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Beyond Atomism and Nihilism: The Metaphysical Challenge of Gunk Ontology

Atomculuk ve Nihilizmin Ötesinde: Yapışkan Madde Ontolojisinin Metafiziksel Meydan Okuması

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Abstract: This article examines David Lewis's gunk ontology as an alternative to ontological approaches such as mereological atomism and mereological nihilism, which are significant in contemporary metaphysics. The concept of gunk, based on the principle of infinite divisibility, rejects the existence of indivisible atoms and presents a vision of a universe where every object is composed of smaller parts. Such ontological model deeply questions the fundamental building blocks assumed by atomism and the concept of mereological sums rejected by nihilism. The article discusses the critical grounds provided by the gunk ontology on key issues such as parthood relations, property-bearers, and metaphysical unity, analyzing how this approach reveals the limitations of classical mereological theories.

Keywords: Gunk, mereology, material composition, David Lewis, metaphysics.

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Introduction

During the periods in which ontological simplicity and the foundational grounds of metaphysics began to be discussed, secondary philosophical debates were largely abandoned in favor of new inquiries into the fundamental aims of metaphysics itself. Within contemporary metaphysics, one of the most significant fields of discussion has been contemporary mereology, where numerous different ideas have been proposed to account for ontological simplicity (Markosian, 1998, p. 228; Smith, 2006, p. 359). In this context, it is possible to argue that the theories attempting to explain the part–whole relations of objects within mereology also aim to offer explanations that are ontologically economical and compatible with human intuitions (Smid, 2015, p. 3254). Mereology can be defined as a metaphysical inquiry into whether objects are composed of parts and how these parts constitute a whole. Also it can be defined as the formal study of the nomological base governing part–whole relations, treating parthood as a reflexive, antisymmetric, and transitive relation that structures the connection between wholes and their constituents (Varzi, 1996, p. 260).

However, since each account of mereology is founded upon specific assumptions, they may lead to different—and at times conflicting—conclusions regarding the ultimate nature of the universe. At this point, the debates in mereology concern not only how part–whole relations. Furthermore, it seeks answers for the questions whether parts themselves have an ontological basis. For example, mereological nihilism argues that no composite objects exist at all and that there are only basic, non-composite parts. However, mereological universalism defends the opposite view that every state of objects may form a whole. The tension between these two extreme positions compels us to reconsider the basic structure of metaphysical explanations. At this point, discussions in mereology concern not only how part-whole relationships function, but also whether these parts exist at all. For example, mereological nihilism claims that no mereological sums actually exist; only basic, non-composite parts exist, while mereological universalism, on the contrary, argues that every group of objects forms a whole (Thunder, 2017, p. 279).

Against Atomism: Gunk, Identity and the Failure of Mereological Essentialism

The concept of gunk itself is actually derives from a thought experiment that pushes the boundaries of classical mereological thought. This concept, introduced by David Lewis, posits that no entity in the universe is composed of the smallest parts and that every object can be divided into smaller parts. According to Lewis, what we try to visualize with gunk is an individual whose parts all possess other corresponding parts (Lewis, 1991, p. 20). To define gunk ontology, we can consider that something can always be divided into smaller parts ad infinitum. The idea of gunk, in fact refers to an ontological structure of being in which every part is composed of other parts and contains no atomic indivisible units whatsoever. At first glance, gunk offers novel ontological model opposed to any kind of atomism. Because nothing that exists here is indivisible or incapable of being further divided. Such a structure requires rethinking not only the nature of physical entities but also the concept of metaphysical wholeness. In this context, instead of viewing gunk as a metaphysical concept with its own existence, we can also consider it as a thought experiment aimed at experiencing the limits of mereological thought. Because if we claim that all the parts within gunk can be divided into distinct parts, we will not be able to encounter any atoms that could be considered as property-bearers substantially. Therefore, we will not be able to access atoms as a fundamental entity that we can present as constitutive within the metaphysical structure or system of the world. In this respect, a gunky world is incompatible with the atomist approach, which accepts that atoms are the most fundamental entities mereologically (Dumsday, 2015, p. 120). Furthermore, if we hold nihilist or reductionist views that reject the ontology of macroscopic entities existing in the world and claim that only atoms arranged within specific objects constitute our fundamental ontology, we will again find ourselves at a theoretically problematic point regarding gunk ontology (Benovsky, 2016, p.59). Therefore, gunk, rather than being used as an example here, may be indicating the exact state of our ontology in the world. Therefore, if gunk ontology refers to the ontological state of the world, then we need to rethink mereological theories and models of material composition.

The metaphysical landscape presented by gunk ontology, as portrayed by Lewis, can be seen as a powerful challenge, forcing a reassessment not only of ontological atomism but also of contemporary reductionist approaches. In this context, gunk ontology can also be considered a philosophical challenge for approaches such as scientific reductionism. The assumption of infinite divisibility of parts invalidates previously accepted notions of *substratum*, property-bearers or bare particulars complicating the search for metaphysical foundations. Therefore, gunk can be viewed not as an abstract hypothesis but also as a critical tool for testing deeply held assumptions about our understanding of ontology (Leonard, 2014, p. 306).

The parts of an object encompassed within gunk ontology can be infinitely divided to comprise new parts. This view challenges ontological simplicity, implying that the structure of the universe is not composed of ultimate particles and therefore cannot be reduced to an absolute foundation. This contradicts both atomism and views that metaphysically view atoms as the primary element of ontological simplicity. Because atomism, as a mereological theory, is not skeptical of the existence of an indivisible foundation, it derives its fundamental ontology from the existence of atoms. According to mereological atomism, all composite entities in the universe are composed of atomic (simple) entities that cannot be further divided into parts. These atoms are used in the sense of being ontologically indivisible, rather than the atoms used in physics and the natural sciences. Therefore, accepting the ontology of entities that cannot be further divided constitutes a defense in favor of mereological atomism. These atoms may not be physical atoms in the scientific sense but ontologically indivisible entities—basic building blocks of being. Hence, when one accepts an ontology of indivisible entities, a defense of mereological atomism follows naturally (Sobociński, 1971, p.89).

From the perspective of gunk ontology, mereological atomism proves inadequate among composition theories. Atomism conceives all material beings as mere aggregates of singular and indivisible parts. This approach, however, fails to explain the holistic structures formed by parts and therefore does not provide a satisfactory ontological framework (Lechthaler, 2019, p. 4447). One may claim that, within mereological debates, atomism offers an overly simple answer. Lewis, however, considers it possible—even

as a thought experiment—that there could exist a structure infinitely divisible no matter how far we proceed, thereby undermining the foundations of atomism. Such a structure is the atomless gunk, a matter containing infinitely many parts, each of which itself has further parts, and whose parts can be divided without limit (Lewis, 1991, p. 20). In Lewis's analogy of gunk, it is impossible to isolate any complete set of parts within a substance—hence, no unit that could properly be called an atom.

This approach might lead Lewis to position singularity in his metaphysics as a void or something without an ontological counterpart. Furthermore, it would be speculative to conclude that this interpretation directly rejects set theory. Lewis attempts to use set theory to understand abstract entities and to understand the concrete objects referred to by names through sets (Lewis, 1991, p. 110). Theodore Sider states that Lewis, with the example of gunk, revives a debate about atomism that has existed since Anaxagoras. Accordingly, in a world with a gunk ontology, individuality is an illusion. Therefore, Sider believes that gunk responds to the mereological debates. In this respect, for example, if the entire world were made of gunk, then no one would have to search for atoms or simples. It could be argued that philosophers seeking definitive answers to mereological debates consistently overlook this possibility (Sider, 1993, p. 285). However, the habit of searching for substantial property-bearers in metaphysics also pushes mereological debates beyond the concept of time, leading them to seek an essentialist individualization theory, and thus appears problematic (Sider, 2003, p. 180).

According to Sider, atomism should not be considered a thesis simply put forth, but rather a hypothesis that is highly empirically observable (Sider, 1993, p. 288). Furthermore, there is an ontological compatibility between mereological essentialism and atomism. Mereological essentialism holds that the parts an object possesses necessarily determine its identity; therefore, when an object loses any of its parts, it ceases to be the same object. This view can be more consistently defended within an atomistic worldview. Atomism posits that the identity of an object depends on the existence and spatial-temporal arrangement of fundamental parts, without appealing to any further, non-physical basis. For an essentialist, identity itself depends on the spatiotemporal location of the object's parts at the

macroscopic scale. At the microscopic scale, however, atomic entities exist as the ultimate bearers of the properties of these parts. Therefore, a microphysical, indivisible bearer of properties that makes the macroscopic properties possible must ultimately exist.[1] Consequently, the parthood relations between objects are necessarily governed by the axioms of classical atomistic mereology (Cotnoir, 2013, p. 68). However, if the universe is composed of gunky matter and every part can be absolutely divided into smaller parts, then there also cannot be any fixed or fundamental parts that determine an object's identity. This undermines the applicability of mereological essentialism, because, from an essentialist perspective, the parts that determine identity must be fixed. In this context, the theoretical success of mereological essentialism depends largely on an atomistic ontology. D. Zimmerman argues that gunk exists in a closed system whose parts cannot be precisely determined. In the case of gunk, the parts of this substance are infinitely divisible, preventing those parts from acquiring a distinct identity (Zimmerman, 1996).

Nihilism and the Incompatibility of Gunky Worlds

Another mereological approach that the gunk ontology makes problematic is mereological nihilism. According to Brenner's definition, "mereological nihilism (or simply 'nihilism') is the thesis that (mereological) composition never occurs. Therefore, if nihilism is true, there are no such things as composite objects" (Brenner, 2017, p. 464). In this respect, mereological nihilism is interpreted as a nihilist view because, while it accepts the parthood relation, it rejects the existence of objects that are a mereological sum or whole. Accordingly, all objects that appear as mereological totalities have emerged from a specific arrangement of simple and indivisible entities like atoms, and the spatiotemporal location of their existence is contingent. Therefore, the states of objects can be altered and rearranged. This approach poses a serious challenge to the concepts of wholeness, identity, and composite objects in traditional metaphysical understandings. Accordingly, all objects we perceive as mereological aggregates

[1] The parthood relations in mereological essentialism indirectly assosciates emergent properties. The reason for this is that the properties possessed by the parts of an object are different from the mereological sum, and the properties the mereological sum has may be categorized differently. Therefore, such properties can be considered “emergent”. For details see. (Moreland, 2023, p. 344).

are actually simply the specific organization of simple and indivisible fundamental entities like atoms (Van Inwagen, 1990, p. 73). This form of organization, however, is not an objective whole, but merely a temporary spatiotemporal arrangement.

According to Giberman, if mereological nihilism—or any form of mereological anti-realism—is necessarily true, then the existence of gunk is impossible (Giberman, 2024, p. 99). The reason is that, in the absence of intermediaries that make composition or parthood relations possible, even when we describe mereological sums as arising from particular arrangements of atomic entities, we still presuppose the existence of indivisible, microphysical simples. Therefore, mereological nihilism cannot be sustained within the framework of gunk ontology. For a nihilist metaphysics that rejects the existence of composite objects must nevertheless rely on the existence of atomic entities that behave as if they were mereological 'sums'.[2]

Gunk and the Limits of Science

Although the concept of gunk was originally introduced within a purely metaphysical framework, it inevitably invites comparison with the findings of contemporary physics. As an ontological hypothesis that denies the existence of ultimate, indivisible simples, gunk challenges the scientific assumption that matter is composed of discrete and finitely divisible particles. This tension between metaphysical continuity and physical discreteness highlights the complex relationship between metaphysical speculation and empirical reality, revealing how the limits of scientific explanation intersect with the conceptual boundaries of ontology.

The nature of subatomic particles revealed by scientific developments highlights the conceptual contrast between the ontological pictures proposed by these two approaches. B. Le Bihan illustrates Lewis's analogy of gunk by referring to subatomic particles. According to Le Bihan, the atom was first taken to be the most basic entity in the history of science, but it was later understood to be a composite structure of neutrons, protons, and electrons. These three components were then regarded as the simplest

[2] The only difference is that treating these arranged simple objects as a mereological sum cannot imply any causal explanation or regularity, or, in other words, it may be epiphenomenal or linguistic. See. (Thiel, 2016, p. 49).

constituents of atoms. However, when quarks were discovered as subunits of these particles, physicists came to see them as, within the limits of current observation, the smallest identifiable constituents of matter. Le Bihan argues that if the world truly instantiated the kind of gunk ontology described by Lewis, we would not be able to identify quarks as fundamental entities, for in such a world there would be no smallest level of matter—each part would itself contain further proper parts ad infinitum (Le Bihan, 2013, p. 13). In this respect, there is a fundamental incompatibility between gunk ontology and mereological nihilism. Nihilism rejects all composite objects yet accepts the existence of fundamental entities that we mistakenly regard as mereological sums.

Lewis's gunk ontology, on the other hand, recognizes neither composite objects nor fundamental parts as possessing ontological status. In this respect, there is an incompatibility between gunk ontology and mereological nihilism. In light of scientific advances, the finite and limited nature of the building blocks of matter in the universe reveals the speculative nature of gunk ontology. While this approach falls beyond the limits of a physically-constructed scientific approach that has concluded that atoms are the smallest particles accessible in the material realm, the thought of gunk ontology nevertheless fulfills one of the most important functions of metaphysics by testing the limits of our understanding of existence and evaluating alternative possibilities. Consequently, the comparison between gunk ontology and absolute nihilism not only reveals the boundary between scientific reality and metaphysical speculation; it also demonstrates the areas where philosophy offers broader, even more radical, possibilities than science (Clarke, 2022, p. 77). From a metaphysical perspective, the comparison between gunk ontology and mereological nihilism not only provides us with a framework for determining which entities truly exist but also reveals how philosophical methods approach science.

Conclusion

In conclusion, in contemporary mereological discussions, gunk ontology is positioned not only as an alternative thought experiment but also as a powerful theoretical challenge capable of pushing the boundaries of

existing metaphysical approaches in the literature. If nothing is ultimately composed of indivisible units, concepts such as identity, wholeness, and existence themselves may need to be redefined. In this context, gunk ontology not only offers an alternative to mereological atomism or nihilism, but also, by becoming central to ontological theories, encourages a reconsideration of the most fundamental questions of metaphysics. The theoretical importance of gunk ontology is particularly heightened at a philosophical juncture plagued by discussions of fundamentality and metaphysical grounding concepts in post-modal metaphysics. In this respect, for example, gunk ontology can be seen as an important intellectual underpinning for foundationalist approaches such as 'ground physicalism' (Moorfoot, 2025, p. 78). From this perspective, Lewis's approach is not a constituent element, but rather an intellectual tool used to illustrate the theoretical difficulties inherent in these constituent elements.

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Öz: Bu makale, çağdaş metafizikte önemli bir yere sahip olan mereolojik atomizm ve mereolojik nihilizm gibi ontolojik yaklaşımlara alternatif olarak David Lewis'in 'yapışkan madde' ontolojisini incelemektedir. Yapışkan madde kavramı, parçalanabilirliğin sonsuzluğu ilkesine dayanarak, bölünemez atomların varlığını reddeder ve her objenin daha küçük parçalara ayrılabildiği bir metafizik tasavvuru ortaya koyar. Bu ontolojik model, hem atomizmin varsaydığı temel yapı taşlarını hem de nihilizmin reddettiği birleşik nesne kavramını derinlemesine sorgular. Makalede, yapışkan madde ontolojisinin, parça-bütün ilişkileri, özellik taşıyıcılık ve metafiziksel bütünlük gibi temel sorunlara dair sunduğu eleştirel zeminler tartışılmakta; bu yaklaşımın klasik mereoloji teorilerinin sınırlarını nasıl açığa çıkardığı analiz edilmektedir.

Anahtar Kelimeler: Yapışkan madde, mereoloji, maddi birleşim, David Lewis, metafizik.