of advances in scientific knowledge.

1. This is related to the pervasive influence of science and technology on the intellectual climate of the twentieth century, which greatly shaped the literary currents of the day, such as modernism and postmodernism. This is documented in work produced by scholars in the fast-growing interdisciplinary field of Literature and Science programmes of various academic institutions and reflected in scholarly publications, such as *Literature and Science* by John Cartwright and Brian Baker, *Quantum Physics: Yeats, Pound, Eliot and the Science of Modernism* by Daniel Albright, *Einstein's Wake: Relativity Metaphor and Modernist Literature* by Michael Whitworth, and *Being Modern: The Cultural Impact of Science in the Early Twentieth Century*, a volume of essays edited by Robert Budd and others. In their introduction to the volume, they write that "the arts drew upon the ideas, metaphors, symbolic meaning and practical potential of science" (2).

I would like to begin with another work of seminal importance by Sara Danius that appeared in 2002 and is titled *The Senses of Modernism: Technology, Perception, and Aesthetics*. She argues persuasively that the connection between technology and aesthetic modernism has remained unexplored because such a connection has been considered irrelevant for a long time. She concedes that scholars have explored the connection of technology with avant-garde movements like Cubism, Futurism, Surrealism and Vorticism. Still, the connection of technology with the mainstream novels of the time has been ignored. According to her, "the nexus of perception, technological change, and literary form" is at the heart of "modernist aesthetics from Marcel Proust to James Joyce," which she

considers the “index of a technologically mediated crisis of the senses” (1). She considers this connection quite strong and remarks that “technology is in a specific sense *constitutive* of high modernist aesthetics” (3) and expounds it at length in individual chapters on three iconic Modernist Texts: Thomas Mann’s *The Magic Mountain*, Marcel Proust’s *Remembrance of Things Past*, and James Joyce’s *Ulysses*.

One of the essays from the volume on *Being Modern*, entitled “Multiple Modernisms in Concert: The Sciences, Technology and Culture in Vienna Around 1900,” establishes two crucial linkages between technology and literature. One that “modern ways of thinking in the natural sciences and mathematics and radical changes in the arts ...occurred at the same time” (26). Two, the modernist style in both sciences and arts “involved a break with direct, supposedly pictorial representation of nature and a turn towards giving free play to abstraction and theoretical imagination” (27). The second essay dwells on how scientific metaphors shaped the thinking and writings of three influential modernist writers. In her essay “Woolf’s Atom, Eliot’s Catalyst and Richardson’s Waves of Light: Science and Modernism in 1919,” Morag Schiach explains in detail how Woolf’s critique of the naturalistic fiction of her contemporaries in her essay on “Modernist Fiction” is based on her belief that life can only be captured in “incessant shower of atoms,” thus applying the principles of physical sciences to the human psyche. In this way, the atom is not merely an object of scientific interest but also of “wider cultural interest” (66).

The essay also discusses that the metaphor of catalyst is seminal to the poetics of impersonality discussed in detail by Eliot in his essay “The Tradition and the Individual Talent.” Eliot confirms the connection between poetry and science when he writes, “It is in this depersonalisation that art may be said to approach the condition of science” (69). He clarifies the metaphor in another passage in which he mentions how two gases are mixed in the presence of a filament of platinum and that “the mind of the poet is the shred of platinum. The more perfect that artist, the more complete separately in him will be the man who suffers and the mind that creates.” Eliot discusses this also in his essay “Humanist, Artist, Scientist” which was published first in *The Athenaeum*. In another essay,

“Poetry is a Science?” Eliot developed many ideas around tradition and the metaphors for expressing these ideas.

In a similar vein, the critic discusses Richardson’s exposure to science and the use of stream of consciousness, which are reflected in several moments in her work *The Tunnel*. In this way, science contributed to the growth of non-linear narrative modes, in which space and time work differently from how they functioned in earlier works.

Much later, when scientists made rapid strides in the development of thermodynamics and established that heat is a form of energy and there is a universal tendency for the degradation of mechanical energy, especially in closed systems, more new scientific metaphors became available to the writers. Since the universe was also a kind of closed system, it was also subject to such degradation, which is measured in terms of entropy. So, like the atom and the catalyst, entropy became the new metaphor for the social and cultural decline of the world. Such visions of decline are in HG Wells’s *Time Machine*, where entropy is considered an inverse of evolution. Entropy is a metaphor for this decline and psychological disturbances in Thomas Pynchon’s *V* and *Gravity’s Rainbow*. Pynchon also wrote a story, “Entropy,” to dramatise this entropic decline. The influence of science on his work has prompted a critic to say that “Pynchon [has] proved that modern literature must make poetry out of equations and chemical bonds” (Limon 1). Entropy functions as a powerful metaphor in many science fiction novels, too. When entropy gets associated with cybernetics, scientists consider it a kind of negative entropy and label it “negentropy.” Heat loss, disorganisation, and the rise of noise combine to create a dismal world, which is dramatised in Don DeLillo’s *White Noise*.

2. Although scientists have continually made claims that their work and the technology developed from it is essential for raising the standard of living of people and, therefore, an arbiter of value, writers and literary intellectuals have increasingly felt concerned about the price that humans would have to pay for that. They think that crude scientific rationalism and technological revolution are gradually assuming dangerous proportions. These concerns find expression in a series of dystopian

works of fiction that create a world of nightmare and bondage in which an attempt is made to destroy diversity in nature by replacing it with mechanical sameness, and individual liberty and privacy are threatened, as, for example in Aldous Huxley's *The Brave New World* and George Orwell's *1984*. The same figures as a key theme in many science fiction novels, of which Philip K Dick's *Do Androids Dream of Electric Sheep* is a kind of trendsetter.

Wells also shows how scientists can threaten the very processes of life by developing schemes to alter them. In one of his stories, an old man, Elvisham, befriends a young man and promises to give him all his property provided he gives proof of his being fit and healthy. When he is satisfied with the young man's fitness, he invites him to dinner, plies him with some concoction and tells him to take some other powder before going to sleep. When the young man gets up in the morning, he is shocked to find that Elvisham has taken his young body and given his old, decrepit one to him. Out of sheer frustration, he commits suicide; Elvisham, too, dies soon after in an accident.

Further, the growth of technology is perceived as a serious threat to all the good things—the values and verities—that have descended the ages. The shift in the zones of technology, from the industrial to the scientific to electronic, is seen as a threat. It dehumanises and diminishes human beings, playing havoc with value structures, and becomes a veritable source of the destruction of civilisational forces, turning the humans into the dead-alive people seen crossing the London Bridge in TS Eliot's *The Waste Land*.

3. Although writers and intellectuals have consistently dwelt on the destructive potential of the fast growth of science and technology, some still believe that science is superior to literature. This became a serious issue in the twentieth century and paved the way for two of the most prominent critical theories of literature, which need to be seen in perspective.

The anti-science attitude of the romantics led to a startling turn when Thomas Love Peacock came up with the idea that poetry had touched a low level and that a poet was “a semi-barbarian in a civilised community...His ideas, thoughts, feelings, associations are all with barbarous manners, obsolete customs, and exploded superstitions” (Wimsatt and Brooks 417). In response to that, Shelley

wrote a spirited defence of poetry and elaborated on its huge influence on the social and political lives of people, but this did not put a stop to the incessant questioning of poets and writers by scientists.

The controversy surfaced, once again, but in the context of culture and education when Julian Huxley stated that attaining real culture with an exclusive focus on scientific education is as effective as exclusive literary education. Matthew Arnold steered past this by defining literature in a very comprehensive sense in which the science and literature controversy ceased to exist. To put what he said in the words of Stefan Collini, “Literature is a larger word; it may mean everything written with letters or printed in a book. Euclid’s *Elements* and Newton’s *Principia* are thus literature.” And further, “By knowing modern nations, I mean not merely knowing their *belles lettres*, but knowing also what has been done by such men as Copernicus, Galileo, Newton, Darwin” (xiv-xv). In this way, Arnold recognised that both science and literature deserve a place in the educational process.

CP Snow gave a new turn to that in his lecture “The Two Cultures and the Scientific Revolution,” by attacking literary intellectuals for being reactionary and backwards-looking and considering scientists progressive and forward-looking. He also found fault with the methods of literary people, which he called unreliable because they are subjective.

The debate not only impacted the writers but also those who had just begun to teach literature as an academic discipline. Their response to the criticism of the advocates of science shaped two of the most influential methods of reading and interpreting literature. Seeing that literature was being attacked because it was not considered valuable, IA Richards proposed a new theory of value for literature and a new method for reading it. Seminal ideas regarding them figure in his *Principles of Literary Criticism* and the volume on poetry and science. This became the basis of close reading of literary texts and inspired the school of New Criticism, which ruled the academy for several decades.

FR Leavis severely attacked CP Snow not only for what he said but also attacked his person. He criticised Snow for projecting the idea of the unquestionable cultural authority of the scientists and their attempt at influencing people to have unqualified belief in the idea of progress through science. He believed that Snow’s quantitative description of the goals of life was highly inadequate.

Such knowledge is embodied only in great works of literature for answering questions like what human beings live for and by. Interestingly, in the revised edition of his lecture, Snow also pleaded for a third culture, but it proved a plea in vain. Much later, Aldous Huxley pleaded for moderation in his short work entitled *Literature and Science*, but Leavis's influence continued to shape the discipline of cultural studies.

4. The most significant development that took root in the third and fourth decades of the twentieth century is the rise of the new genre of science fiction, which some trace to writers like Jules Verne and HG Wells. Experts make a distinction between hard and soft science fiction depending on the way in which science is used in this fiction. The hard one is mostly science-oriented, about the emotional experience of describing and confronting what is scientifically true and plausible, as is done by Isaac Asimov and Arthur Clarke. As against this, soft science fiction has a strong speculative element, allowing writers to use more imagination than merely to rework what is already known. Ursula Le Guin and Philip K Dick are known writers who deal with social aspects of science, such as sociology and psychology.

Early science fiction works were speculative in nature, which dealt with what was still unknown in the form of fantasies, like extraordinary journeys, such as Jules Verne's *Journey to the Centre of the Earth* or HG Wells's *The First Men on the Moon*. Or journeys away from the Earth into new worlds, which are wholly imaginary and, in some cases, also involve encounters with aliens. It also deals with subjects that concern people on this earth, such as human intelligence and its relationship to the physiology of the brain, biological changes and artificial life forms, and genetic engineering, which involves issues related to human cloning, alternative histories, and dystopias.

Another interesting aspect of science fiction is its concern with the human future, which some science fiction critics club under futurological fantasy. The history of science fiction shows that this has been of varied kinds, with political affiliations as well, as, for example, a conception of a scientific, collectivist future or consumer-oriented capitalist future. Apart from this, science fiction also deals with carrying forward the movement of the evolutionary process. If humans have evolved

over time, then it is possible to imagine that they could live in artificial environments, eat artificial foods, and have artificial means of reproduction. The writers have also experimented with the possibility of prolonging human life.

Science fiction works have also projected the possibility of the earth becoming a place not fit for supporting life. Given the levels of environmental degradation the earth has already touched and the possibility that any disaster could destroy life on the earth, this possibility sounds realistic. So, the writers have conceived the possibility of interplanetary travel and the setting up of human settlements in outer space. Considering that science fiction could imagine atomic wars and journeys by humans into outer space, which have already happened, more new possibilities could also come true.

Some of these ideas are implied in the theory of science fiction given by Darko Suvin, who has been recognised by critics across disciplinary boundaries as the one who established science fiction as a legitimate field of inquiry. In his theory of “cognitive estrangement” or “strange newness” or *novum*, he propounds that science fiction is a work that provides an imaginative framework that is different from and, therefore, an alternative to the environment of the writers. In other words, the difference between the two arises from the writer’s creation of an alternative reality based on scientific discoveries or technologies or on new ones which have a scientific or rational basis or are validated by cognitive logic. Because of this, genuine science fiction does not accommodate anything like the supernatural. Even when it looks different from what it is like in the real world, it is within the realm of possibility that is backed by science and holds promise for humans. That is why Frederick Jameson associates Darko’s theory with the human desire for utopias and comments that “Darko’s is an aesthetic... that characterises science fiction in terms of an essentially epistemological function, [and] posits one specific subset of this generic category specifically devoted to the imagination of alternative social and economic forms” (xiv).

Another related development in the field of science fiction is the increasing levels of participation by scholars of scientific background in literary activities by writing novels, short stories,

essays, and even long narratives about issues related to disease, health, and bodily concerns. Some of the scientists turned writers write mostly science fiction; they include David Brin, Gregory Benford, Carl Sagan, Rober L Forward, Poul Anderson, and Fred Hoyle. Short story writers and essayists include Lewis Thomas, Richard Selzer, Jeremy Bernstein, and Stephen J Gould, and long narratives related to disease and health have been published by Siddharth Mukherjee and Atul Gawande. The last one has contributed significantly to the evolving discipline of medical humanities.

Thus, science and technology have impacted human thinking and culture and influenced the creative efforts of writers in multiple ways. Their writings have also assessed the impact of science and technology on the well-being of humans. By taking to writing, scientists have helped raise the consciousness of the general masses about issues that have a direct bearing on the health, welfare, and creativity of human beings.

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