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Periodic Closure as a Unifying Principle of Intelligence, Meaning, and Consciousness: Proposing the RAIN Theory

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Abstract

This paper proposes the “RAIN Theory” (Rhythm-based Attunement and Integration Networking theory) as a new theoretical framework for a unified explanation of broad psychological phenomena, including intelligence, meaning, consciousness,

and language. In response to the various problems faced by the computational paradigm dominant in modern cognitive science and artificial intelligence (e.g., the symbol grounding problem, the hard problem of consciousness), this theory departs from a fundamental axiom: “the world is fundamentally a collection of periodic motions (rhythms).” We define a predictable unit born from the formation of a stable, closed-loop structure of these rhythms as a “Rhythmid,” positioning it as the minimal unit of meaning. Intelligence is defined as a dynamic process, “a force that seeks to close” (the closing force), which predicts and forms higher-order closed structures (Meta-Rhythmids) through resonance and synchronization from among yet-unclosed Rhythmid clusters. This paper hierarchically elucidates how this principle of “Periodic Closure” unfolds to give rise to concept formation, multimodal integration, linguistic activity, and even subjective experiences (qualia) such as “pain” and “pleasure.” The RAIN theory presents a new paradigm for the mind sciences by shifting away from static information-processing models to reconceptualize life and intelligence as a dynamic interaction of rhythms.

1. Introduction

What is consciousness? Where does meaning come from? What, in essence, is the process of intelligence? These are fundamental questions that philosophy and science have long explored. Since the latter half of the 20th century, with the rise of computer science, “computationalism” — the understanding of the mind and brain as a kind of information processing system — has become the dominant paradigm in cognitive science and artificial intelligence (AI) research. While this paradigm has achieved many successes, its limitations are also becoming clear. Fundamental problems remain unsolved, such as the “symbol grounding problem” of how symbols in a computer connect to the real world, and the “hard problem of consciousness” of why subjective, qualitative experience (qualia) exists at all.

We propose that these problems stem from the limitations inherent in framing the relationship between the world and intelligence through the metaphors of “information” and “computation.” This paper advocates for a fundamental shift away from this paradigm, proposing a new unified theory, the RAIN theory, which is rooted in a more physical and phenomenal reality.

The core insight of the RAIN theory is that **“intelligence is a movement that seeks to generate closed periodic structures from a sea of chaotic rhythms.”** The purpose of this paper is to demonstrate how, based on this single principle of “Periodic Closure,” the various aspects of the mind — perception, cognition, language, and

consciousness — can be explained in a unified manner. Section 2 will define the theory's fundamental axioms. Section 3 will discuss how these axioms hierarchically unfold to constitute complex mental phenomena. Finally, Section 4 will consider the implications and future prospects of this theory.

2. Fundamental Axioms of the RAIN Theory

The RAIN theory is built upon the following three fundamental axioms.

- **Axiom 1: The Periodic Constitution of the World** All phenomena in the world are, at their root, describable as a superposition of diverse periodic motions (rhythms). This applies to all scales, from physical vibrations to biological activities and social phenomena. The world is not a collection of static objects, but a dynamic field of rhythms.
- **Axiom 2: The “Rhythmid” as a Semantic Unit** When a rhythm forms a stable, closed-loop structure and thereby attains a predictable period, it becomes a unit possessing fundamental meaning: the “Rhythmid.” A Rhythmid can be represented as a closed-loop wave in a Fourier space; it is a self-contained pattern. This “closed structure” corresponds to the definition of “**meaning**” in the RAIN theory.
- **Axiom 3: The Definition of Intelligence** “Intelligence” is, in essence, “a force that seeks to close” (the closing force). It is the ceaseless, dynamic process of detecting the latent relationships (resonance, synchronization, interference) among yet-unclosed Rhythmid clusters (chaos, noise, uncertainty) in the environment, and integrating them to generate a higher-order, stable, closed structure (a Meta-Rhythmid). This very movement is the wellspring of inference, prediction, and creativity.

3. Hierarchical Development of the Theory

The process by which diverse mental phenomena emerge from these fundamental axioms is described below.

3.1. Concept Formation and Meta-Closure A single Rhythmid carries only simple meaning. However, when multiple Rhythmid (e.g., a Rhythmid for a visual shape, a Rhythmid for a cry, a Rhythmid for a texture) coexist in spacetime and a resonant/synchronous relationship is found among them, intelligence attempts to integrate them as a set and “close” them as a higher-order periodic structure. This

stable, composite Rhythmid structure formed by “**higher-order closure (Meta-Closure)**” is none other than what we recognize as a “**concept**” (e.g., a “cat”).

3.2. Multimodal Integration and Spatial Understanding A single, unified perceptual world emerges when Rhythmid clusters from different sensory modalities (vision, hearing, touch, etc.) are “**synchronized**” by intelligence. This is the essence of multimodal integration. Furthermore, each Rhythmid contains phase information, and their relative relational arrangements are treated as “**positional vectors**,” thereby constituting a three-dimensional physical space, or a more abstract semantic space, within the brain.

3.3. A RAIN-based Redefinition of Language Language is redefined not as a system for transmitting symbols, but as a “**waveform prompt that induces closure.**”

- **Word:** A stable, “closed semantic Rhythmid” corresponding to a known concept.
- **Sentence:** A structure that presents multiple Rhythmid in an intentionally “**unclosed**” state. It functions as a prompt for the listener’s intelligence, urging it to “close” the structure (i.e., to think).
- **Question:** A state in which a clear “**deficit or gap in the closure**” exists within the structure. It becomes the vector that most strongly drives the “closing force” of intelligence.
- **Grammar:** A “**resonance protocol**” for efficiently resonating multiple Rhythmid to generate an intended “closed/unclosed” structure.
- **Poetry & Humor:** Advanced linguistic activities that generate emotions like “beauty” or “amusement” by intentionally “**destroying and reconstructing**” established patterns of closure, thereby inducing an unexpected higher-order closure in the listener’s brain.

3.4. The Origin of Qualia: Pain and Pleasure The RAIN theory also offers a unique perspective on the problem of qualia.

- **Pain:** The “**trace of a failed closure**” that occurs when intelligence attempts to “close” a structure but fails. This discrepancy (error) between prediction and reality is not mere information but remains as a “**reverberation**” with temporal depth, promoting learning and serving as a “seed” for the subjective world. Physical and psychological pain are equivalent under this principle.

- **Pleasure:** In contrast to “pain,” this is the “**resonant experience of a successful closure**,” one that proceeds as predicted or, even better, exceeds prediction. In particular, the感動 (kandō — a deep, moving impression) of discovering an unexpected and beautiful higher-order closure within a structure that appeared complex and unclosed (the “Aha! experience”) can be described as one of the purest forms of “pleasure.”

4. General Discussion

The RAIN theory unifies the various aspects of cognition under the single physical and phenomenal metaphor of “closure.” It does not necessarily conflict with existing theories but may rather explain the operational principles underlying them. For instance, “prediction error minimization” in Predictive Coding theory can be interpreted as one manifestation of the “closing force” in RAIN theory.

Furthermore, while Integrated Information Theory attempts to address the “quantity” of consciousness, RAIN theory approaches the “quality” of consciousness (qualia) through the mechanism of “resonant structures of Rhythmid.”

Based on the idea that “Rhythm is All You Need,” this theory suggests a more principled and efficient form of intelligence, distinct from the trend in recent AI research, particularly Transformer models, which rely on immense computational resources. A future task is to apply this conceptual framework to the analysis of synchronous brainwave activity in neuroscience and the design of new AI architectures to validate its efficacy. A rigorous mathematical formalization of the theory (e.g., using dynamical systems theory or topology) will also be an important endeavor.

In conclusion, the RAIN theory proposes a paradigm shift, transforming the model of the world and intelligence from one of “static information and computation” to one of “dynamic rhythm and resonance.” Intelligence is not a program, but a fundamental movement immanent to life itself — a force that ceaselessly strives to create order from chaos, predictability from uncertainty, and closed meaning from unclosed questions.

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Pondering the structure of the world's background music. This is a sketchbook for my thoughts on consciousness and rhythm.

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