

Following the Footsteps of Fiction: Studying the Role of Imagination and the Influence of Speculative Fictions in Technological Innovation and Scientific Development

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Abstract

Since human civilization's dawn, evolution has been fueled by imagination and innovation. From the moment of harnessing fire to crossing the orbital boundary, every step beyond the horizon was led by a visionary thought. Mankind's journey from being hunters and gatherers to being the interstellar explorer was consistently driven by their ability to envision a reality beyond the present one. This paper examines how imagination has always preceded man's innovative actions and repeatedly opened new doors to a technologically advanced world. This paper provides a short discussion on how the European philosophers previously tried to theorize the concept of perception and imagination. The article primarily focuses on a few selected examples taken from English Science-fiction to examine how certain technological and scientific milestones succeeded the speculative ideas from literature. The article traces ethical implications embedded in the narratives of the speculative literature and establishes the ground for modern innovation ethics that must supervise both technologically and ethically advanced innovations. Expanding on the moral dilemmas of technological advancement, the article further explores the concept of sustainability as depicted in certain fictional narratives. The paper also discusses the genre of "Solarpunk" fictions, which envision an optimistic future driven by sustainable actions, technology, and values and how these narratives deviate from the dystopian possibilities of the future while exploring cutting-edge technology as well as an environment-friendly consciousness. In conclusion of this study, it is explained how human imagination and scientific endeavors are psychologically and cognitively connected with each other.

Keywords: Imagination, innovation, innovation ethics, science-fiction, speculative fiction

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INTRODUCTION

On September 2, 2023, the murmur of the crowd grew louder as ISRO launched Aditya L1, the maiden craft towards the sun. It flew at a speed unimaginable to humans to cover 1.5 million kilometers in 127 days. Aditya's journey is extraordinary in the 21st century, but in human imagination, Icarus flew close to the sun in the minds of ancient Greek thinkers. Icarus, with his enormous wings of wax, flew higher and higher until he fell to his death as the wax in his wings melted in the unconquerable heat of the sun. Therefore, Aditya L1's journey towards the orbit of the Sun is not just scientific but also carries poetic significance. It is Icarus's ambition that leads Aditya too close to the sun. While reconciling with the myth of Icarus, one must focus on two aspects. First, the human and their longing to conquer the aerial sphere, and second, the innovation that came

after. From the point of view of a 21st century brain, wings made of wax and feathers seem foolish, but the innovator of the wings, Daedalus, was an ancient man who was imprisoned in a high tower with his son, Icarus. All he had was the urge to fly out of jail, the wax from the prison candles, and the abandoned feathers from the birds hovering above them. He made wings for both of them, and as a true scientist, he warned Icarus of the dangers it held, even though it offered him freedom. It is true that he is a mythical character without any real evidence of existing in real life, but it is the grandeur of these imaginative mythical men who reside in the heads of the innovators, tinkerers, and thinkers of different eras in the timeline of history. Thousands of wars were fought, thousands of kings were overthrown, and thousands of civilizations perished after the story was told but no Daedalus could be overthrown or perish as he only thrived within the unique minds, as proved in the pages of the Italian polymath's diary, in his design of the Ornithopter. Leonardo da Vinci's innovation and ideas were induced by the same old human imagination that led humans to achieve the milestones of innovation throughout history. Therefore, imagination is the egg that is fertilized by the urge of need, and innovation is born.

LITERATURE REVIEW

Human civilization has been marked by innovation since its early days. Descartes' famous statement on human cognition and existence also suggests that thinking is being – "I think, therefore I am". Although philosophers, like Plato and Kant, argued over its definition, imagination proves to be nothing but a cognitive and psychological process according to modern medical science that involves the brain's prefrontal cortex, hippocampus, thalamus, and other organs present in our brain [1, 2]. The English Romantic poets tried to define and redefine imagination in the late 18th century. For poet John Keats, imagination is invisible and yet has the power to carry an individual to the unattainable: "Not charioted by Bacchus and his pards,/ But on the viewless wings of Poesy" [3, 4]. On the other hand, S.T. Coleridge theorizes that imagination is an "esemplastic power" [1], a unifying force that brings together fragments and creates a whole. Thus, imagination has been considered a unique potential of the human mind that creates, innovates, and recreates. Innovation, as its definition suggests, is the introduction of a new method or idea. Without the urge to attain the unattainable, as Keats suggested, or without the urge to create a united whole, there is no innovation. Imagination is the blood that flows through the arteries of innovation. In brief, imagination precedes innovation. In contrast, imagination is evoked by a sense of dire necessity to be fulfilled [5, 6].

DISCUSSION

Natural human curiosity about what is beyond has made them look skyward. Different cultures from around the world have imagined cosmic bodies and orbs as deities, gods, nurturing mothers and sisters, and even warriors protecting them. When the first satellite launched from earth, those stories came full circle [7]. It is such a relief that the virtue of imagination has always reclaimed its seat amidst many trials and conflicts. Imagination, quite loudly, produced the alternative grand narrative of the world: literature, the field where imagination runs wild, where time can be bent, space can be invaded, nature can be controlled, and infinity is touched. Literature from around the world records the unleashed chase of imagination and the possibilities of human capacities and capabilities.

Innovation, when coupled with imagination, upholds both the pioneering human intellect and unassailable human spirit. It is limiting to relate the possibilities of the word "Innovation" only to technology and STEM studies [8–9]. In French writer Jules Verne's 1870 science-fiction novel *Twenty Thousand Leagues under the Sea* we come across the Nautilus, an armor-plated, invincible, marine juggernaut which was 230 feet long, and was equipped with a 12,000-volume library, and a large "salon" which included boxed collections of valuable marine specimens and an art collection with the valuable works by Leonardo da Vinci, Titian, and Raphael:

- "Here, Professor Aronnax, are the different dimensions of this boat now transporting you. It is a very long cylinder with conical ends. It noticeably takes the shape of a cigar, a shape already adopted in London for several projects of the same kind. The length of this cylinder from end to end is exactly seventy meters, and its maximum breadth of beam is eight meters. So, it is not quite built on the ten-to-one ratio of your high-speed steamers; but its lines are sufficiently long,

and their tapering gradual enough, so that the displaced water easily slips past and poses no obstacle to the ship's movements. These two dimensions allow you to obtain, via a simple calculation, the surface area and volume of the Nautilus. Its surface area totals 1,011.45 square meters, its volume 1,507.2 cubic meters – which is tantamount to saying that when it is completely submerged, it displaces 1,500 cubic meters of water or weighs 1,500 metric tons” [10].

It was engineered by a mysterious Captain Nemo who was a champion of human intellect. The idea of submarines has been around for a long time, starting roughly from as early as the 16th century. Verne named Captain Nemo's invention after Robert Fulton's 1800 model of a submarine of the same name. While submarines were used as powerful weapons in contemporary political conflicts [2], Verne's Nautilus upheld the idea of boundless exploration beyond national and political boundaries. As recorded historically, Fulton first proposed to build the submarine as an underwater war machine [9]:

- “Most crucially, for military purposes, the craft contained an ingenious sting. Using a spike and reel, the craft could pin a bomb to the hull of a ship and then trigger the device when safely out of range.” In later years, Fulton envisioned that Nautilus might transform the conventional scenario of war and claimed, “It is certainly the gentlest and least bloody method the philosopher can imagine to overturn war” [7].

What makes Nemo's *Nautilus* an amalgamation of imagination and innovation is the representation of the *Nautilus* as a submerged testament to human civilization. It is undeniable that Nemo's Nautilus was fully equipped to be an invincible warship but unlike Fulton, Captain Nemo reinforced anti-imperialist ideas. Captain Nemo's ambitious underwater exploration was a pioneer in oceanology and marine biology research. Verne's imaginary gypsy submarine opened a new world for innovative submarine machines and technology for the purpose of exploring the unknown instead of bombing others' territories. The innovative vision of Captain Nemo paved the way for enlightenment instead of destruction and eventually unfolded the modern vision of submarines – the explorer of the unknown. Verne's anti-colonial representation of Nautilus in his science-fiction delivered a significant aspect of Innovation and ethics. By deviating from the original 1800 model of the Nautilus with the mechanisms to attack the opponent to a new innovative model that preserves human culture and civilization, Verne's deviation from Fulton's military imagination to an ethical and responsible one proved that both imagination and innovation must lean on ethics and morals.

The moral and ethical aspects of innovation gained relevance since the advent of nuclear energy. In the imagination of the ancient Greeks, Prometheus steals fire from heaven, whose shadow loomed largely over 20th century European and American physicists who were experimenting with atomic science to harness nuclear energy. However, the introduction of nuclear energy as a military weapon during World War II with the atomic bombings on Hiroshima and Nagasaki in 1945 questioned the ethical position of innovation, science, and technology. Many futuristic dystopian fictions still deal with catastrophes and apocalypse led by unethical nuclear wars and explosions. Novels, like *A Canticle for Leibowitz* (1959) by Walter M. Miller, *By the Waters of Babylon* (1937) by Stephen Vincent Benet, *Shadow on the Hearth* (1950) by Judith Merril, deal with the theme of nuclear holocaust and depict the horror of the aftermath of a nuclear catastrophe [11, 13]. The prevalent threat of nuclear power in the present times has contaminated the positivism and optimism of imagination that once prevailed in Verne's narratives:

- “Man has landed and walked on the moon. Americans Neil Armstrong and Edwin Aldrin, 240,000 miles from the planet earth, had settled to a dusty landing on the moon's alien soil at 9.17 p.m. BST yesterday and it was Armstrong who made the first footprint on that strange globe” [8].

On the morning of July 21, 1969, everyone forgot all political boundaries and celebrated the landing of Apollo 11 as a victory for all humankind. Before Armstrong's “one small step”, a little-known young Belgian reporter and his friends landed on the surface of the moon. Even though his footsteps cannot

be found on the dusty silver surface, Tintin made the journey in December 1953 on his creator Herge's wings of imagination. In this issue, the crew boards an atomic rocket-powered spacecraft and lands on the Hipparchus crater. Some scientific instruments were set up by Inventor Calculus and engineer Frank Wolff to begin experimental work on the Moon while Tintin and Captain Haddock went on to explore several stalactite caves around the Ptolemaeus Crater by driving around the marvelous "Moon Tank". Their findings were never recorded in any scientific journals, but the young reporter's journey surely created the vision of man walking on the moon, later to be achieved by the brave trio of Apollo 11. It is true that Herge's imagination had no concrete contribution to the success of the landing of Apollo 11, but it definitely created an impact that can only be termed as "poetic." Herge's words had little to do with severely complicated astrophysics and calculations, but Herge's fictional reporter definitely kindled a spark in human pride, ambition, and legacy. On July 20, 1969, science followed in the footsteps of fiction.

The task of counting imagination-induced innovation is undoubtedly impossible. The stories of H.G. Wells or Frank Herbert, where intergalactic conflicts and wars come alive, can never be taken as mere fictions since mankind has initiated their interstellar explorations. Written in 1951, Isaac Asimov's short story "The Fun They Had" foresaw a computerized online education system with a mechanical teacher. In 2025, with the post-covid society and the emergence of generative AI, Asimov's imagination seems to be a well-told prophecy. Mary Shelley's *Frankenstein*, published in 1818, can never be taken as a mere horror story of a monster and its creator; rather, it is a narrative that envisioned defeating and defying death through the innovative experiments of a medical pioneer who tried to break through the norms of the contemporary. Fictions, like *Klara and the Sun* (2021) by Kazuo Ishiguro, *The Stone Gods* (2007) by Jeanette Winterson, William Gibson's *Neuromancer* (1984), and even the Japanese manga *Ghost in the Shell* (1989–1991), have imagined a futuristic world where humans coexist with robots, AIs, and cyborgs.

These products of rich imagination, however impossible they seem today, may open the doors to the new dimension beyond today's reality, as they always have. Some futuristic science fiction imagines a Utopian vision of the future world where humankind has founded a sustainable and peaceful world. They have recognized the past mistakes and have proceeded toward eradicating aspects of various discrimination that held them back. Often referred to as "solarpunk," these novels envision a world powered by solar energy. Solarpunk literature showcases innovative sustainable technologies within a utopian context and provides speculative models that aim to inspire and influence future scientific research and innovation.

CONCLUSION

Imagination makes us see the beyond, while science makes us go further the present horizon toward a new one. In Dr. Nalo Hopkinson's words "So, part of what it does is it gives you a way of thinking about the thing that you are taught that is an absence, the thing that you have no paradigm for thinking about. Science fiction gives you ways of mapping that, to start trying to imagine yourself into that space." Here Hopkins easily explains that science fiction gives way to imagining a blueprint or a map to fill an absence. In other words, extraordinary innovation is the outcome of the fulfilling of a desire often evoked by speculative narratives. Hopkins also says that the future is not predicted in science fiction; it is rather imagined:

- "So, I think this is one of the things that makes science fiction and fantasy very, very powerful because fantasy reimagines the past and imagines our relationships as cultures to myth. And myths are very, very powerful. We use them as driving images. We make new ones, completely new ones, all of a sudden, you have at a physical level a new way of experiencing the world So, it is not really a game of prediction. It is a game, as you say, of imagination".

In his article "Rabindranath o Kalpabigyan," Amitava Rakshit articulates the idea that both science and imagination pursue the absolute and the sublime. Science seeks the truth through empirical measurement, and literature, as a manifestation of imagination, through poesy.

When Ray Bradbury wrote “Science Fiction is the one field that reached out and embraced every sector of the human imagination, every endeavor, every idea, every technological development, and every dream...”, he amalgamated the spheres of science and imagination.

In conclusion, imagination stands as the driving force behind all innovations. From ancient myths to groundbreaking scientific inventions, the trajectory of human progress reveals how evolution of human civilization, in essence, is the evolution of imagination. To innovate, one must dare to imagine.

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