Research Essay

Bridging Realities: The Intersection of Imaginary Numbers, Nested Dreaming & Universal Analogies

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Abstract

Raising an imaginary number to its own power yields an infinite set of real solutions in mathematics, which follow a geometric series and parallel mass-centred systems observed in the universe. This suggests a deeper connection between the abstract and the tangible. An imaginary number, being inherently unreal, can be analogised with imagination—both detached from physical reality. Neuroscience supports the equivalence of imagination and dreams, as both engage nearly identical brain regions, with imagination being a controllable extension of the subconscious. Following this analogy, the activities in dreaming within a dream correspond to the infinite real solutions of an imaginary number raised to its own power and parallel the myriad observable realities in the universe, each governed by the dynamics of mass-dominated systems. This abstract mathematical concept thus provides a framework for understanding the relationship between dreams, imagination, and the underlying structure of reality.

Keywords: Atom, brain, dream, galaxy, imagination, pure imaginary number, realities, real numbers, star, time dilation, universe.

1. Introduction

The nature of reality and its relationship with imagination is a profound question. Some theories suggest that reality and imagination are not distinct but may overlap significantly or be closely intertwined. While such claims might seem speculative, exploring these ideas can provide insights into how these concepts might be connected.

Common examples illustrate how imagination manifests into tangible objects: "the table before me was once the imagination of a carpenter," "the Howrah Bridge in Kolkata was once envisioned by an engineer," or "the Taj Mahal was initially conceived by its architects." These examples demonstrate that thoughts—initially abstract—can become physical realities that are tangible and perceptible. This suggests that reality might be viewed as the materialisation of imagination, indicating a deep connection between the two [1] [2].

Similarly, in mathematics, real quantities can be square-rooted to yield real results. For instance, the square root of 4 is 2, and the square root of 3 is approximately 1.732. Negative numbers, however, do not have real square roots. To address this, imaginary numbers are introduced; for instance, the square root of -1 is represented as *'i.'* Although '*i'* 'might seem abstract, it plays a crucial role in analysing real phenomena, such as the behaviour of electrical components.

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2. Arithmetic Operations on Pure Imaginary Numbers

2.1 In the Real Domain

Arithmetic operations like addition, subtraction, multiplication, division, and exponentiation can be performed on pure imaginary numbers. For example,

a) $i + i = 2i$ (one operation of addition),
b) $i + i - i = i$ (two combined operations one of addition and another of subtraction)
c) $(i)(i) = i$ *squared* $= -1$ (one operation of multiplication or one operation of exponentiation),
d) $i/i = 1$ (division).

Number of the operations (one or two) was in real integers and these result in either real or imaginary numbers [3][4].

2.2 In the Imaginary Domain

In contrast, raising i to the power of *i* involves a fundamentally different process, as "multiplying i times" does not correspond to a real number. This operation resides within the imaginary domain.

To explore the properties of a pure imaginary number further, consider the case of i^i. The mathematical solution to this expression is

$$i^i = \{cos\ (2k\pi + \pi/2) + i\ sin\ (2k\pi + \pi/2)\}^i = e^{\{i(2k\pi+\pi/2)\}i} = e^{-(2k\pi+\pi/2)}, \quad (1)$$

where k can have values 0, 1, 2, … up to infinity, '*e'* is *a Euler's* number equal to *2.71828* and π is a mathematical constant equal to *3.14159.* On solving this quantity, results obtained are infinite following geometric series with principal value or first term $e^{-\pi/2}$. Let S be the sum of all the terms T_1, T_2, T_3 ... being first, second, third terms of the series, then

$$S = 0.207879576 + 0.000388203 + 0.000000725 + \cdots + 0 = 0.2082685059.$$

This demonstrates that an imaginary number raised to the power of another imaginary number results in an infinite series of real numbers. The ratio of the principal value to the sum of the series is

$$T_1/S = 0.207879576/0.2082685059 = 0.9981325573$$

or principal value of its solution is 99.81325573 percent of sum of values of all its solutions [3] [4].

3. Equivalence of Universe and Imaginary Number Raised to Power Itself

3.1. Equivalence in Numbers

The infinite series resulting from raising an imaginary number to the power of another imaginary number can be compared to the infinite realities of the universe. The universe, composed of

countless real objects, can be likened to an infinite series of real solutions, with the final term in the series having a value of zero. The massless particle photon, the lightest known reality, corresponds to this final term of zero in the series [2].

3.2. Equivalence in Mass Ratios

Within the atom, the nucleus—a rigid, solid mass composed of protons and neutrons—is surrounded by lighter electrons moving in various shells and sub shells. The ratio of the nucleus's mass to that of the entire atom is approximately *1:0.99995* closely matching the ratio of the principal value to the sum of the series solutions to i^i.
Similarly, in a stellar system, a star at the centre governs the orbits of planets based on their masses and distances. For the solar system, the ratio of the star's mass to the total stellar mass approaches *1:0.9986,* again aligning with the ratio of the principal value to the sum of the series solutions to an imaginary number raised to the power of another imaginary number [5].

4. Equivalence of Dreams and Imagination

Dreaming and imagination involve similar neural mechanisms, including the Default Mode Network (DMN), which encompasses the medial prefrontal cortex and posterior cingulate cortex [6]. Neuro imaging studies, show that both dreaming and imagination engage regions related to vision and emotion, highlighting their interconnected nature [7] [8]. Theories by Freud and Jung suggest that both processes reveal subconscious desires and universal symbols. While dreaming is primarily subconscious and imagination is often conscious, both can be influenced by the subconscious, indicating their deep connection [9] [10].

5. Nested Imagination, Nested Dreaming, and Reality

Imagination involves thought processes that become tangible when practically applied, similar to how an imaginary number operates as a theoretical tool rather than a tangible entity. Imagination can be compared to a pure imaginary number i . As established, dreaming and imagination are nearly identical processes involving similar brain activities. The primary difference is that one does not control the brain during dreams, whereas one consciously controls the brain during imagination. Given the similarity between imagination and dreaming, the analogy of i with imagination also applies to dreaming.

A pure imaginary number raised to the power of another pure imaginary number is an exponentiation operation within the imaginary domain. In the context of dreaming, this operation corresponds to a person dreaming within a dream, or "nested dreaming." Consider a person *A* who falls asleep and dreams of themselves, denoted as *A'*. If *A'* then falls asleep and dreams, I denote this further dream persona as *A"*. Given the equivalence between dreaming and imagination, nested dreaming—dreams within dreams—corresponds to a pure imaginary number raised to the power of another pure imaginary number, resulting in infinite real solutions. Therefore, nested dreams give rise to infinite realities, with the principal reality represented by

A", As the dream personas *A"* can theoretically extend indefinitely, the events and entities within nested dreams can be considered as real as those in our waking life [11]

8. Tangibility and Observability of Nested Dreaming

While the mathematical solution of an imaginary number raised to the power of another imaginary number is well established, the concept of nested dreaming lies outside the realm of mathematical analysis. Dreaming involves the spontaneous generation of vivid and often narrative experiences, primarily orchestrated by the subconscious mind. Upon waking, these experiences may not be fully recalled. The default mode network (DMN), which is active during restful wakefulness, engages brain areas associated with self-referential thoughts and emotional processing [6]. This complexity makes it challenging to document occurrences within nested dreams and to ascertain their connection to observable realities.

However, the striking equivalence between the ratios observed in central mass-dominated systems (e.g., the mass of a nucleus to its atom, or the mass of a star to its stellar system) and the infinite realities of the universe, compared to the ratio of the principal term to the sum of all terms in the series of solutions for an imaginary number raised to its own power, supports a compelling hypothesis. This suggests that the observable realities of the universe might, in fact, be akin to the dreams of a higher consciousness, even though empirical validation for such a theory is currently lacking. As our understanding of mind and consciousness advances, what seems speculative today may eventually be grounded in scientific evidence.

Eastern philosophy, particularly within Hinduism, views dreams as intertwined with the illusory nature of reality, known as Maya. In this perspective, dreams are not distinct from reality; rather, they reflect the transient and interconnected nature of consciousness, blurring the lines between waking and dreaming states. Hindu cosmology metaphorically regards the universe as a dream of Lord Brahma, symbolising the cyclical creation and dissolution of the cosmos. [12] [13]. This aligns with the hypothesis that reality could be viewed as a dream within a dream, analogous to an imaginary number raised to the power of another imaginary number, emphasising the transient and illusory nature of existence.

This raises an intriguing question: How can a few hours in a dream correspond to the vast expanse of time over which the cosmos exists? This notion, once relegated to myth, finds a rational explanation in Einstein's Theory of Relativity, which demonstrates how time dilates in a frame of reference moving near the speed of light [19]. This theory also supports ancient narratives, such as the story of Princess Revati's marriage to Prince *Balarama*. According to the tale, King *Kakudami* visited *Brahmalok*, the abode of Lord Brahma, to seek guidance on finding a suitable match for his daughter Revati. What seemed like a few minutes of waiting in *Brahmalok* translated into many *Yugas* on Earth, during which all eligible suitors had aged and passed away. Eventually, Lord Brahma advised the King to marry Revati to the available bachelor, Prince *Balarama* [12–18]. Other theories suggest that the universe may be a sophisticated simulation, with all beings playing their predetermined roles.

9. Results and Conclusions

The mathematical exploration of an imaginary number raised to its own power yields a series of real numbers forming an infinite geometric sequence. The principal (first) term of this series is approximately 0.20788, with subsequent terms decreasing according to a common ratio. Notably, the ratio of the principal term to the sum of all terms in this series intriguingly parallels ratios observed in central mass-dominated physical systems, such as the ratio of a nucleus's mass to that of its atom or a star's mass to its stellar system. This parallelism suggests a promising metaphorical analogy between the mathematical solutions of imaginary numbers raised to their own powers and the structural realities in the universe.

Furthermore, the hypothesised equivalence between dreams and imagination, based on the mechanisms of the brain, proposes that an imaginary number raised to its own power could serve as an analogy for nested dreaming. This idea aligns with interpretations in Hindu philosophy, which often blur the distinction between dreams and reality by depicting the cosmos as the dream of Lord Brahma—a concept that intriguingly resonates with Einstein's Theory of Relativity. While these hypotheses are speculative, they open a potentially rich avenue for further exploration, suggesting that nested dreams could indeed bear analogical relevance to the formation of realities.

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References

1. Descartes, R. *Meditation on First Philosophy.* Oxford University Press, Oxford.
2. Hume, D. (1739). *A Treatise of Human Nature*. Oxford University Press, Oxford.
3. Abramowitz, M., Stegun, I.A. (1965). *Handbook of Mathematical Functions.* United States Department of Commerce (DOC), Washington, D.C., USA.
4. Rudin, W. (1976). *Principles of Mathematical Analysis.* McGraw-Hill, New York.
5. Hawking, S., Penrose, R. (1996). *The Nature of Space and Time*. Princeton University Press, Princeton.
6. Raichle, M.E. (2015). The Brain's Default Mode Network. *Annual Review of Neuroscience* 38, 433–447.
7. Addis, D.R., Wong, A.T., Schacter, D.L. (2007). Remembering the past and imagining the future: Common and distinct neural substrates during event construction and elaboration. *Neuropsychologia* 45(7), 1363–1377.
8. Schacter, D.L., Addis, D.R., Buckner, R.L. (2012). Remembering the past to imagine the future: The prospective brain. *Nature Reviews Neuroscience* 8(9), 657–661.
9. Freud, S. (1900). *The Interpretation of Dreams*. Franz Deuticke, Leipzig and Vienna, Austria.
10. Jung, C.G. (1964). *Man and His Symbols.* Random House Publishing Group, New York, NY, USA.
11. Berkeley, G. (1719). *A Treatise Concerning the Principles of Human Knowledge*. Aaron Rhames, Dublin.

12. Radhakrishnan, S. (1923). *Indian Philosophy.* Vol. 1 and 2, Oxford University Press, Oxford. ISBN 978-0195638190.

13. Radhakrishnan, S. *An Idealist View of Life.* Harper and Brothers. New York, NY, USA ISBN 978-8120815681.

14. Vivekananda, S. (1896). *Raja Yoga.* Advaita Ashrama. Kolkata, India. ISBN 978-8175051560.

15. Vivekananda, S. (1896). *Karma Yoga.* Advaita Ashrama. Kolkata, India. ISBN 978-8175051478.

16. Vivekananda, S. (1896). *Jnana Yoga*. Advaita Ashrama. Kolkata, India. ISBN 978-8175051119.

17. *Bhagavata Purana.* Book 9, Book 2, India Penguin Classics. New Delhi, India. 18. *Vishnu Purana.* Book 1, Book 4, Diamond Books. New Delhi, India.

19. Einstein, A. (1916). *Relativity: The Special and the GeneralTheory*. Henry Holts BD Company New York, USA. ISBN: 978-1512047363.