# Binary Classification of Science Fiction: Examining Hard and Soft SF

Enze Shi

Science fiction (SF) is a relatively new literary genre with contributions from many new authors. Due to this, it has lacked a consistent definition amongst readers as compared to other genres like horror and drama. SF emerged from base fiction and is differentiated by its involvement of science and realism. For some, SF is defined as the straightforward combination of science, imagination, and fiction. However, there are also more theoretical approaches. For example, Darko Suvin defines SF as a literary genre whose necessity is the presence and interaction of estrangement and cognition (372). Paul Kincaid stated that "the inability to define science fiction" has been long recognized (409). This definitional ambiguity has created ongoing debate within SF scholarship. This controversy has its benefits; it has helped redefine the boundaries between SF and the other genres, allowing scholars to examine why this genre emerged from conventional fiction.

SF had rapidly grown since the early 19th century. Two centuries of development created a huge catalog in SF. This proliferation not only made this genre more prevalent but also let readers and scholars develop an internal classification: hard and soft SF. In simple words, hard SF adheres to science and reality to a higher degree than soft SF. While the binary classification of SF into hard and soft creates a convenient framework for understanding, it ultimately oversimplifies the genre's rich complexity. Overemphasizing categorizing hard and soft SF leads to misplaced attention and distorted interpretation in SF criticism. Instead, SF criticism should prioritize its primary purpose: exploring universal questions, challenging readers' perspectives, and influencing reality. A more meaningful application of the hard and soft classification is through relative comparison; stating a work is "harder" or "softer" than others, rather than assigning absolute labels. This approach acknowledges the interdependent and overlapping nature of this category, allowing for a more comprehensive evolution without forcing a reductive classification onto complex work

**Defining Hard and Soft Science Fiction**

Hard and soft SF have subjective and vague guidelines: hard SF adheres more precisely to scientific principles and realism, while soft SF has more imaginative elements. However, these guidelines often overlap, making it possible for a work to qualify as both hard and soft SF simultaneously. Thus, scholars have attempted to define them more accurately. Allen Steele, for instance, defined hard SF as "the form of imaginative literature that uses either established or carefully extrapolated science as its backbone." (4) Meanwhile, *Brave New Words: The Oxford Dictionary of Science Fiction* offers two complementary definitions of soft SF; first, as fiction emphasizing the social science and focusing on societal, cultural, or political development

rather than natural science and technology; second, as SF where scientific elements serve as the background rather than central focus (Prucher 191). Nevertheless, in practice, many SF narratives still contain elements of both categories, challenging this binary classification.

***Dune* as a Case Study of Classification Tension**

A prime example of the hard and soft debate is Frank Herbert's *Dune* (1965), a novel that defies simple categorizations and illustrates the limits of binary classification. *Dune* can be credibly placed in either category, leading to debate over its hard or soft classification. Examining how scholars justify each side, we can see how such rigid distinctions often fail to rigorously and objectively define SF works.

Many scholars argue that *Dune* contains strong elements of hard SF. John W. Campbell, the editor of *Analog Science Fiction and Fact*, where *Dune* was originally published, specifically referred to it as "hard science-fiction worked out in meticulous detail." (592–3) In speaking of Villeneuve's 2021 film adaptation, Burgett argues that it is much harder and more grounded than most other SF films. Their justifications are particularly adapted from *Dune*'s ecologically grounded world-building and plausible technologies. Frank Herbert's detailed explanation of Arrakis's water cycle, sandworms' biology, and desert climate reflects scientific realism. Gerald Jonas noted that Herbert "so completely worked out the interactions of man and beast and geography and climate," that *Dune* became the standard for ecological SF. While some may argue that ecology belongs to the soft sciences, proponents of the hard SF justify its classification using Herbert's logical consistency from real environmental science. In addition, the technologies in *Dune*, while not heavily described, also reflect real scientific concepts. Devices like stillsuits that recycle water and ornithopters that mimic bird flight are theoretically possible to create (Kennedy). Thus, Herbert's attention to scientific possibilities in his setting is a crucial justification. Altogether, these elements provide strong arguments for critics and readers who believe *Dune* is a valid candidate for hard -

On the other hand, many scholars believe that *Dune* is a soft SF work by definition, not primarily because it lacks scientific detail, but because it focuses more on social, cultural, and psychological exploration. For example, Xu Tengyue explicitly analyzes Villeneuve's *Dune* as an example of a "soft science fiction film," noting that soft SF film "pays more attention to the expression of human values and story lines" rather than elaborate special effects or technical applications (82). In other words, *Dune* emphasizes "soft" science (anthropology, sociology, psychology, political science, ecology) over the "hard" sciences like physics (Kennedy). Soft SF deals directly or indirectly with anthropology, ecology, psychology, and sociology (Nicholls). By this criterion, *Dune* fits the soft SF genre. Moreover, its plot centers on culture (the Fremen society), politics (imperial and feudal power struggles), religion (Messianic prophecy and mythmaking), and psychology (Paul's mental training and prescient visions). Additionally, some argue that the deliberate suppression of science in *Dune* makes it soft SF. Herbert does introduce devices such as stillsuits and ornithopters, technologies grounded in plausible engineering.

However, his deliberate omission of computers, robots, and artificial intelligence reflects a larger thematic purpose: to emphasize human evolution, religious myth, and political systems over technical advancement. By intentionally downplaying certain advanced technology, he focused on the essence of humanity. These approaches align with soft SF, offering strong arguments on the side of the debate that supports *Dune*'s soft classification.

This debate over *Dune* reveals a deeper issue: hard and soft classification often reflects personal interpretation more than objective analysis. It highlights its fundamental inability to rigidly classify any work of SF. Whether labeled hard or soft SF depends largely on which elements a critic chooses to emphasize. To justify their argument in this debate, the interpreters spend a great deal of time finding and analyzing the scientific connection, which is not the primary focus of SF.

**Examining SF's Focus in Global Contexts: Western and Chinese SF Evolution**

Overemphasizing the hard and soft debate often leads critics to hyper-fixate on a work's scientific accuracy. However, solely integrating science into fiction has never been the primary focus of SF. Instead, its primary focus lies in its potential to address broad social, ethical, and philosophical questions. To understand these deeper focuses, we better step back from rigid classification and examine how SF has developed across different cultural contexts. A comprehensive examination cannot focus solely on Western SF works such as *Frankenstein*, The Foundation series, and *2001: A Space Odyssey*. Although Western SF is fundamental to the genre, there are other major players in the larger world of SF. Chinese SF is one of these significant contributors. Liu Cixin's novel *The Three-Body Problem* (2008; Eng. trans. 2014) and his novella *The Wandering Earth* (2000; film adaptation 2019) have both achieved international acclaim. Shaped by distinct political, economic, and cultural histories, Western and Chinese SF provide broader and unique insights into the primary focus of SF through a holistic analysis.

Starting with Western SF, it is widely believed that Western SF emerged with Mary Shelley's *Frankenstein* (1818), which used scientific curiosity to examine the ethical and moral dilemmas of its time (Ellis 27). In the late 19th century, the genre expanded with Jules Verne's adventurous voyages and H.G. Wells's cautionary tales, which both integrated new scientific ideas with speculation, but Verne leaned toward scientific fantasies while Wells leaned toward scientific romances (Ege 93). Entering the early to mid-20th century, the so-called "Golden Age of SF" had authors like Isaac Asimov, Arthur C. Clarke, and Robert A. Heinlein, whose works not only entertained but also reflected contemporary issues and ideas related to scientific progress. Nowadays, SF books and films vary greatly in topics and settings, addressing complex societal, environmental, and technological issues. Its greater flexibility in world-setting and range of topics reaches a larger audience. Throughout these periods, Western SF evolved not merely to speculate on technological advancements, but to reflect contemporary messages and issues.

Besides Western SF, in Raphals's deep study, Chinese SF development can be generalized into three distinct phases: the utopian phase in the late Qing dynasty; the pedagogical phase in the

1950s; and the speculative phase since 1989 (82). The utopian phase began with the translation of Western literature and the sparking of innovative thought among the populations instead of having captive minds. The scholars proposed that mass translations would help spread advanced Western knowledge into China (82). Additionally, some representative indigenous SF works, for example, Liang Qichao's *Future of New China*, commonly involved the prediction of China having a bright future after adopting science (83). The formation of the pedagogical phase aligns with the founding of the People's Republic of China (1949). Here, SF's main role was to promote and cement the ideas of Marxism and Maoism, shaping the population's ideology (Raphal 84). In this phase, SF was integrated into education, which is the most effective approach to control and shape ideology. Lastly, the phase currently ongoing, the speculative phase, began the year of the Tiananmen Square massacre, 1989 (85). The restrictions on speculative literature were eased by the government, allowing a flowering of Chinese SF that directly grappled with the legacy of the Cultural Revolution. This phase answered the rapid technological growth, greater openness, and the evolution of public thought. Across all the phases, Chinese SF has been a mirror of the nation's ideological shifts and social anxieties.

**SF as a Medium for Message, Not Just Method**

Examining the evolution of SF across both Western and Chinese contexts reveals a consistent pattern: SF has always assumed multiple unspoken roles, such as conveying messages, examining dilemmas, and critiquing ideology. While scientific concepts provide the framework, they do not have to be the message itself. Instead, they serve as a platform upon which the deeper messages are built. Thus, SF's focus is on utilizing scientific concepts as a gateway to explore deeper societal and philosophical questions, often imagined through future worlds. This broader function of SF is what critics overlook when they fixate solely on hard or soft classification

In the case of *Dune*, the argument about its classification as hard or soft obscures its deeper literary value. The excessive focus on the debate over its binary identification can overlook the work's rich exploration of themes like political corruption, religious manipulation, and messianic power. These messages are the primary focus and crucial to its literary value. However, they could not be spotlighted while solely focusing on the narrative's scientific connection.

**When Labels Limit: Cognitive Heuristics and Reader Bias**

The debate over *Dune* is just an example. Similar debates emerge whenever a popular SF work is released, which reflects a broader cognitive tendency to simplify complex information. The frequent use of hard and soft labels in marketing and reviews of SF has led many critics and fans to support keeping and promoting this distinction in SF. They argue that the binary labels encourage more audiences who lack deep knowledge in SF to step into this field. The human brain tends to break down complicated and multifactorial entities or problems into a few numbers of ramifications to generalize and make it easier to understand. When presented with only two clear options, as with the binary classification of hard versus soft SF, our brains can more easily process and understand the information, analogous to the binary 0 and 1 mechanism in computer science.

This quick and straightforward determination is also called the one-reason decision-making heuristic. This heuristic shows that by focusing on a single, decisive cue rather than an exhaustive set of details, individuals can achieve surprisingly accurate judgments quickly and with minimal cognitive load. As Todd and Gigerenzer argue, heuristics, some in particular, produce accurate decisions by exploiting the structure of applied information and environment (167). Consequently, using a broad, easily digestible label invites non-experts into the field by applying our natural tendency to reduce complex information into clear categories.

In fact, the use of heuristics in SF criticism does make SF more accessible and appealing to a broad audience to some degree. However, it not only generates simplicity and popularity but also preconceived notions or bias. In their influential study, Tversky and Kahneman illustrate that people often rely on heuristics, such as the representativeness heuristic, to make judgements, even when they lead to "systematic and predictable errors" (1131). In terms of SF, that means once a reader or viewer approaches a work with a preconceived perspective that it is either hard or soft, they are more likely to unconsciously focus on the elements that confirm their assumption. As a result, they might overlook other significant elements that are against their assumption, leading to an incomplete and biased interpretation.

**Thematic Depth and Real-World Influence in SF**

In practice, authors generally do not begin the creative process with a determined intention of making a work that strictly adheres to one sub-genre over the other; instead, they weave together various ideas, techniques, and influences that challenge binary categorization. Like all literature, SF is built on complex narratives, themes, and elements, and rarely do all aspects of a SF work align perfectly within the confines of either hard or soft. This reality makes the argument that justifies a SF work being classified as hard or soft problematic, as it tends to selectively extract supporting elements from throughout the book or film. Therefore, when critics or readers rely solely on these binary classifications, they lack an overview of the work's whole picture. It ultimately compromises the possibility of a holistic, objective review, which then causes bias and distorted interpretation.

Therefore, rather than sticking with rigid labels, SF criticism should shift toward evaluating the themes, messages, and real-world impact of these works. We can see some of the ideal approaches that have been made while reviewing famous SF works like Isaac Asimov's Foundation series and Liu Cixin's *The Dark Forest* (sequel to *The Three-Body Problem*). Through their comprehensive analysis, we can see the valuable insights it brings.

Specifically, both have conveyed profound messages and challenged readers' understanding. For instance, in Isaac Asimov's *Foundation* series, science serves as the framework for exploring the rise and fall of civilizations through the emergence of psychohistory, a kind of mathematical sociology. Here, the scientific elements are not the core focus; they are the platform that supports challenging questions about human destiny and social organization. Similarly, Liu Cixin's *The Dark Forest* uses complex scientific theories and the vastness of space to showcase humanity's vulnerability, existential risks, and the consequences of our technological development.

Importantly, he proposes a hypothesis among universal civilizations—the Dark Forest hypothesis. In both examples, the quality of science, whether perceived as strong or weak, is subordinate to the larger narrative. Psychohistory and the Dark Forest hypothesis represent two notions in SF theorizing by Asimov and Liu, respectively. Psychohistory is Asimov's purely fictional mathematical system, while the Dark Forest hypothesis, though dramatized by Liu, reflects real scientific speculation about the Fermi Paradox. However, both authors demonstrate the logical consistency of these concepts within their created, reality-analogous worlds. These theories—one fictional, one speculative—challenge readers' understanding of society and science and offer provocative predictions about humanity's future.

Another crucial criterion for SF criticism is examining works' capacity to indirectly bring influential impacts to reality. Kevin L. Young and Charli Carpenter investigated whether and how popular SF media influence public attitudes toward emerging military technologies, specifically autonomous weapon systems (AWS). Individuals who report higher consumption of SF—measured by the number of iconic killer-robot franchises they have viewed—are significantly more likely to oppose the development and deployment of AWS (573). The direct impact SF has brought into the world is just a mere example of how imaginative narratives can shape reality.

**Conclusion: Toward a More Holistic SF Criticism**

If SF criticism consistently centered on the purposes that have been presented above, *Foundation*, *The Dark Forest*, and SF's impact on the public opinion about AWS, then the authors' creative intentions could be more accurately understood and appreciated. This shift not only reduces misinterpretation caused by the rigid hard and soft classification but also creates a more dynamic and meaningful environment in SF. While the binary classification may serve as a helpful guideline when used for relative comparison, it must not overshadow the SF's larger literary and philosophical contributions. Encouraging such an evaluative approach would push the authors to produce more thoughtful and thematically rich SF works, which focus well on the primary focus and unspoken rules. It could ultimately push the SF community to grow more receptive to diverse voices and exploration, promoting the genre's continued evolution.

## Works Cited

Burgett, Cole. "*Dune* and the Future of the Science Fiction Epic." *Christian Research Journal*, vol. 44, no. 4, 10 Nov. 2021.

Campbell, John W., Jr. *The John W. Campbell Letters. Volume I*. Edited by Perry A. Chapdelaine, Sr., Tony Chapdelaine, and George Hay, AC Projects, 1985, pp. 592–3.

Ege, Sema. "Jules Verne and H.G. Wells." *Ankara Üniversitesi Dil Ve Tarih-Coğrafya Fakültesi Dergisi*, vol. 35, no. 1, 1 Jan. 1991, pp. 91–6.

Ellis, Markman. "Fictions of science in Mary Shelley's 'Frankenstein.'" *Sydney Studies in English*, vol. 34, no. 2, 1999, pp. 27–46.

Jonas, Gerald. "The Sandworm SAGA." *The New York Times*, 17 May 1981.

Kennedy, Kara. "The Softer Side of *Dune*: The Impact of the Social Sciences on World-Building." *Exploring Imaginary Worlds: Essays on Media, Structure, and Subcreation*, edited by Mark Wolf, Routledge, 2021.

Kincaid, Paul. "On the Origins of Genre." *Extrapolation*, vol. 44, no. 4, Winter 2003, pp. 409–19.

Nicholls, Peter, and John Clute. "Soft Science." *The Encyclopedia of Science Fiction*. Edited by John Clute and David Langford, Ansible Editions, 9 Apr. 2015,

Prucher, Jeff, editor. *Brave New Words: The Oxford Dictionary of Science Fiction*. Oxford University Press, 2007, p. 191.

Raphals, Lisa. "Chinese Science Fiction: Imported and Indigenous." *Osiris*, vol. 34, 2019, pp. 81–98.

Steele, Allen. "Hard Again." *The New York Review of Science Fiction*, no. 46, Jun. 1992, pp. 2–4.

Suvin, Darko. "On the Poetics of the Science Fiction Genre." *College English*, vol. 34, no. 3, Dec. 1972, pp. 372–82.

Todd, Peter. M, and Gerd Gigerenzer. "Environments That Make Us Smart: Ecological Rationality." *Current Directions in Psychological Science*, vol. 16, no. 3, Jun. 2007, pp. 167–71.

Tversky, Amos, and Daniel Kahneman. "Judgment under Uncertainty: Heuristics and Biases." *Science*, vol. 185, no. 4157, 27 Sep. 1974, pp. 1124–31.

Xu, Tengyue. "Research on Soft Science Fiction Films Based on the Movie *Dune*." *Frontier in Art Research*, vol. 4, no. 13, 2022, pp. 82–6. Francis Academic Press.

Young, Kevin L., and Charli Carpenter. "Does Science Fiction Affect Political Fact? Yes and No." *International Studies Quarterly*, vol. 62, no. 3, Sep. 2018, pp. 562–76.

**Enze Shi** is a researcher who focuses on science fiction, translational, and outcomes research. Being an immigrant from China, both Chinese culture and Western culture had a significant influence on his academic and personal growth. Integrating the perspectives and contributions of both Chinese and Western SF allows him to bring notions with novel approaches. Shi is a student of the Texas Academy of Mathematics and Science at the University of North Texas. There, he conducts chemistry research and is involved in Chinese philosophy classes, being active in both STEM and humanities fields.