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Genomic Behavior of Language

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ABSTRACT

This study investigates the concept of *genomic behavior of language*, an interdisciplinary perspective that situates language as a living, evolving system. Language is not merely a neutral instrument for communication; it functions, much like the genome, as a carrier of information, memory, and cultural identity. Words, as linguistic molecules, embody codes that—through syntactic rules and semantic crystallization—shape collective life. Just as genes undergo mutation, natural selection, and recombination in the evolutionary process, language experiences continuous variation, genealogy, and transformation across history.

By introducing the notion of "genomic language," the paper proposes that language can be understood as a self-organizing, adaptive system that crystallizes within collective memory and interacts with its environment. Every lexical innovation or syntactic shift represents a mutation within the linguistic genome, while processes comparable to genetic *crossing-over* manifest in language as the recombination of cultural and semantic elements.

Drawing upon philosophy, evolutionary biology, hermeneutics, and sociology, this article frames language as a dynamic entity embedded in both natural and cultural evolution. The central conclusion is that language should not be regarded as a static archive of the past but as a living and future-making memory—one that, even in the age of digital technology and artificial intelligence, continues to be rewritten and re-created.

Keywords Genomic language; linguistic genome; evolution; memory; cultural crystallization; variation; crossing-over; interdisciplinarity

Introduction

Throughout history, human thought has sought metaphors and frameworks capable of capturing the profound complexity of existence and culture. In earlier epochs, the universe was often conceived as a mechanical device; later, with the rise of evolutionary biology and quantum physics, life and consciousness came to be understood as dynamic, fluid, and probabilistic. Today, however, the analogy between language and the genome opens an entirely new horizon: language no longer appears merely as a communicative tool, but as a living, evolving entity in its own right.

Like the gene, language functions as a bearer of information. Yet the information it carries extends far beyond interpersonal communication: language reproduces culture, preserves historical memory, and structures collective life. Each word can be seen as a linguistic molecule encoded with meaning, which—through interaction with other words and within the social environment—generates structures of living sense. Just as the gene secures diversity through mutation and recombination, language ensures cultural and intellectual diversity through lexical innovation and syntactic transformation.

The significance of this interdisciplinary perspective lies in its ability to bridge the traditional divide between the natural sciences and the humanities. Linguistics, philosophy, evolutionary biology, and sociology converge within a shared horizon to illuminate a single phenomenon from different vantage points. In this framework, language is not solely the domain of linguists or literary scholars; it must also be understood as a **cultural genome**, an evolutionary system embedded in history and collective life.

In the contemporary age, where technological innovations—particularly artificial intelligence and natural language processing—are reshaping the very conditions of communication, the need to reconceptualize the essence of language has become more urgent than ever. Once confined to the human voice and the written page, language now thrives in machine memory and computational algorithms. This shift reveals that language, like the gene, adapts and persists beyond its original environment—human society—into new technological ecosystems.

Accordingly, this article engages with concepts such as *mutation*, *natural selection*, *homeostasis*, and *crossing-over* to develop a theoretical framework for the genomic behavior of language. Within this framework, language emerges as an evolutionary force, a living memory, and an active participant in cultural and social transformation.

Thus, the central question animating this work is: **How can language be understood not as a passive tool but as a living genome? And what philosophical, scientific, and social implications arise from this perspective?**

Chapter One: Philosophical and Theoretical Foundations

1. Language as Being

From the dawn of philosophy, thinkers have sought to clarify the relationship between language and existence. For Hegel, language was not a neutral medium for the exchange of thoughts but the manifestation of Absolute Spirit—the space in which the world reveals itself and where the subject attains self-consciousness. In this view, language is not external to being but part of it. It functions much like a cultural gene, enabling the expression of thought and the formation of society.

Marx, by contrast, understood language as part of material and social activity: it emerges from labor and production and reflects the power dynamics of class relations. In this sense, language is akin to a gene embedded within social structures, mutating and evolving as economic and political conditions transform.

These philosophical insights converge on one essential point: language is a *living entity*—a bearer of memory, history, and tradition that, like the genome, undergoes continuous reproduction and transformation.

2. Biology and the Genomic Analogy

Twentieth-century biology introduced concepts that profoundly reshaped philosophy. The gene, as the unit of biological information, encodes the instructions of life. Through mutation, natural selection, and crossing-over, genes ensure both diversity and continuity.

When extended to language, these biological processes generate a new horizon of understanding:

- Each word operates as a gene, carrying semantic information.

- Syntax functions like an enzyme, linking lexical units into structured wholes.

- Metaphors and neologisms act as linguistic mutations, creating novel forms of meaning.

- Natural selection appears in the survival of words and idioms that remain socially effective.

- *Crossing-over* is mirrored in the exchange and recombination of linguistic and cultural elements.

Thus, language itself may be seen as a genome—not confined to the body of an individual but living within the body of society.

3. Hermeneutics and Language as Memory

Within hermeneutics, language is conceived as the vessel of human historical experience. Every word preserves strata of the past while opening possibilities for the future. This corresponds to the genomic model: genes archive biological memory, while words archive cultural memory.

Each use of a word resembles the transcription and translation of a gene. Yet unlike the relatively stable processes of biology, linguistic meaning is constantly reshaped through dialogue with culture, history, and collective memory.

4. Interdisciplinarity as Necessity

The distinctiveness of the genomic perspective on language lies in its reliance on interdisciplinarity. Philosophy of language, evolutionary biology, sociology, and even quantum physics converge to illuminate the living character of language. If quantum physics has revealed the indeterminacy and multiplicity at the heart of reality, language similarly reveals indeterminacy and polyphony within meaning. The linguistic genome behaves as a self-organizing system that can only be fully understood at the crossroads of disciplines.

5. Theoretical Synthesis

Taken together, these perspectives show that the genomic conception of language rests upon three theoretical pillars:

1. **Classical and critical philosophy** – language as the manifestation of spirit and as embedded in social relations.

2. **Evolutionary biology** – the gene as the unit of information, paralleled by language as the cultural genome.

3. **Hermeneutics and interdisciplinarity** – language as living memory, shaped and reshaped in historical context.

These foundations provide the conceptual groundwork for understanding language as an evolutionary, dynamic system.

Chapter Two: Language as a Gene

1. Information: The Code of Life and the Code of Meaning

In biology, the gene is understood as the fundamental unit of information—a code that directs the synthesis of proteins and ensures the continuity of life. By analogy, language can be regarded as a cultural code: words and grammatical rules constitute the "nucleotides" of meaning, whose combinations produce the complex architectures of thought and social interaction.

Both genes and language are systems of encoding and translation. Genes encode information that is translated into proteins, while language encodes words into meanings and experiences. In both domains, the processes of coding and decoding are conditions for survival—biological in one case, cultural in the other.

2. Reproduction and Mortality

Genes endure through replication, ensuring the survival of species. Replication is never perfect; variation arises through errors, which serve as the basis for biodiversity. Language undergoes a similar process. Each generation inherits vocabulary and syntax, reproducing them while also introducing modifications.

Some words and structures disappear—linguistic mortality—while others endure, becoming linguistic equivalents of genetic "survivors." Natural selection thus governs not only biology but also the survival of language across generations.

3. Linguistic Mutations and Metaphors

Genetic mutation is the source of evolutionary novelty. Similarly, metaphors, neologisms, and syntactic innovations function as linguistic mutations. A metaphor, for instance, unites two previously unrelated domains of meaning, producing new conceptual possibilities.

When humans describe abstract concepts through concrete images ("time is a river"), they enact linguistic mutations that open new horizons of thought. Such innovations, like genetic mutations, can redirect the course of cultural and intellectual history.

4. Crossing-Over: Semantic Recombination

In genetics, *crossing-over* refers to the exchange of segments between homologous chromosomes, generating new combinations of traits. A parallel process occurs in language when elements from different languages, discourses, or cultures intermingle.

Borrowed vocabulary, hybrid idioms, and blended discourses are linguistic recombinations. These processes of semantic crossing-over generate diversity and renew vitality within the linguistic genome, ensuring that language evolves in response to cultural encounters.

5. Natural Selection of Vocabulary

Just as natural selection favors traits suited to survival, language preserves words and expressions that remain effective for communication. Scientific terminology, religious vocabulary, and colloquial expressions are retained or discarded depending on their social utility.

Terms that no longer meet communicative needs eventually vanish, resembling the evolutionary elimination of nonfunctional genes.

6. Language as a Living Entity

These parallels allow us to treat language as a living organism. It carries memory, codes, and the capacity for mutation and selection. It interacts dynamically with its cultural environment and reproduces itself within collective life. Like the genome, it is both the bearer of identity and the vehicle of future possibility.

7. Synthesis

The similarities between genes and language can be summarized as follows:

- Both function as systems of encoding and translation.

- Both undergo replication, mutation, and selection.

- Both interact with their environments to evolve.

- Both serve as archives of the past while generating future possibilities.

- Both achieve diversity and novelty through processes analogous to *crossing-over*.

Thus, the conception of "language as a genome" is not a mere metaphor but a theoretical framework for understanding language as an evolutionary, cultural system.

Chapter Three: Environment, Culture, and Memory

1. Environment as the Genetic Context of Language

In biology, the environment plays a decisive role in shaping genetic expression. Genes do not function in isolation; they are activated or silenced in response to specific ecological contexts. Similarly, language emerges not merely within the individual mind but within the broader social, cultural, and historical environment.

The environment, therefore, can be described as the **genetic context of language**. Traditions, institutions, collective practices, and even material objects act as cultural determinants that stabilize or reshape linguistic structures. It is through interaction with this environment that language gains vitality and meaning.

From another standpoint, what we call the environment—if we set aside the inanimate natural realm—consists of nothing but crystallized and flowing genes. More precisely, civilizations can be understood as organized masses of such genes, simultaneously solidified and in motion.

This perspective suggests an intrinsic homogeneity between the genes in flux—representing the subject—and the crystallized genes—representing the object. It is this underlying homogeneity that renders possible, and to some extent legitimizes, the occurrence of identity between subject and object within the process of cognition itself.

2. Linguistic Crystallization in Culture

In chemistry and biology, crystallization refers to the formation of stable patterns from fluid and dispersed elements. A comparable process occurs in language: words and expressions crystallize within culture, becoming established frameworks of meaning.

Idioms, proverbs, and common expressions are linguistic crystals formed from collective experiences. They serve as the cultural memory of a people, condensing layers of history into everyday language.

3. Collective Memory and Language

Like genes that archive biological memory, language preserves cultural and civilizational memory. Each word carries traces of history, encoding values, struggles, and shifts in thought.

For example, the integration of scientific or technological vocabulary reflects broader social transformations, while the disappearance of older terms indicates the fading of particular cultural practices. In this sense, the evolution of vocabulary mirrors the continuous rewriting of cultural memory.

4. The Reciprocal Relationship between Language and Environment

The relationship between language and environment is reciprocal. While the environment shapes language, language simultaneously reshapes the environment. Concepts articulated in language—such as "rights," "freedom," or "technology"—eventually become material forces that transform institutions, cities, and social life.

Thus, language cannot be seen as a passive reflection of its environment; it is an active agent of change that redefines its very context.

5. Language as Crystalline Memory

Every word may be viewed as a crystal refracting the accumulated experiences of a community. These linguistic crystals are not static archives but dynamic reservoirs of possibility. In this sense, language constitutes the **crystalline memory of civilization**, where the past is preserved while simultaneously generating futures.

Language thus functions as a living memory: it sustains continuity but also enables transformation, shaping cultural evolution as the genome shapes biological evolution.

6. Synthesis

Environment and culture are not external backgrounds to language but integral components of its life. They act as the cultural "ecology" in which language evolves, just as biological species evolve within ecosystems.

Language, like the genome, is enmeshed in a network of environmental and historical relations. It preserves memory, crystallizes experience, and, through its interaction with culture, continuously re-creates the conditions of future existence.

Chapter Four: Language and Social Evolution

1. Language as the Genome of Society

Just as the genome ensures the coherence and survival of the biological organism, language serves as the organizing code of society. Without language, no community can endure. It is through language that laws, traditions, and relationships take shape, weaving individuals into a collective whole. In this sense, language functions as the **social genome**, the hidden code that makes collective life possible.

2. Language and Power

Language is not a neutral reflection of power; it actively constructs it. Words legitimize authority, sustain ideologies, and mobilize resistance. Concepts such as "freedom," "justice," or "revolution" are not merely abstract; once embedded in discourse, they become forces that reshape political structures.

This dynamic mirrors natural selection: terms with greater socio-political efficacy are preserved and propagated, while weaker ones fade into obscurity. The history of language is thus inseparable from the history of power struggles.

3. Language and Social Class

From a Marxist perspective, language belongs to the superstructure of society, shaped by material conditions. Words and expressions are marked by the perspectives of social classes. The language of workers, intellectuals, or ruling elites carries distinct cultural genomes, each reflecting different historical experiences.

As class relations evolve, linguistic forms also mutate. Thus, the evolution of language parallels the evolution of society.

4. Language and Collective Identity

Language is both the archive of collective memory and the foundation of collective identity. Nations, ethnicities, and communities define themselves through language. For this reason, linguistic boundaries often coincide with cultural and political boundaries.

The decline of a language frequently signals the erosion of a collective identity, while its revitalization restores cultural memory and solidarity. Language, therefore, acts as the **cultural genome of identity**, ensuring the survival of communities across time.

5. Historical Dynamism of Language

Just as genes evolve within the timeline of natural history, language evolves within the timeline of social history. Words are born, transformed, and sometimes vanish, reflecting shifts in science, technology, and ideology.

The political vocabulary of the French Revolution, for example, introduced new linguistic codes that reshaped modern societies. In the digital era, words such as "internet," "algorithm," and "artificial intelligence" crystallize entirely new domains of civilizational experience.

6. Language as an Agent of Transformation

Language is not simply the mirror of society; it is a driver of transformation. Each linguistic innovation—whether a slogan, metaphor, or scientific term—has the potential to alter the trajectory of collective life. Like genetic mutations, linguistic mutations can redirect the course of history.

Language is, therefore, a seed of change: every word is a gene planted within history, carrying the possibility of new social forms.

7. Synthesis

In the social realm, language assumes the role that genes play in biology. It preserves memory, establishes identity, and fuels transformation. Without language, society would resemble an organism stripped of its genes—fragmented and unsustainable.

The genomic perspective thus provides a framework for understanding not only the evolution of language but also the evolution of society itself.

Chapter Five: Language, Science, and Interdisciplinarity

1. Beyond Disciplinary Boundaries

Modern knowledge has often been organized into rigid disciplinary boundaries. Yet contemporary inquiry increasingly acknowledges the necessity of crossing these divisions. No phenomenon can be fully grasped through a single lens. Language is a clear example: it belongs simultaneously to philosophy, linguistics, biology, sociology, and even physics.

The genomic approach shows that language, like life itself, emerges from the interplay of multiple systems. To study language adequately therefore requires an **interdisciplinary framework** that integrates both the natural sciences and the humanities.

2. Language and Biology

In biology, the gene serves as the carrier of information, ensuring reproduction and survival. Similarly, words and structures transmit cultural and social information. Biological processes such as mutation, natural selection, and crossing-over have striking linguistic analogues:

- **Mutation** occurs through metaphors, neologisms, and structural innovations.

- **Natural selection** operates as certain words stabilize and others disappear.

- **Crossing-over** is mirrored in the borrowing and blending of linguistic and cultural elements.

This analogy demonstrates that language, like the genome, is a dynamic and adaptive system.

3. Language and Quantum Physics

Quantum physics revealed that reality at its foundation is indeterminate and probabilistic. A similar condition characterizes language: meanings are not fixed but emerge in relation to context.

Words resemble quantum particles, whose positions and meanings depend on the discursive "fields" in which they appear. A single word may carry divergent meanings in different contexts, reflecting the probabilistic structure of linguistic reality.

4. Language and Philosophy

From Plato and Aristotle to Wittgenstein and Heidegger, philosophers have consistently grappled with the mystery of language. Heidegger famously called language "the house of being," the medium through which existence is disclosed. Within the genomic perspective, this can be reformulated: language is not only the house of being but the **genome of being**. Just as genes make biological life possible, language makes human existence possible by generating the horizon of thought and culture.

5. Language and the Mathematics of Patterns

If genes operate through biological algorithms, language operates through cultural algorithms. Grammar, as a finite system of rules, generates an infinite range of sentences and meanings. This mathematical dimension links language to information theory and computer science.

Both language and the genome exemplify **complex self-organizing systems**—structures that generate immense diversity from simple building blocks.

6. Language in the Interdisciplinary Horizon

Genomic language inherently belongs to the interdisciplinary horizon:

- From **biology**, it borrows concepts of information, mutation, and evolution.

- From **physics**, it adopts the principles of uncertainty and systemic complexity.

- From **philosophy**, it inherits ontological and hermeneutic insights.

- From **sociology**, it incorporates the study of power, culture, and identity.

Thus, language cannot be studied exclusively by any single field. Like the genome, it demands a comprehensive, multi-perspectival approach.

7. Synthesis

The genomic conception of language illustrates the essential role of interdisciplinarity in human knowledge. By bringing together insights from biology, physics, philosophy, and the social sciences, it frames language as a living, evolving system that shapes—and is shaped by—both culture and nature.

Language, like the genome, is at once natural and cultural, scientific and philosophical.

Chapter Six: Language and New Technologies

1. Language in the Digital Age

Just as genes adapt to the ecosystems that sustain them, language adapts to the communicative environments in which it exists. If the natural world constitutes the habitat of genes, the digital sphere has become the new habitat of language. In the internet age, language is no longer confined to oral speech or written text; it thrives across digital platforms, social networks, and machine memory.

In this digital environment, language achieves unprecedented speed and reach. Words emerge, stabilize, and circulate globally within hours. Discourses interact and recombine across cultural boundaries. This acceleration can be compared to rapid evolutionary shifts, where environmental pressures produce bursts of genetic mutation.

2. Artificial Intelligence and Natural Language Processing

One of the most transformative developments of our era is artificial intelligence (AI), particularly natural language processing (NLP). Machines can now read, write, translate, and even converse. Language, once tied exclusively to human cognition, now exists within technological systems.

If genes ensure biological continuity through replication, language today achieves continuity through algorithms and machine learning. These systems not only imitate but also contribute to the reproduction—and sometimes transformation—of language. This signals a new evolutionary stage: language that is at once human and technological.

3. Machine Memory and Cultural Memory

Traditionally, language was preserved in human memory, manuscripts, and libraries. Today, vast digital databases store and reproduce linguistic material, extending language beyond human limits.

This phenomenon resembles genetic **crossing-over**: data from multiple languages and cultures are recombined within computational systems, generating novel semantic structures and hybrid linguistic forms. Machine memory thus extends cultural memory, transforming the way language evolves.

4. The Acceleration of Linguistic Mutation

New technologies have dramatically accelerated the pace of linguistic change. Historically, language evolved over centuries. Now, hashtags, neologisms, and digital idioms can emerge and spread globally in a matter of days.

This acceleration parallels sudden bursts of mutation in biology triggered by extreme environmental shifts. The digital ecosystem places language under constant evolutionary pressure, compelling it toward ceaseless innovation.

5. Language as Cultural Biotechnology

In this stage, language transcends its role as a purely human or social phenomenon. It functions as **cultural biotechnology**: a living system reproduced through both human interaction and machine processes.

Language as cultural biotechnology signifies a hybrid existence. It belongs to natural evolution and, simultaneously, to technological design. It is both inherited and engineered.

6. Synthesis

In the digital and technological era, language enters a new evolutionary horizon:

- The digital sphere accelerates its mutations.
- Artificial intelligence embeds it into computational systems.
- Machine memory transforms cultural memory.
- Linguistic innovation occurs with unprecedented speed.

Language has thus become a hybrid organism—part natural, part technological; part human, part machine. Like the genome, it adapts to new environments, ensuring continuity while generating diversity.

Chapter Seven: Conclusion and Future Outlook

1. Language as a Cultural Genome

This study has argued that language behaves as a genome: it encodes, reproduces, mutates, and evolves within its cultural and social environments. Just as the biological genome secures the continuity of life, the linguistic genome sustains the continuity of collective memory and cultural identity. This is not a mere metaphor but a conceptual framework that links the humanities and the natural sciences.

In this view, language is not a passive archive of the past but a living organism—an active force that crystallizes history while opening pathways toward the future. Each word, like a gene, carries traces of cultural evolution; each linguistic innovation, like a mutation, introduces new trajectories for thought and society.

2. Philosophical Implications

Understanding language as a cultural genome reshapes our comprehension of being. Language is not external to existence; it is its very condition. Every utterance is not simply communicative but ontological, a participation in the unfolding of meaning.

Language, therefore, constitutes the genome of thought. Without language, human beings could not think, remember, or recognize themselves as conscious entities.

3. Scientific Implications

From a scientific perspective, the genomic model highlights the evolutionary and systemic nature of language. Concepts such as mutation, selection, homeostasis, and crossing-over allow scholars to treat language as a dynamic organism rather than a static structure.

This interdisciplinary approach has applications in:

- **Cultural biology**, to study how discourses and ideas evolve.
- **Computational linguistics**, to simulate semantic change.
- **Sociology**, to analyze how language organizes identity and power.

4. Language and the Technological Horizon

The digital age has placed language in a new evolutionary context. Once confined to human voices and written archives, language now circulates in digital databases, machine learning models, and artificial intelligence. In this hybrid ecosystem, language evolves at unprecedented speed.

The future suggests the emergence of a **global linguistic genome**: a system that, through interaction, translation, and recombination, constantly rewrites itself. Just as genetic crossing-over generates biological diversity, linguistic crossing-over across cultures and technologies ensures diversity in meaning and identity.

5. Final Synthesis

Language as a genome reveals itself as:

- An archive of the past and a horizon for the future.
- A dynamic system of reproduction, mutation, and selection.
- A phenomenon simultaneously natural, cultural, and technological.

Ultimately, language is not a fossilized remnant of history but a living, future-making memory. Each word participates in the ongoing rewriting of humanity's collective destiny.

Chapter Eight: Practical and Research Applications of Genomic Language

1. Genomic Language in Politics and Media

In modern society, media act as one of the most powerful ecosystems for linguistic evolution. Words, once crystallized in headlines, slogans, and narratives, function like genes, replicating themselves across the social body. Political language, in particular, reveals the genomic behavior of discourse: each new slogan or phrase represents a mutation capable of reshaping collective identity.

Through this framework, one can analyze how ideologies are constructed, how power is legitimized, and how societies resist or transform authority. Language in media is therefore not a neutral channel of communication but a generative force that encodes and reproduces cultural genomes.

2. Genomic Language and Education

Education is another domain where the genomic model of language applies directly. Learning a language is not merely about acquiring grammar and vocabulary; it is about inheriting and internalizing a cultural genome. To learn a new language is to adopt a new genetic–cultural system.

In this sense, the teacher is not only an instructor but also a custodian of cultural reproduction, ensuring that the linguistic genome is transmitted, preserved, and renewed across generations.

3. Genomic Language and Computer Science

In computer science and artificial intelligence, particularly in natural language processing (NLP), the genomic model provides a fruitful analogy. Algorithms resemble genetic processes: neural networks operate like proteins emerging from genetic codes, while datasets function as linguistic DNA.

Genomic language suggests new approaches for AI design—systems that do not merely imitate language but also evolve with it, engaging in processes comparable to mutation, recombination, and selection at the computational level.

4. Genomic Language and Philosophy of Science

The genomic model also reframes our understanding of science itself. Scientific theories can be seen as cultural genes: born within specific contexts, mutating under pressure, selected for survival, and recombined to form new paradigms.

From this standpoint, the history of science is a genomic history—an evolutionary chain of conceptual mutations and recombinations. The genomic approach to language provides tools for tracing these intellectual transformations and for understanding the role of discourse in shaping scientific knowledge.

5. Genomic Language and Interdisciplinary Research

Perhaps the most profound implication of the genomic model lies in its capacity to encourage interdisciplinary inquiry. Applications include:

- **Sociology**, where language is analyzed as the genome of power and identity.
- **Psychology**, where memory and the collective unconscious are studied through linguistic codes.
- **Literature**, where metaphors and stylistic innovations can be traced genealogically.
- **Philosophy**, where language is understood as both the condition of being and the genome of thought.

Thus, genomic language provides a framework that bridges the humanities and the sciences, fostering collaboration across disciplines.

6. Synthesis

The practical and research applications of genomic language demonstrate that this framework is not abstract speculation but a working model with real implications. From politics to AI, from education to philosophy, language as a genome reshapes how we understand continuity, mutation, and transformation within culture.

It is simultaneously a force of preservation and a force of innovation—a living archive of the past and an engine for the creation of futures.

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