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Bridging Thought and Reality: Frege's Enduring Impact on Philosophy of Language

Abstract: This paper delves into the pivotal contributions of Gottlob Frege to the philosophy of language, emphasizing his distinctions between sense (*Sinn*) and reference (*Bedeutung*) and his formal logical systems. Frege's foundational works, including *Begriffsschrift* and *Grundlagen der Arithmetik*, are examined to contextualize his philosophical framework. Central to Frege's theory is the distinction between sense and reference, exemplified in his analysis of proper names and definite descriptions, which has profoundly influenced the understanding of meaning and truth in linguistic expressions. The paper further explores Frege's impact on analytic philosophy, highlighting his contributions to logical positivism, formal semantics, and principles of compositionality. Lycan's, Schiffer's, and Schellenberg's perspectives on Frege are also considered to demonstrate the lasting relevance of his theories. Despite criticisms, Frege's theories remain essential for analyzing the logical structure of language and understanding the relationship between language, thought, and reality. His legacy underscores his enduring significance as a foundational figure in the study of language and meaning.
Keywords: Philosophy of Language, Linguistic turn, Frege, Sense, Reference, Artificial Intelligence.

Düşünce ve Gerçek Arasında Köprü: Frege'nin Dil Felsefesi Üzerindeki Kalıcı Etkisi

Öz: Bu çalışma, Gottlob Frege'nin dil felsefesine yaptığı çok önemli katkıları ele almakta ve onun anlam (*Sinn*) ile gönderge (*Bedeutung*) arasındaki ayrımlarını ve formel mantık sistemlerini vurgulamaktadır. Frege'nin felsefi çerçevesini bir bağlama oturtmak için *Begriffsschrift* ve *Grundlagen der Arithmetik* gibi temel eserleri incelenmiştir. Frege'nin teorisinin merkezinde, özel adlar ve belirli betimlemeler üzerine yaptığı analizle somutlaşan anlam ve gönderge arasındaki

ayrım yer almakta olup, bu ayrım dilsel ifadelerde anlam ve doğruluk anlayışını derinden etkilemiştir. Makale ayrıca, Frege'nin analitik felsefe üzerindeki etkilerini araştırarak, onun mantıksal pozitivizm, biçimsel anlambilim ve tümleme ilkelerine katkılarını öne çıkarmaktadır. Lycan, Schiffer ve Schellenberg'in Frege üzerine görüşleri de onun teorilerinin kalıcı önemini göstermek amacıyla ele alınmıştır. Eleştirilere rağmen, Frege'nin teorileri, dilin mantıksal yapısını analiz etmek ve dil, düşünce ve gerçeklik arasındaki ilişkiyi anlamak için vazgeçilmez olmaya devam etmektedir. Frege'nin mirası, onun dil ve anlam çalışmalarında temel bir figür olarak taşıdığı kalıcı önemi vurgulamaktadır.
Anahtar Kelimeler: Dil Felsefesi, Dilbilimsel Dönüş, Frege, Anlam, Gönderim, Yapay Zekâ.

Introduction

The late 19th century marked a transformative era in philosophy, characterized by a heightened focus on the fundamental nature of language and meaning. Philosophers began to grapple with essential questions: What do words and sentences signify? How do they convey meaning? And what is the relationship between language, thought, and reality? These inquiries ushered in a period of profound intellectual transformation that sought to bridge the gap between linguistic analysis and broader philosophical concerns (Kenny 2007: 121).

Amidst this intellectual upheaval, Gottlob Frege emerged as a towering figure whose work reshaped the philosophy of language and laid the groundwork for analytic philosophy. Frege's inquiries into the logical structure of language and his innovative distinction between sense (*Sinn*) and reference (*Bedeutung*) fundamentally redefined how philosophers approached meaning and truth. His seminal contributions, exemplified in works like *Begriffsschrift* and *Grundlagen der Arithmetik*, not only provided new tools for logical analysis but also forged pathways that influenced subsequent generations of thinkers.

Frege's pioneering distinction between sense and reference offered a nuanced framework for understanding linguistic expressions. By elucidating the cognitive pathways through which language connects with the external world, Frege revolutionized semantic theory and paved the way for developments in formal semantics and truth-conditional approaches. His focus on precision and logical rigor resonated with the broader aims of the linguistic turn, a movement that emphasized

the centrality of language in addressing philosophical problems (Baykent 2016: 69). Schiffer (1972: xi, xii) later built on Frege's ideas, emphasizing the intricate relationship between meaning and speaker intent, thereby highlighting how Frege's theories continue to inform debates on linguistic communication and cognitive processing. Schellenberg (2012: 165-168) expanded these discussions by examining the sameness of Fregean sense, delving into its implications for reference, meaning, and cognitive access to linguistic content.

This paper examines the depth and breadth of Frege's contributions to the philosophy of language, exploring how his theories have shaped contemporary discourse. By analyzing key concepts such as sense, reference, and compositionality, the study highlights Frege's role in bridging linguistic theory with formal logic. Furthermore, it considers the enduring relevance of Frege's work, as interpreted by scholars like Lycan, Schiffer, and Schellenberg, in contemporary debates surrounding meaning, cognition, and the relationship between language and reality. Through this exploration, the article underscores Frege's position as a cornerstone in the ongoing philosophical investigation of language and its complexities.

Frege's Philosophical Framework

Gottlob Frege was born on November 8, 1848, in Wismar, Germany, into an academic family that fostered his intellectual growth. Frege's 1879 publication of *Begriffsschrift* introduced a formal logical system that surpassed earlier frameworks, marking the beginning of his systematic exploration of the logical structure underlying language and mathematics. Frege's rigorous approach in *Begriffsschrift* demonstrated his commitment to the formalization of thought, a theme that would pervade his entire career.

Frege's philosophy is grounded in the logical analysis of language and mathematics. Rejecting psychologism, Frege argued for the objectivity of mathematical truths, independent of human cognition. Frege's anti-psychologism laid the foundation for his broader philosophical approach, emphasizing logic's

independence from subjective mental states. His distinctions between sense and reference and between concepts and objects provide a robust framework for analyzing meaning and truth in linguistic expressions (Baykent 2016: 71). Fodor (1975: 33) aligns with Frege's emphasis on compositionality, positing that the systematic structure of meaning reflects the architecture of thought itself.

Frege's commitment to precision and clarity is further exemplified in his analysis of mathematical reasoning. In *Grundlagen der Arithmetik,* Frege critiqued contemporary views that conflated arithmetic with psychological processes, instead asserting that mathematical truths are grounded in logic. Lycan's reflections on Frege's anti-psychologism highlight its significance in distinguishing formal semantics from cognitive psychology, further solidifying Frege's influence on modern linguistic theory.

Sense and Reference

In On Sense and Reference (*Über Sinn und Bedeutung*), Frege introduced his seminal distinction between sense and reference. He writes, "The reference of a proper name is the object itself which we designate by its means; the idea, which we have in that case, is wholly subjective; in between lies the sense, which is indeed no longer subjective like the idea, but is not yet the object itself." Reference is the actual object or entity denoted by a term. Sense is the mode of presentation of the object, providing the cognitive pathway to its reference. For instance, "the morning star" and "the evening star" both refer to Venus (same reference) but differ in sense due to their distinct modes of presentation (Frege 1948: 214). Frege's distinction elucidates how expressions with the same reference can convey different cognitive content, a revelation that has had profound implications for semantic theory. Lycan (2008: 32-35) notes that Frege's theory of sense and reference not only bridges linguistic expressions with their corresponding entities but also establishes the cognitive processes underlying understanding. Pinker (1995: 347) builds on this

foundation, exploring how humans construct meaning through cognitive and linguistic mechanisms.

Frege extended this analysis to entire propositions, arguing that the sense of a sentence—its thought (*Gedanke*)—determines its truth conditions. He explains that a proposition contains a thought. This thought is the sense of the proposition. And it is by means of this sense, in particular, that the proposition is connected with the reference (Frege 1948: 214). His emphasis on the logical structure of propositions revolutionized the study of meaning, offering tools to analyze linguistic expressions with unparalleled rigor. Frege's approach to understanding how language represents reality has been pivotal in bridging the gap between linguistic theory and philosophical inquiry. Frege also noted the importance of context, stating, "If one wants to say something about an actual object, it does not suffice to use the name, but one must be able to grasp the reference through the sense."

Frege's Influence on Analytic Philosophy

Frege's contributions significantly shaped analytic philosophy, influencing figures such as Bertrand Russell, Ludwig Wittgenstein, and the logical positivists. His pioneering work laid the foundation for subsequent developments in the field and continues to inspire philosophical inquiry today. The foundational ideas of Frege profoundly influenced Russell's theory of descriptions. Frege's distinction between sense and reference became a cornerstone of logical analysis, as reflected in Russell's seminal work, *On Denoting* (1905: 152-155). Russell's acknowledgment of Frege's contributions underscores their enduring impact on analytic philosophy. Russell, who sought to address the complexities of reference in language, built on Frege's insights to advance a theory that clarified the logical structure of propositions involving definite descriptions. This collaboration of ideas between Frege and Russell highlights a significant moment in the evolution of linguistic analysis.

The groundbreaking ideas of Frege served as a foundation for Wittgenstein's early work. *Tractatus Logico-Philosophicus*, which explores the relationship between language and reality, bears the mark of Frege's influence. Wittgenstein's (1922: 149) approach to logical form, particularly his assertion that "the limits of my language mean the limits of my world," reflects the rigor and clarity introduced by Frege's philosophy. By emphasizing the logical structure of language, he advanced Frege's ideas into a broader philosophical context that questioned the very boundaries of linguistic meaning.

The logical rigor introduced by Frege laid the groundwork for a movement that emphasized empirical verification and clarity in semantic analysis. This movement, later known as logical positivism, gained momentum through figures like Rudolf Carnap, who extended Frege's principles into formal semantic systems. Frege's insistence on clarity and precision became guiding principles for this tradition, which sought to merge empirical science and philosophical analysis through a unified framework of logic and language. Carnap's use of Fregean logic to systematize knowledge representation highlights the adaptability of Frege's ideas to diverse intellectual domains.

Frege's emphasis on the compositionality of meaning—that the meaning of a complex expression derives from its components and their combination—remains a foundational principle in linguistic and cognitive science. This principle has influenced the development of truth-conditional semantics and other formal approaches to meaning. Contemporary scholars, such as Lycan, elaborate on this principle by demonstrating how Frege's framework continues to underpin discussions about the systematic nature of language and its interpretation. Frege's contributions to compositionality not only shaped theoretical linguistics but also provided a model for analyzing how meaning is constructed and understood in natural and artificial languages.

Why Frege's Views are Considered a Milestone

Gottlob Frege's contributions to the philosophy of language are widely regarded as a milestone due to their transformative impact on both theoretical and practical dimensions of linguistic analysis. His work introduced concepts and frameworks that not only redefined the study of meaning and reference but also laid the foundation for the modern fields of analytic philosophy, formal semantics, and logic.

Revolutionary Distinction Between Sense and Reference

Frege's distinction between sense and reference represented a breakthrough in understanding how language operates. By separating the cognitive content of an expression (its sense) from its denotation (its reference), Frege provided a way to resolve longstanding puzzles in semantics, such as the informativeness of identity statements (e.g., "The morning star is the evening star"). This framework has influenced countless philosophical and linguistic theories, as it clarified how meaning can remain stable even when different terms refer to the same object.

Foundation for Formal Semantics

Frege's emphasis on the logical structure of language was pivotal in establishing the principles of formal semantics. His insight that the meaning of a sentence derives from the meanings of its parts and their syntactic arrangement (compositionality) became a cornerstone of semantic theory. This principle not only advanced theoretical linguistics but also provided a model for computational applications, including natural language processing and artificial intelligence.

Bridging Logic and Language

Frege's work forged a critical connection between logic and language, demonstrating that the principles of formal logic could be applied to analyze linguistic expressions. By introducing a symbolic language in *Begriffsschrift*, Frege enabled philosophers and mathematicians to represent the structure of arguments

with unprecedented precision. This innovation directly influenced the development of mathematical logic and underpins modern computational logic systems.

Influence on Analytic Philosophy

Frege's theories served as the intellectual foundation for the analytic tradition, shaping the work of philosophers like Russell, Wittgenstein, and Carnap. Russell's theory of descriptions, Wittgenstein's exploration of the relationship between language and reality, and Carnap's formal systems of semantics all trace their origins to Frege's groundbreaking ideas. His insistence on clarity, precision, and logical rigor continues to define the methodological standards of analytic philosophy.

Enduring Relevance and Interdisciplinary Impact

Frege's ideas remain highly relevant, as they address foundational questions about meaning, truth, and reference that resonate across disciplines. Contemporary scholars like Schiffer (1972: xi, xii) and Schellenberg (2012: 165-168) have expanded and refined Frege's theories, applying them to topics ranging from pragmatics and speaker intention to cognitive accessibility and epistemology. Moreover, Frege's principles have found applications in computer science, cognitive psychology, and linguistic philosophy, underscoring their versatility and enduring significance.

Frege's views are considered a milestone because they provided the tools to analyze language with unparalleled precision and rigor. His theories not only resolved pressing philosophical problems of his time but also created a framework that continues to shape how we understand the relationship between language, thought, and reality.

Contemporary Applications, Criticisms and Continuing Relevance

Frege's theories have had a profound and lasting influence across diverse fields, shaping foundational concepts and methodologies in philosophy, linguistics, computer science, and cognitive science. His contributions to *formal semantics* can

be listed as larification of quantifiers, predicate calculus, and the systematic linkage of syntax to semantics. Frege is widely regarded as the founder of formal semantics due to his pioneering work on the relationship between language, logic, and truth. His distinction between sense, the mode of presentation of an expression, and reference the object or concept an expression refers to, revolutionized the study of meaning. This framework allows for the resolution of puzzles like how two expressions (e.g., "the morning star" and "the evening star") can have the same reference (Venus) but different senses.

Frege's approach directly influenced truth-conditional semantics, where the meaning of a sentence is analyzed in terms of the conditions under which it would be true. Philosophers like Davidson built on Frege's insights to explore the relationship between linguistic meaning and logical truth, while Montague (2003: 94-95) formalized these ideas to create a unified framework that bridges natural language and formal logic. Montague grammar, for instance, adapts Fregean principles to describe how complex sentence meanings emerge systematically from their parts. This work laid the groundwork for computational semantics, enabling applications like natural language understanding in computers.

His possible contributions *Artificial Intelligence* are related to his foundations for formal knowledge structures, compositional meaning in NLP, and logical reasoning in AI systems. Fregean logic is foundational in AI, particularly in areas like knowledge representation, reasoning, and natural language processing (NLP). His development of predicate logic provides a powerful framework for encoding information about the world in a machine-readable format. For example, first-order predicate logic, derived from Frege's work, enables AI systems to model facts, relationships, and rules about entities in a domain. In knowledge-based systems, Fregean principles are used to structure logical rules that allow machines to draw inferences and reason about complex problems. This logic is also integral to automated theorem proving, which demonstrates the validity of logical

statements—a capability critical for verifying mathematical proofs and software correctness.

Frege's emphasis on compositionality has direct implications for natural language processing. NLP systems leverage this principle to understand and generate human language. For example, sentiment analysis, machine translation, and semantic search engines all rely on models inspired by the structured logical relationships outlined by Frege. Modern advancements, like neural symbolic AI, aim to combine Fregean logic with machine learning, creating systems that are both statistically powerful and logically interpretable. His work laid the groundwork for formal logic, which is essential for the computational processes that underlie AI systems. Frege's formalization of logic, particularly his introduction of quantifiers and the distinction between sense and reference, has influenced the way AI systems understand and process language (Hull, 2023: 195). The significance of Frege's ideas is evident in the way they have been integrated into modern computational logic, which serves as a backbone for various AI applications, including natural language processing and knowledge representation. The historical context of Frege's work is crucial to understanding its relevance to AI. The Dartmouth Conference in 1956, often regarded as the birthplace of AI, was heavily influenced by the logical foundations established by Frege and his contemporaries. This conference aimed to explore how machines could exhibit intelligent behavior through logical reasoning, a concept that Frege's work directly supports (Trunk et al. 2020: 880). Furthermore, the philosophical inquiries into the nature of intelligence and reasoning highlight the ongoing relevance of Frege's contributions in addressing contemporary challenges in AI, such as the alignment of AI systems with human values and ethical considerations. Moreover, Frege's influence extends to the development of cognitive architectures in AI, which aim to replicate human-like reasoning processes. His formalization of logical rules has been foundational in creating systems that can perform complex reasoning tasks, thereby bridging the gap between human cognition and machine intelligence. The integration of Fregean logic into AI systems

has enabled advancements in areas such as automated theorem proving and intelligent decision-making, showcasing the practical implications of his theoretical contributions (Siekmann 2014: 15). In summary, Frege's contributions to logic and philosophy have been instrumental in shaping the theoretical underpinnings of Artificial Intelligence. His work not only influenced the early pioneers of AI but continues to inform contemporary research and applications in the field. The interplay between Frege's logical frameworks and modern AI technologies underscores the enduring significance of his ideas in the ongoing evolution of intelligent systems.

His contributions to *cognitive science* are related to explanation of compositionality, foundations for linguistic competence, and insights into human reasoning and meaning construction. Frege's insights into the logical structure of language and the principle of compositionality have deeply influenced cognitive science, particularly in the study of how humans process and generate meaning. Compositionality posits that the meaning of complex expressions (e.g., sentences) arises systematically from the meanings of their parts (e.g., words) and their syntactic arrangement. This principle aligns with empirical studies in psycholinguistics that examine how humans parse sentences and resolve ambiguities in real time.

Frege's work provides a theoretical basis for understanding linguistic competence—our innate ability to grasp and produce meaningful language. His ideas resonate with Chomsky's (1965: 75-79) generative grammar, which explores the deep structures underlying language, as well as cognitive models like those developed by Fodor, who argued for a "language of thought" that mirrors Fregean logical principles. Cognitive scientists use Frege's frameworks to explore phenomena like semantic priming, lexical access, and sentence comprehension. Neuroimaging studies investigating the neural correlates of language processing

also often reference his principles to interpret findings on how meaning is represented and manipulated in the brain.

Frege's contributions to cognitive science are foundational, particularly in the realms of semantics, logic, and the philosophy of language. His pioneering work on the distinction between sense and reference has been instrumental in shaping our understanding of cognitive significance and how meaning is processed in the mind. Frege posited that the cognitive content of a sentence—its "sense"—is distinct from its reference, which is the object it denotes. This distinction has profound implications for cognitive science, as it suggests that understanding language involves more than merely mapping words to objects; it requires an appreciation of the mental representations that underlie linguistic expressions (Yablo 2023: 205-207). Frege's informativity thesis, which asserts that logic is a science because it is deductively informative, further illustrates his influence on cognitive science. This perspective emphasizes the role of logical structures in shaping thought processes and cognitive functions. By establishing that logical principles govern the norms of correct thinking, Frege laid the groundwork for understanding how cognitive processes can be structured and analyzed through formal logic (Schmidt 2023: 132). This has implications for cognitive models that seek to replicate human reasoning and decision-making processes, as it provides a framework for how logical reasoning can be integrated into cognitive architectures. Moreover, Frege's work has been pivotal in discussions surrounding psychologism—the idea that logic should be grounded in psychological processes. He argued against psychologism, advocating for a clear distinction between logical laws and psychological phenomena. This stance has influenced the analytic tradition in cognitive science, promoting a view that separates cognitive processes from the formal structures of logic. This distinction is crucial for cognitive scientists who aim to model human thought without conflating it with the formal rules that govern logical reasoning. Frege's contributions also extend to the principle of compositionality, which posits that the meaning of a complex expression is determined by the meanings of its parts

and their syntactic arrangement. This principle is fundamental in cognitive science, particularly in the study of language acquisition and processing, as it informs how individuals construct meaning from linguistic inputs. The implications of compositionality are evident in computational models of language understanding, where the structure of language is analyzed to derive meaning systematically. It is true to say that Frege's work has significantly shaped cognitive science by providing essential insights into the nature of meaning, the structure of logical reasoning, and the relationship between language and thought. His distinctions and principles continue to inform contemporary research in semantics, cognitive modeling, and the philosophy of language, making his contributions vital to the field.

Generally, his impact is cross-disciplinary. Frege's theories have not only shaped these individual fields but have also fostered interdisciplinary approaches. For example, his work is at the heart of computational linguistics, which merges formal semantics and AI to create models for understanding and generating human language. Similarly, his influence on philosophy of language and logic continues to inform debates about the nature of meaning, reference, and truth. By addressing fundamental questions about how we use language to think and communicate, Frege's legacy extends far beyond his initial contributions, providing enduring tools and concepts for analyzing both human cognition and artificial systems.

Frege was also criticised for his arguments. One of these criticisms is about anti-psychologism. Critics like Edmund Husserl argue that Frege's dismissal of psychological processes neglects the cognitive underpinnings of meaning. Frege's strict separation of logic from psychology remains a contentious aspect of his philosophy. He was also criticised for ideas related to existence as a ssecond-level concept. Frege's view that existence applies to concepts rather than objects has been contested as counterintuitive. This interpretation has sparked debates on the nature of existence within philosophical discourse. Another criticism was about the objectivity of meaning. Opponents claim that meaning is inherently tied to

subjective intentions and mental states, challenging Frege's assertion of its independence from individual cognition. Additionally, challenges arise in addressing linguistic phenomena like fictional names or theoretical terms lacking clear referents, highlighting limitations in Frege's framework. However, these criticisms often serve to underscore the depth and complexity of Frege's ideas, which continue to inspire rigorous analysis and debate.

Despite the criticisms, Frege's influence endures across philosophy, linguistics, and artificial intelligence. His logical framework has shaped formal theories of syntax and semantics, facilitating advances in computational linguistics and generative grammar. For example, Chomsky's generative grammar, which explores the deep structure of language, is deeply indebted to Fregean principles of compositionality and logical form. Similarly, the development of formal semantics, as spearheaded by Montague (2003: 93), directly incorporates Frege's distinction between sense and reference, providing a robust foundation for analyzing linguistic meaning.

Modern implementations of Fregean logic in AI enable systems to process and understand human language, demonstrating the versatility of his ideas. Predicate logic, derived from Frege's work, serves as a critical tool for building knowledge representation systems and natural language processing frameworks (Russell & Norvig 1995: 11-13). Semantic parsing algorithms, for instance, use Fregean principles to map natural language inputs to formal logical representations, enabling tasks such as question answering and machine translation (Jurafsky & Martin 2023: 586).

Frege's legacy is evident in ongoing debates about meaning, reference, and the interplay between language and thought. Philosophers continue to explore his concepts of sense and reference to address issues in epistemology and metaphysics, such as Kripke's (1980: 48) work on rigid designators and theories of naming. Linguists and cognitive scientists also build on Frege's insights to investigate how

meaning is structured and understood, reinforcing the centrality of his ideas in theoretical and applied contexts. Lycan's (2008: 4-6) analysis reaffirms Frege's contributions, suggesting that his theories provide a critical foundation for understanding the complexities of language. Frege's rigorous analysis, particularly his systematic approach to logic and meaning, continues to inspire innovative approaches to philosophical and scientific inquiries, cementing his role as a pivotal figure in modern intellectual thought.

Conclusion

Gottlob Frege's contributions to the philosophy of language are both foundational and transformative, encompassing profound insights into the nature of meaning, logic, and linguistic structure. His distinctions between sense and reference laid the groundwork for modern semantic theory, allowing for rigorous analysis of how language relates to thought and reality. Frege's innovations, including his formalization of logic in *Begriffsschrift* and his exploration of the logical underpinnings of arithmetic, revolutionized the study of philosophy, mathematics, and linguistics. By emphasizing the importance of precision and clarity, Frege introduced methodological standards that continue to shape analytic philosophy and adjacent disciplines.

Despite facing criticisms—notably regarding his anti-psychologism and his views on the objectivity of meaning—Frege's theories have inspired ongoing debates, driving intellectual progress in fields as diverse as cognitive science, artificial intelligence, and epistemology. Scholars such as Chomsky, Davidson, and Pinker have extended Frege's insights, demonstrating their relevance to contemporary issues like language acquisition, computational semantics, and the representation of knowledge in machines. Frege's principles of compositionality and logical form remain central to understanding how humans process and generate meaning, bridging philosophical inquiry with empirical research in psycholinguistics and AI.

Moreover, Frege's enduring legacy underscores the interdisciplinary impact of his ideas. His influence spans computational linguistics, where his formal logic provides the basis for natural language processing systems, to epistemology and metaphysics, where his theories inform questions about meaning, reference, and truth. The integration of Fregean principles into AI highlights their adaptability and importance in addressing modern challenges, such as ethical decision-making in autonomous systems and the alignment of machine reasoning with human values.

Frege's intellectual rigor and systematic approach continue to inspire scholars seeking to unravel the complexities of language, thought, and reality. His work not only enriched the analytic tradition but also established a framework for interdisciplinary research, demonstrating the unifying power of logic and language. As new technologies and theories emerge, Frege's contributions provide an enduring foundation, ensuring his relevance in both theoretical and applied contexts. In a rapidly evolving intellectual landscape, Frege's legacy remains a testament to the transformative power of clear and precise thinking. Frege's place in the history of philosophy is firmly secured as a thinker who bridged the gaps between disciplines and epochs. His unwavering commitment to addressing foundational questions about meaning and truth has left an indelible mark, ensuring that his ideas continue to resonate and inspire across generations of scholars and practitioners.

REFERENCES | KAYNAKÇA

Baykent, U. Ö. (2016). *An Introductory Course to Philosophy of Language*. Cambridge Scholars Publishing.

Chomsky, N. (1965). *Aspects of the Theory of Syntax*. MIT Press.

Fodor, J. A. (1975). *The Language of Thought.* Harvard University Press

Frege, G. (1948). *On Sense and Reference*. Philosophical Review, Vol. 57, No. 3 pp. 209-230.

Hull, G. (2023). Unlearning Descartes: sentient ai is a political problem. Journal of Social Computing, 4(3), 193-204

Jurafsky, D., & Martin, J. H. (2023). *Speech and Language Processing* (3rd Edition). Pearson.

Kenny, Anthony. (2004) A New History of Western Philosophy: Volume 1, Ancient Philosophy. Claredon Press, Oxford.

Kripke, S. (1980). *Naming and Necessity*. Harvard University Press.

Lycan, W. G. (2008). *Philosophy of Language: A Contemporary Introduction*. Routledge.

Montague, R. (2003) Universal Grammar in *Semantics: Foundational issues* edited by Javier Gutiérrez-Rexach. Routledge.

Pinker, S. (1995). *The Language Instinct: How the Mind Creates Language*. Penguin Books.

Russell, B. (1905). On Denoting. *Mind*, 14(56), 479-493.

Russell, S., & Norvig, P. (1995). *Artificial Intelligence: A Modern Approach* Prentice Hall.

Schellenberg, S. (2012). Sameness of Fregean Sense. *Synthese*, 189(1), 163–175.

Schiffer, S. (1972). *Meaning*. Oxford: Oxford University Press.

Schmidt, J. (2023). Not coped with by a machine: on frege's conception of logic as science. Revista Ética E Filosofia Política, 1(26), 129-149.

Siekmann, J. (2014). Computational logic. In *Handbook of the History of Logic*. J. Siekmann (ed.) pp.15-30. Elsevier.

Trunk, A., Birkel, H., & Hartmann, E. (2020). On the current state of combining human and artificial intelligence for strategic organizational decision making. *Bur- Business Research,* 13(3), 875-919.

Wittgenstein, L. (1922). *Tractatus Logico-Philosophicus*. Harcourt, Brace and Company.

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Yablo, S. (2023). Leverage: a model of cognitive significance., *In Oxford Studies in Philosophy of Language Volume 3*. Ernest Lepore and David Sosa (eds.), 205-248, Oxford University Press