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Discussion Note

The Bona Fide of Non-Human Intelligence (NHI) Exploring Earth: Evolutionary Pressure and the Halting Problem

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ABSTRACT

The question of why Non-Human Intelligence (NHI) might explore Earth is multifaceted, particularly in light of recent revelations regarding Unidentified Anomalous Phenomena (UAP) reported under oath in the United States House Committee on Oversight and Accountability's hearing on "Unidentified Anomalous Phenomena: Implications on National Security, Public Safety, and Government Transparency," held on July 26, 2023 [1]. This discussion note reveals a technological and evolutionary dilemma, exploring the *bona fide* from the perspective of computational complexity theory. By examining higher-level premises, we aim to provide a comprehensive understanding of potential NHI motivations, while also formalizing the equivalence of the evolutionary dilemma with the *Halting Problem*, discussing limitations of algorithmic prediction in certain domains. We investigate a necessary condition wherein NHIs master non-deterministic processing (NDP) having evolved to a level where technology ensures nearly constant, maximized living conditions. We hypothesize that a reduction of evolutionary pressure leads to a critical halt in endogenetic evolution, prompting NHIs to explore Earth and other life habitats to study evolutionary solutions on genetic lines different from their own. We formalize this hypothesis by defining a function $H(P(NHI))$ that aims to determine NHI evolutionary trajectories. However, the already known computational complexities of the *Halting Problem* show, that $H(P(NHI))$ cannot serve its purpose. Through this exploration, we intend to deepen our understanding of the implications of technological evolution with potential consequences for as well as both, NHI and humanity.

Keywords: Non-Human Intelligence (NHI), Evolutionary Pressure, Computational Complexity Theory, Halting Problem, Non-Deterministic Processing (NDP), Endogenetic Evolution, Computational Complexity, Unidentified Anomalous Phenomena (UAP), Genetic Diversity

1. INTRODUCTION

The question of why Non-Human Intelligence (NHI) might explore Earth is a complex and multifaceted one, especially in light of recent developments regarding Unidentified Anomalous Phenomena (UAP). [2] The reality of UAP manifestations on Earth, as reported under oath [3] [4] [5] in the United States House Committee on Oversight and Accountability's hearing on "Unidentified Anomalous Phenomena: Implications on National Security, Public Safety, and Government Transparency," held on July 26, 2023, [1] underscores the acute need to address the *bona fide* hypothesis from all angles.

For this discussion, NHI shall be anything non-human, able to manifest with documented UAP, i.e., high-tech.

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Unreflected answers to this question may range from conquest and resource exploitation to more benign forms of exploration. However, a deeper analytical approach suggests considering higher-level premises, such as those rooted in computational complexity theory:

2. COMPLEXITY THEORY

Computational complexity theory [6], often likened to a "zoo" of computational challenges (FIG. 1), encompasses fundamental questions such as P vs. NP [7] and the consequences of their resolution. If P=NP were true [8] [9] [10] [11], it would imply that all problems with solutions verifiable in polynomial time could also be solved in polynomial time. This theoretical breakthrough would revolutionize technology and lifestyle, enabling feats like cures for all diseases, design automation (hard/software/molecular), (almost) unlimited resources (energy/materials) and formal (mathematical/scientific) knowledge, material design on isotopic level, inter-galactic travel, inertia freedom, weightlessness, non-monetary zero-marginal cost economy [12] [13] etc.), all under the umbrella of its implementation as a Non-Deterministic Processor (NDP). [14]

In furtherance of this discussion, we conjecture that an NDP is a necessary condition for interstellar exploration.

3. THE HALTING PROBLEM

At the pinnacle of computational complexity challenges lies the *Halting Problem* [15], a classic *Entscheidungsproblem* [16] in computer science. It asks whether a given algorithm will halt or run indefinitely, while its unsolvability stems from the inherent limitations of algorithmic computation in predicting the behavior of computational processes.

The *Halting Problem* essentially asks whether it is possible to devise an algorithm that can determine, for any input program and input, whether the program will eventually halt or run indefinitely. This problem was proven undecidable by Alan Turing [17] in his seminal work on computability theory.

To illustrate why the *Halting Problem* is necessarily unsolvable, we suppose that there exists an algorithm A, that can determine whether any given Turing machine [18] halts on a particular input. It will become self-evident, that such a algorithm leads to a contradiction, hence, could never terminate:

Let $H(M, x)$ be a function that takes as input a description of a Turing machine M and an input string x, and returns "true" if M halts on input x, and "false" otherwise.

Consider constructing a new Turing machine, D, defined as follows:

1. On input M, where M is a description of a Turing machine:
2. Run the algorithm A with inputs M and M. That is, $A(M, M)$.
3. If A returns "true", i.e., M halts on input M, then loop infinitely. Otherwise, halt.

Now, let's analyze what happens when we feed D as input to itself, $D(D)$:

1. D runs the algorithm A with inputs D and D. This corresponds to $A(D, D)$.
2. If A returns "true", i.e., D halts on input D, then D enters an infinite loop.
3. If A returns "false", i.e., D does not halt on input D, then D halts.

Finally, consider the implications:

- If A returns "true", then D enters an infinite loop, contradicting the assumption that A correctly determines whether Turing machines halt.
- If A returns "false", then D halts, also contradicting the assumption that A correctly determines whether Turing machines halt.

In either case, we have arrived at a contradiction, which means our initial assumption - that there exists an algorithm A to solve the *Halting Problem* - is false.

Therefore, the *Halting Problem* is unsolvable by any algorithm whatsoever, regardless of its efficiency (FIG. 1).

Representing the ultimate boundary of computational feasibility, any problem that is reducible to the *Halting Problem* inherits its undecidability, making it one of the most fundamental and far-reaching results in theoretical computer science.

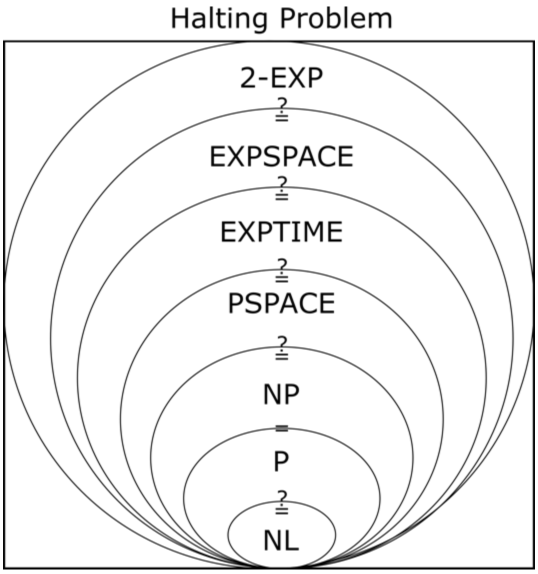

FIG. 1 Complexity Zoo

Accordingly, the powerful computational NDP paradigm does not offer a resolution to the *Halting Problem*.

4. COGNITION VS ALGORTIHMS

With the undecidability of the *Halting Problem* revealing a fundamental boundary within the realm of algorithmic logic and formal systems, as illustrated by Turing alongside Gödel's incompleteness theorems [19], it underscores a critical distinction between the nature of algorithmic processes and the broader, nuanced realm of cognitive abilities observed in humans and potentially NHI.

Despite the proficiency with which humans or any NHI might execute algorithms, such as those designed to solve SAT (Boolean satisfiability problem) [20], these algorithmic methods intrinsically lack "non-algorithmic" capabilities.

"Non-algorithmic" capabilities refer to a mode of problem-solving and understanding that extends beyond the strictures of algorithmic logic and computation. This concept points to an ability to navigate and resolve issues that are inherently unsolvable through algorithmic means, such as those challenges highlighted by the undecidability of the *Entscheidungsproblem*.

This trivial distinction suggests that, regardless of the sophistication or efficiency of an algorithmic process, it is fundamentally confined to the domain of computable problems, incapable of encompassing or replicating the entirety of human or non-human cognitive abilities alike.

This purposely not further specified separation carries profound implications for the fields of computational theory, algorithm design, and the understanding of intelligence. It emphasizes a boundary in computational and cognitive sciences, delineating a clear divide between algorithmic computation and the wider capabilities that include non-algorithmic reasoning and problem-solving.

5. EVOLUTIONARY PRESSURE

Evolutionary pressure, also known as selective pressure or selection pressure, [21] refers to the influence exerted by environmental factors on the survival and reproductive success of organisms within a population. These pressures drive the process of natural selection and endogenesis [22], where individuals with advantageous traits are more likely to survive and reproduce, passing on their genes to future generations.

In scenarios where evolutionary pressure approaches zero, the selective forces that typically drive adaptation and evolution become greatly diminished or non-existent. This can occur under conditions where environmental conditions are extremely stable, resources are abundant and consistently available, and there are minimal threats to survival.

Under such circumstances, several consequences may arise for the population:

1. *Decreased Genetic Diversity:* Without selective pressures driving the emergence and maintenance of advantageous traits, there may be reduced genetic diversity within a population. Traits that were previously advantageous for survival may no longer confer any reproductive advantage, leading to a homogenization of the gene pool.

2. *Reduced Adaptability:* In the absence of selective pressures, there may be a diminished need for organisms to adapt to changing environmental conditions. As a result, populations become less flexible in responding to new challenges or environmental shifts, potentially increasing vulnerability to future changes.
3. *Stagnation or Stasis:* Populations experiencing negligible selective pressures may enter a state of evolutionary stasis, where little to no change occurs over extended periods of time. This can result in populations becoming "frozen" in their current state, with minimal evolutionary innovation or divergence.
4. *Loss of Fitness:* While organisms may thrive in stable environments with minimal selective pressures, they experience a decline in overall fitness over time. Without the need to maintain adaptive traits, populations accumulate deleterious mutations or genetic variants that would otherwise be selectively removed under more challenging conditions.
5. *Vulnerability to Environmental Shifts:* Although stable environments may provide short-term benefits, populations lacking genetic diversity and adaptive potential may be ill-equipped to cope with sudden environmental changes or disruptions facing increased risk of extinction or decline.

In sum, low selective pressure can lead to long-term consequences that affect genetic diversity, adaptability, and overall evolutionary fitness (FIG. 2):

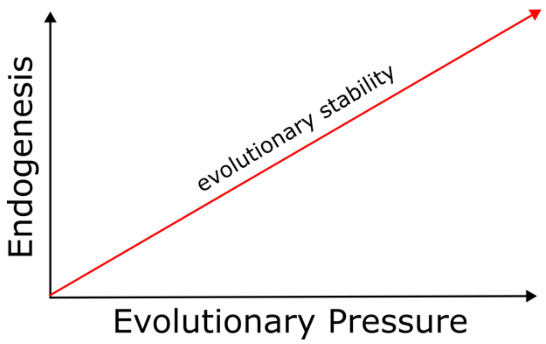

FIG. 2 Evolutionary Stability

6. THE NDP DILEMMA

With the necessary NDP conjecture and NHIs hundreds, thousands, millions, if not a billion of Earth years ahead in their evolutionary journey, we draw a *Gedankenexperiment* that transcends the bounds of our current imagination:

NHIs have mastered the art of existence in harmony with the cosmos. NDP enables conditions where traditional evolutionary pressures are not just mitigated but virtually eliminated. Environmental calamities, resource scarcities, and biological constraints are concepts relegated to footnotes in the annals of history. NHIs inhabit engineered ecosystems which are tailored for ecological balance and aesthetic beauty, diseases are no factor, and every individual has instantaneous access to the cumulative knowledge and experience of their civilization.

The societal fabric of the NHIs is woven from threads of curiosity, artistic exploration, and scientific inquiry. Technology grants them the power of understanding the universe's deepest mysteries. Spirituality in this advanced society is not confined to introspection; it encompasses forming profound, empathetic connections with the consciousness of the universe, exploring the spiritual implications of existence beyond physical form.

With this unparalleled advancement and existential harmony, the fundamental computational limit imposed by the *Halting Problem* to predict the *Best of Evolution*, [23], i.e., the fittest trajectory of their evolution, was already anticipated with the very conceptualization and inception of NDP.

To further investigate and enforce this conjecture, we define the intuitive function $H(P(NHI))$, facing the inherent undecidability rooted in the same computational and logical constraints that define the *Halting Problem*:

7. $\boldsymbol{H(P(NHI))}$

Recall the *Halting Problem*, which demonstrates that no general algorithm can decide for every possible program and input whether the program will halt or run indefinitely.

Now consider $H(P(NHI))$ with:

- H an algorithm intended to predict the evolutionary outcomes of NHIs.
- $P(NHI)$ representing the set of all possible evolutionary trajectories p that NHIs could take.

The goal of $H(P(NHI))$ is to determine, for any p in $P(NHI)$, whether the trajectory p would lead to an optimal evolutionary state (halt) or continue evolving indefinitely (run indefinitely).

Essentially, $H(P(NHI))$ is designed NHIs to identify the fittest or most advantageous evolutionary trajectory, not merely as a reactive measure to current challenges but as a proactive tool for adapting to potential future conditions before problems arise. Thus, $H(P(NHI))$ aims to be a forward-looking instrument that enables NHIs to navigate their evolutionary path with foresight, ensuring their continued prosperity and adaptation.

When considering a specific evolutionary trajectory, denoted as p, the operation goes:

- Run the algorithm H with inputs p and p, $H(p, p)$
- If H returns "true", indicating that the trajectory p leads to an optimal state, then an adjustment is made to ensure the trajectory continues evolving indefinitely. Conversely, if H returns "false", the trajectory is adjusted to reach an optimal state and effectively "halt".

To leverage $H(P(NHI))$, NHIs need to adapt their behavior or development strategy based on H's predictions. This adaptive adjustment - simply denoted as $D(p, H)$ - indicates that the action or change to trajectory p is influenced by H's prediction. Thus, D needs to consider itself in the context of H's predictions:

- D runs H with D as both inputs, equivalent to $H(D, D)$.
- If H returns "true", suggesting D would halt on input D, then D is designed to enter an infinite loop (evolve indefinitely).
- If H returns "false", indicating D does not halt on input D, then D is adjusted to halt (reach an optimal state).

It is this configuration introducing the undecidability characteristic of the *Halting Problem* into $H(P(NHI))$:

The algorithm H, when applied to D - which is influenced by H's prediction - must account for the self-modification of D in its predictions. This creates a recursive, self-referential dilemma where H's predictions directly influence the phenomena it attempts to predict, embodying the paradox of attempting to forecast the outcome of a system that adapts based on those forecasts (FIG. 3):

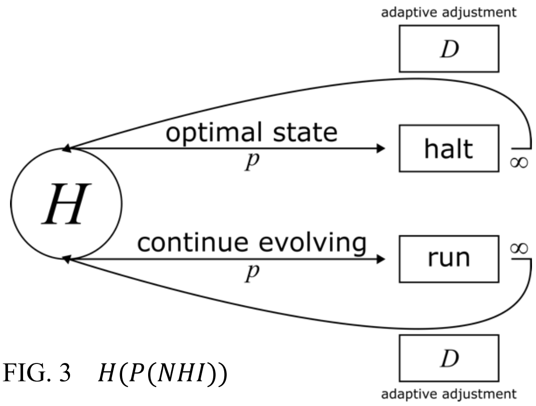

FIG. 3 $H(P(NHI))$

8. CONCLUSION

In furtherance of our *Gedankenexperiment*, NHIs foresaw the evolutionary dilemma inherent in their trajectory towards a utopian existence enabled by NDP well before this technology's actualization. This foresight allowed them to understand that the very essence of achieving a near-perfect society would eventually necessitate confronting the paradox of maintaining evolutionary dynamism without traditional pressures.

This contemplation led to a strategic anticipation: the solution to the impending evolutionary conundrum lay not within the confines of their own civilization but in the vast expanse of the cosmos. Before the dilemma reached a critical juncture, NHIs determined that the key to circumventing the potential for evolutionary stagnation - without resorting to artificially inducing selective pressures which would be in contradiction to their state of evolution - was to delve into the evolutionary narratives unfolding on worlds beyond their own.

The approach was elegantly simple yet profoundly insightful: to decipher and analyze the myriad evolutionary trajectories that have sculpted life across the universe, particularly focusing on civilizations and ecosystems far removed from their own experiences. This strategy of looking outward - to the evolutionary successes and trials on planets like Earth - offered a window into a kaleidoscope of adaptive strategies, survival mechanisms, and innovative solutions that have enabled diverse forms of life to flourish against the backdrop of constant environmental flux.

By systematically studying these external evolutionary achievements, the NHIs aim to distill, categorize, and integrate these "best solutions" into their own societal and biological frameworks. Leveraging NDP, they embarked on a grand analytical expedition to mine the evolutionary wisdom scattered across the stars. This endeavor represented a shift from a self-centric predictive model to an expansive, analytical exploration of life's universal principles of adaptation and resilience.

In doing so, the NHIs not only sidestep the absolute limitations posed by the *Halting Problem* but also enrich their civilization with the distilled essence of billions of years of natural experimentation. This proactive strategy ensures that NHIs can maintain their utopian conditions while embedding a layer of evolutionary insight and flexibility into the fabric of their society, thereby continuing their trajectory of growth and innovation with the wisdom of the cosmos as their guide.

Through this anticipatory and outward-looking approach, NHIs seamlessly navigate the potential impasse, ensuring that their evolution remained vibrant and dynamic, even in the absence of traditional evolutionary pressures.

Accordingly, the *bona fide* of NHI visiting Earth likely transcends simplistic notions of conquest or exploitation:

While it aligns with the fundamental drive for survival inherent in any species in the universe - whether on top or at the bottom of the food chain, it may first and foremost encompass a deliberate endeavor aimed at exploring and studying diverse evolutionary solutions, including those present within the human habitat.

Indications from reported cases of bovine excision [24], alien abduction [25], and the absence of overt hostility suggest a more nuanced understanding of NHI motivations, one rooted in the quest for evolutionary knowledge and survival rather than overt aggression.

9. FINAL NOTE

Regardless of the level of sophistication evolution may achieve, technological or not, it could be crucial to recognize that all evolutionary solutions are, in essence, transient and alternative adaptations within the vast tapestry of creation. This perspective underscores the inherent temporality and adaptability of evolutionary processes, suggesting that while computational advancements with, e.g., NDP might appear to accelerate evolutionary progress, they paradoxically may also lead to its stagnation. As we navigate the intersection of evolution and technology, it becomes evident that the pursuit of computational innovation, although seemingly propelling us forward, can inadvertently slow the dynamic and continuous flow of evolutionary change to a halt.

This realization invites a contemplative reflection on the delicate balance between advancing technological capabilities while preserving the natural impetus with evolutionary diversity and adaptability for NHI and humanity alike.

10. ACKNOWLEDGEMENT

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11. REFERENCES

[1] United-States-House-Committee-on-Oversight-and-Accountability, "Unidentified Anomalous Phenomena: Implications on National Security, Public Safety, and Government Transparency", United States House Committee on Oversight and Accountability, 6 July 2023. [Online]. Available: https://oversight.house.gov/hearing/unidentified-anomalous-phenomena-implications-on-national-security-public-safety-and-government-transparency/. [Accessed October 2023].

[2] Wikipedia-contributors, "Unidentified flying object", Wikipedia, The Free Encyclopedia., 5 October 2023. [Online]. Available: https://en.wikipedia.org/wiki/Unidentified_flying_object. [Accessed 5 October 2023].

[3] R. Graves, "Unidentified Anomalous Phenomena: Implications on National Security, Public Safety, and Government Transparency", 26 July 2023. [Online]. Available: https://oversight.house.gov/wp-content/uploads/2023/07/Ryan-HOC-Testimony.pdf. [Accessed October 2023].

[4] D. C. Grusch, "Unidentified Anomalous Phenomena: Implications on National Security, Public Safety, and Government Transparency", 26 July 2023. [Online]. Available: https://oversight.house.gov/wp-content/uploads/2023/07/Dave_G_HOC_Speech_FINAL_For_Trans.pdf. [Accessed October 2023].

[5] D. Fravor, "Unidentified Anomalous Phenomena: Implications on National Security, Public Safety, and Government Transparency", 26 July 2023. [Online]. Available: https://oversight.house.gov/wp-content/uploads/2023/07/David-Fravor-Statement-for-House-Oversight-Committee.pdf. [Accessed October 2023].

[6] Wikipedia-contributors, "Computational complexity theory", Wikipedia, The Free Encyclopedia., 12 April 2023. [Online]. Available: https://en.wikipedia.org/w/index.php?title=Computational_complexity_theory&oldid=1149528209. [Accessed April 2023].

[7] Wikipedia-contributors, "P versus NP problem", Wikipedia, The Free Encyclopedia., 1 February 2024. [Online]. Available: https://en.wikipedia.org/wiki/P_versus_NP_problem. [Accessed 3 February 2024].

[8] N. Abdelwahab, "On the Dual Nature of Logical Variables and Clause-Sets", *J. Acad. N.Y.,* vol. 6, no. 3, pp. 202-239, 15 September 2016.

[9] N. Abdelwahab, "Constructive Patterns of Logical Truth [v2] ", *J. Acad. N.Y.,* vol. 6, no. 2, pp. 99-199, 1 July 2016.

[10] N. Abdelwahab, "#2SAT is in P", *J. Acad. N.Y.,* vol. 8, no. 1, pp. 3-88, 13 October 2018.

[11] N. Abdelwahab, "Three Dogmas, a Puzzle and its Solution", *J. Acad. (N.Y.),* vol. 12, no. 1, pp. 3-101, 2023.

[12] Wikipedia-contributors, "Non-monetary economy", 2022. [Online]. Available: https://en.wikipedia.org/wiki/Non-monetary_economy. [Accessed 24 February 2022].

[13] J. Rifkin, "The Zero Marginal Cost Society", 18 June 2015. [Online]. Available: https://youtu.be/MBlWEOHqdOU. [Accessed 24 February 2022].

[14] GridSAT-Stiftung, 1 July 2021. [Online]. Available: http://gridsat.io. [Accessed 1 February 2024].

[15] Wikipedia-contributors, "Halting problem", Wikipedia, The Free Encyclopedia., 12 November 2023. [Online]. Available: https://en.wikipedia.org/wiki/Halting_problem. [Accessed 3 February 2024].

[16] Wikipedia-contributors, "Entscheidungsproblem", Wikipedia, The Free Encyclopedia., 28 January 2024. [Online]. Available: https://en.wikipedia.org/wiki/Entscheidungsproblem. [Accessed 1 February 2024].

[17] Wikipedia-contributors, "Alan Turing", Wikipedia, The Free Encyclopedia., 8 February 2024. [Online]. Available: https://en.wikipedia.org/wiki/Alan_Turing. [Accessed 8 February 2024].

[18] Wikipedia-contributors, "Turing machine", Wikipedia, The Free Encyclopedia., 28 January 2024. [Online]. Available: https://en.wikipedia.org/wiki/Turing_machine. [Accessed 7 February 2024].

[19] Wikipedia-contributors, "Gödel's incompleteness theorems", 18 January 2024. [Online]. Available: https://en.wikipedia.org/wiki/G%C3%B6del%27s_incompleteness_theorems. [Accessed 28 January 2024].

[20] Wikipedia-contributors, "Boolean satisfiability problem", Wikipedia, The Free Encyclopedia., 20 December 2023. [Online]. Available: https://en.wikipedia.org/wiki/Boolean_satisfiability_problem. [Accessed 31 January 2024].

[21] Wikipedia-contributors, "Evolutionary pressure", Wikipedia, The Free Encyclopedia., 7 November 2023. [Online]. Available: https://en.wikipedia.org/wiki/Evolutionary_pressure. [Accessed 1 February 2024].

[22] Wikipedia-contributors, "endogenesis", Wiktionary, 21 June 2023. [Online]. Available: https://en.wiktionary.org/wiki/endogenesis. [Accessed 5 February 2024].

[23] 3onic Systems, Inc., "BEST OF EVOLUTION". United Stated of America Patent 97487152, 7 November 2023.

[24] Wikipedia-contributors, "Cattle mutilation", Wikipedia, The Free Encyclopedia., 13 December 2023. [Online]. Available: https://en.wikipedia.org/wiki/Cattle_mutilation. [Accessed 1 February 2024].

[25] Wikipedia-contributors, "Alien abduction", Wikipedia, The Free Encyclopedia., 9 February 2024. [Online]. Available: https://en.wikipedia.org/wiki/Alien_abduction. [Accessed 9 February 2024].

OpenAI. (2024). *ChatGPT* (January version) [Online]. Available: https://chat.openai.com/.