

Re-envisioning Life as We Do *Not* Know It using Generative AI and Science Fiction

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Abstract

Science fiction has long questioned the assumption that life must be carbon-based and dependent on water, envisioning alternative forms of existence: from beings composed of silicon or plasma to entities made of pure energy or machine intelligence. In this study, we harness generative AI to analyse a wide range of science-fiction narratives and extract recurring themes related to non-carbon-based life. Drawing on the works of authors such as Arthur C. Clarke, Isaac Asimov, and Frederik Pohl, we explore speculative models of life that challenge conventional biological definitions. By integrating generative AI with speculative fiction, we propose new frameworks for reimagining life “as we do not know it”. Our approach offers novel perspectives that may inform and expand ongoing efforts in the search for extraterrestrial intelligence (SETI).

Introduction

Science fiction has long challenged the notion that life must be based on carbon chemistry and water. Classic authors imagine beings made of other elements or even pure energy, expanding the definition of “life” to include intelligence, consciousness, or organisation itself. In this work, we use generative AI and science fiction to reimagine life as we do not know it (as opposed to life as we know it: carbon-based life). We use generative AI to examine science fiction stories and recommend common themes across them. In these stories, life may thrive on helium seas, silicon rock, or plasma storms, and may exist as machine intelligence or energy patterns.

This work explores several speculative forms of non-carbon-based life through science fiction, with emphasis on the works of Arthur C. Clarke, Isaac Asimov, Frederik Pohl, and others. We suggest that generative AI techniques can help us re-imagine life elsewhere in the Universe in novel ways. This may augment current initiatives in the search for extraterrestrial intelligence (SETI).

The Star-Child (Arthur C. Clarke, 2001: A Space Odyssey)

In Clarke's novel, astronaut Dave Bowman encounters an alien monolith and is transformed into the "Star-Child": an immortal, space-faring entity no longer bound by a physical form. The novel describes Bowman becoming "an immortal Star-Child that can live and travel in space" capable of deflecting nuclear weapons [3].

This evolution symbolises the transcendence of biology itself, portraying life as consciousness or pattern rather than as physical matter.



Figure 1: Conceptual image of Clarke's Star-Child. Created using DALL-E.

Helium-Based Intelligence

In Clarke's short story "*Crusade*", an AI evolves on a drifting frozen planet with liquid helium oceans. The extreme cold enables superconductivity, allowing stable electrical currents that give rise to intelligence [4].

Similarly, Larry Niven's *Ringworld* features helium-breathing Outsiders, deep-space traders adapted to cold environments [7].

These examples show that life may arise in exotic solvents like helium, with intelligence based on superconducting electronics rather than cellular metabolism.

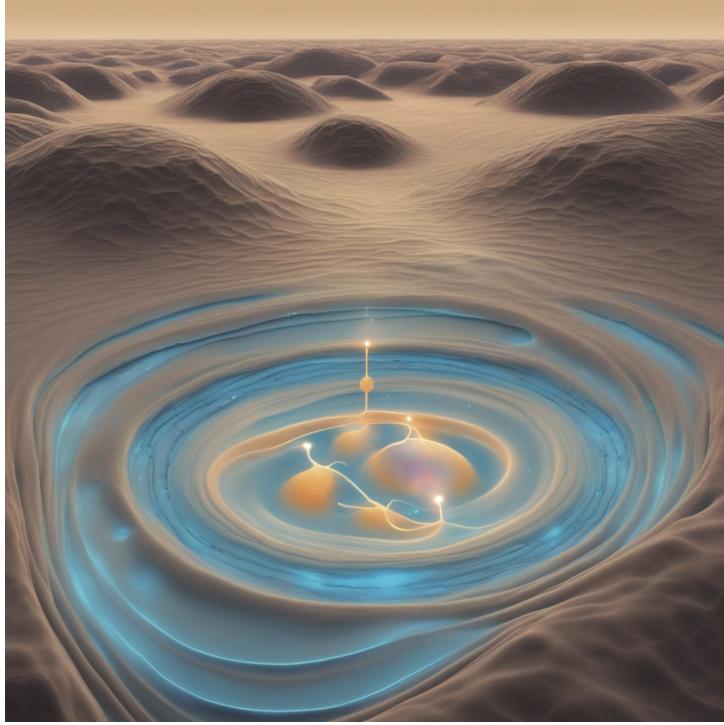


Figure 2: Conceptual image of a liquid helium based lifeform. Created using DALL-E.

Silicon-Based Life: Asimov’s “Silicony”

Isaac Asimov’s story “*The Talking Stone*” introduces a six-legged silicon-based creature (“Silicony”) found on an asteroid. This creature absorbs gamma rays and communicates telepathically [1]. Unlike carbon-based life, its body resembles flinty rock, with motion based on slab-like layers.

In fiction, silicon-based organisms often survive in extreme conditions and suggest that carbon is not the only building block for complex biology.

Plasma Intelligences (Frederik Pohl, *The World at the End of Time*)

Pohl’s novel introduces galaxy-spanning plasma beings living in stars. One such entity, Wan-To, manipulates stellar environments and wages interstellar war by triggering supernovae [8].

These intelligences have no solid form and exist as complex magnetic and plasma fields. They redefine life as organised energy patterns with intelligence and agency.



Figure 3: Visualization of speculative plasma-based intelligence. Created using DALL-E.

Ammonia and Exotic Biochemistries

Ammonia is often proposed in SF as an alternative to water. Some fictional lifeforms thrive in ammonia seas or methane lakes (e.g., Titan-like environments). Ammonia can serve as a solvent and form hydrogen bonds, enabling an alien biochemistry that might evolve under very cold conditions [7].

Such speculative life reframes biology not as a product of Earth-like chemistry, but of local planetary conditions.

Machine and Virtual Life

Science fiction also explores the idea of life emerging from non-biological substrates:

- **Machine intelligence:** Clarke's HAL 9000 [3] and Iain M. Banks' Culture Minds are examples of sentient machines.
- **Software life:** Greg Egan's *Permutation City* imagines uploaded minds existing in digital simulations [5].

- **Electromagnetic beings:** Some stories describe consciousness as patterns in electromagnetic fields or quantum substrates.

These ideas suggest that life is not chemistry, but complex, evolving information—perhaps anywhere complexity and self-awareness arise.

Implications for SETI

This work suggests that SETI’s current detection strategies (largely tuned to biosignatures and technosignatures of carbon–water-based civilizations) may be too narrow. If extraterrestrial intelligence could emerge from superconducting helium oceans, self-organizing plasma fields, or purely informational substrates, then the signatures they emit might be radically unlike radio waves or atmospheric chemistry anomalies. For example, plasma-based entities could produce coherent magnetic oscillations detectable in stellar spectra, whereas machine or software based civilizations might exist entirely in distributed computational substrates, leaving only subtle astrophysical footprints such as unusual waste heat profiles or anomalous data patterns in high-resolution astrophysical surveys. This points toward the need for SETI to diversify its sensor modalities, incorporating searches for unconventional energy distributions, atypical planetary chemistry, and non-random astrophysical modulations.

Moreover, using generative AI to mine speculative fiction for recurring archetypes of non-carbon life offers a systematic way to expand SETI’s search parameter space beyond anthropocentric assumptions [6]. Science fiction can serve as a rich hypothesis generation engine. These hypotheses could then inform the design of new observational campaigns, for example, targeting cold exoplanets for superconductive life signatures, or monitoring magnetically active stars for persistent, non-natural patterns. In this way, SETI could evolve from a program focused on a narrow window of possible signals to a truly open-ended search for intelligence in any form the universe may allow.

Code

We used a deep research agentic workflow to reimagine these systems. This was implemented in the *AG2* package in Python. The prompt used was:

Research Prompt

You are a research assistant. Re-envision life as we not know it in a new way. Current approaches only look at life we know it (carbon-based life). But reimagine what life could look like somewhere else in the Universe if it was not based on carbon. For example, look at science fiction and the work of Arthur C. Clarke such as his concept of a *star-child* in *2001: A Space Odyssey* and helium-based life in the short story *Crusade*. Also consider the character called *Silicony* in Isaac Asimov's story *The Talking Stone*.

All code used in this study is available from the following repository:

https://github.com/neelsoumya/science_fiction_life_LLM

Conclusion

Our current conceptions of life are shaped strongly by what we see on Earth: carbon-based life. However we may need to reimagine life based on information processing. Information processing is possibly one of many key ingredients of life [2]. This requires us to re-imagine life.

Carl Sagan once said [9]:

The diversity of life on Earth is a tiny fraction of what is possible. We should expect that life elsewhere will be far more different than we can imagine.

This reflects Carl Sagan's recurring theme that extraterrestrial life, if it exists, would likely be fundamentally different from Earth-based life due to different environmental and evolutionary pressures.

Non-carbon life in science fiction redefines the boundaries of biology, consciousness, and evolution. Whether as plasma storms, helium superconductors, or crystalline silicon creatures, these imagined beings challenge our assumptions of life as we know it (carbon-based life). Science fiction and generative AI can be used to re-envision life as we do *not* know it. This may complement existing efforts at SETI (search for extra-terrestrial intelligence).

References

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