The role of efficient causation in Aristotle's philosophy: ensuring the continuity and coherence of the cosmos within a teleological framework

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Introduction

Aristotle consistently upholds the notion that the entire cosmos is characterized by inherent goodness, a quality intrinsically tied to its teleological structure. For Aristotle, the natural world is not a collection of arbitrary occurrences but a domain of purposeful activity, where all natural substances operate with an intrinsic goal, as they exist "for the sake of" something good. This teleological framework is foundational to Aristotle's philosophy, underscoring his belief that reality as a whole tends toward the good.[1] However, despite this overarching teleological order, there are instances where the goodness or purposiveness of certain parts of reality, or specific phenomena, is not immediately discernible.[2]

[1] For instance, see *DA* II.4, 415b15–17; *GA* I.1, 715b15–16; *DC* I.4, 271a34; *Phys* II.7, 198b4–9; 198a22–24; *DC* I.4, 271a34. These interpretations also emphasize the centrality of the final cause in Aristotle's philosophy as the foundational principle that underpins both natural and metaphysical order. Rist (1965, 342) identifies an overarching teleology in Aristotle's thought, suggesting that final causation functions not merely in isolated contexts but as a principle governing the entire cosmos. Similarly, Owens (1968, 167) characterizes Aristotle's teleology as a "teleology of nature," oriented "towards something above and outside itself." This interpretation points to the transcendent aspect of Aristotle's teleological framework, with the Unmoved Mover serving as the ultimate goal (telos) that directs all motion and change toward a higher purpose. Kahn (1985, 193) advances the view that Aristotle's final causation offers an explanation of the universe, encompassing both inanimate and biological realms. He describes this as a "cosmic teleology reaching down from the outer heavens," which aligns the patterns of immanent teleology observed in living organisms with the broader cosmic order. This perspective highlights the interconnectedness of all entities in Aristotle's universe through the hierarchical operation of final causes. Sedley (2000, 327–329) identifies a single ultimate principle of final causation in Aristotle's *Metaphysics*, which he argues pervades the entire cosmos. This principle, according to Sedley, serves as the foundational cause that integrates all aspects of reality into a cohesive whole, providing a teleological explanation for the universe's inherent order and purpose. Furley (2002, 76) underscores the universality of Aristotle's final cause, suggesting that it offers a comprehensive framework for explaining the unity of the world. By linking individual phenomena to the overarching teleological structure of the cosmos, final causation ensures that the universe operates as an integrated system. Johnson (2005, 133) echoes this view, emphasizing that Aristotle's final cause contributes to a overall vision of reality by connecting diverse natural processes within a coherent framework. These interpretations converge on the idea that Aristotle's final causation functions as the ultimate explanatory principle, capable of integrating the multiplicity of phenomena into a teleological system.

[2] Many commentators argue that Aristotle's final cause is inadequate as a principle for providing an explanation of the universe as a whole, as its applicability is limited to certain domains. For instance, Nussbaum (1978, 93–94) contends that Aristotle's final causal explanations cannot be extended to meteorological phenomena or the motions of the elements. She states, "the idea that I think natural phenomena—eclipses, rainstorms, the downward motion of earth, the upward motion of fire—are best explained teleologically is a misconception that I frequently try to avoid." Nussbaum further argues against a universal application of final causation in Aristotle's thought, claiming (1978, 60) that "Aristotle neither applies teleology to nonliving natural bodies nor gives any evidence for believing in a universal teleology." Similarly, Ayala (1970, 49) asserts that Aristotle's error lies not

These moments raise the question of whether such aspects of nature can be reconciled with the broader teleological orientation, and if so, how they might be comprehended within the structure of Aristotle's causal framework. This thesis is an attempt to address such complexities by focusing on the role of Aristotle's efficient cause, particularly its function in sustaining the continuity of the cosmos. While final causation establishes the teleological grounding of the universe, efficient causation operates as the mechanism through which continuity—both spatial and temporal—is maintained across diverse phenomena. By examining efficient causation, this study tries to answer the question of how even those parts of reality that appear less evidently aligned with goodness or purposiveness contribute to the continuity and coherence of the universe.

For Aristotle, the primacy of the final cause[3] is beyond dispute, as it serves as the ultimate explanatory principle in his teleological framework.[4] The final cause, epitomized by the Unmoved Mover, is fundamentally distinct from the other causes in its role and operation. It functions as an object of desire, engaging in "pure activity (actuality)", which is entirely self-sufficient and does not result involve direct action or causal interaction. The Unmoved Mover, as the highest actuality, draws the cosmos toward itself as the ultimate end, providing the teleological grounding for all motion and change. This transcendent primacy

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in his use of final causation within biology but in extending the concept to the nonliving world, such as the motions of the elements. Gotthelf (1987b, 210) supports this view, maintaining that Aristotle does not employ final causation in the realm of elemental motions. He provocatively asks, "Can one account for a particular living process in terms of the element-potentials involved in the process, making no mention of the overall end or goal of the process?" Other scholars, including Wieland (1975, 150) and Byrne (2002, 19–21), have similarly noted the limited applicability of final causation in explaining the motions of elements. Furthermore, Balme (1991, note at HA 591b27) critiques Aristotle's teleological framework by pointing to the behavior of certain large sea creatures that turn over while eating, an activity that inadvertently benefits the survival of smaller fish. Balme argues that this example contradicts Aristotle's teleological explanations, as the activity of these larger creatures serves not only their own purposes but also the survival of other species. These criticisms collectively highlight the perceived limitations of Aristotle's final causation in providing a universal explanatory framework, particularly in the domains of inanimate nature and nonbiological phenomena. Such critiques underscore ongoing debates regarding the scope and coherence of Aristotle's teleological system and its capacity to explain the each and every aspect of the natural world.

[3] The variety of the explanations of the final cause found in Aristotle's physical treatise is often taken as one homogeneous category. The constant phrase usually employed by Aristotle for the notion of final cause is '(that) for the sake of which (οὗ ἕνεκα)'. For Aristotle's definition of the final cause, see chapter 2.1.1.

[4] In addition to the texts quoted in note 2 above, see also *Phys* II.8, 198b32–199a8; *DA*, III.12, 434a31; III.9, 432b21; III.12, 434a31; *PA* I.1, 639b12–640a20.

reflects the Unmoved Mover's unique role as the final cause, which holds primacy over all other causes and remains independent of them. It also makes clear that, within the natural world, the efficient, formal, and material causes collectively play indispensable roles in the realization of a continuous, and living cosmos. These causes function within a hierarchy that serves the overarching teleological purpose established by the final cause. The material cause provides the substratum for change, the formal cause constitutes the structure and identity of things: in Aristotle's framework, the efficient cause is often integral to the actualization of the formal cause, particularly in processes involving change or motion. For instance, in natural generation, the efficient cause initiates the process through which the formal cause is realized in the material substrate. The efficient cause explains the spatial and temporal continuity. Together, they interact dynamically to fulfill the telos, or purpose, of the cosmos.

Although Aristotle attributes an overarching teleological order to the cosmos—a framework in which all natural phenomena are understood to exist 'for the sake of' some good'—there are significant instances where the inherent goodness or purposiveness of certain aspects of reality remains obscure. These moments reveal the boundary of Aristotle's teleology, as they expose gaps in the application of his final causal explanations. For example, natural occurrences such as the behavior of inanimate elements or unpredictable meteorological events often resist straightforward alignment with Aristotle's teleological framework, challenging the idea that all phenomena can be easily integrated into a purposive and goal-directed system.

These interpretive challenges arise because Aristotle's final causal explanation, while comprehensive, was not intended to apply uniformly across all domains of reality. Instead, it finds its most robust expression in biological contexts, where the purposeful structures and functions of living organisms vividly illustrate the operation of final causes. However, when applied to phenomena such as the motions of nonliving bodies or certain irregular natural processes, the explanatory power of teleology appears more constrained. These limitations invite critical reflection on whether Aristotle's teleological framework can provide a truly universal explanation of the cosmos or whether its application must be understood as context-dependent. In such cases, the alignment of these phenomena with Aristotle's broader teleological vision becomes obscured, requiring a more nuanced consideration of how—or even if—such aspects of reality can be

reconciled with the overarching teleological order.

It is important to note that, while Aristotle assigns a central role to the final cause in achieving a unified explanation of the universe, he seems to acknowledge that some causes do not operate universally across all domains; for example, the applicability of the final cause may be less evident in meteorological phenomena or the motion of inanimate elements. In addition, he seems to recognize that certain phenomena resist being fully explained in terms of teleology or intrinsic goodness, particularly when their connection to a broader purpose is not immediately apparent.

As early as Theophrastus[5], interpreters of Aristotle have expressed concerns regarding an apparent tension in his causal framework: while Aristotle asserts the primacy of the final cause, he often does not explicitly invoke it in explanations of certain natural phenomena, such as meteorological processes and the formation of water bubbles. Theophrastus' critique highlights a crucial challenge in Aristotle's teleology—how can the final cause be considered primary if it is absent from the explanation of various physical occurrences?

This study takes Theophrastus' critique seriously and examines *Meteorology* and other Aristotelian texts to uncover possible implicit responses Aristotle might have offered. Had Theophrastus directly posed this challenge, Aristotle's response, I suggest, would have emphasized a distinction between different levels of teleological explanation. While Aristotle maintains that the universe as a whole is directed toward the good, the explanatory focus shifts when investigating specific natural phenomena. In such cases, rather than analyzing how each discrete part contributes to the overarching good, Aristotle is concerned with the structural continuity and causal interdependence that unify disparate elements of the cosmos. This continuity, which ensures that the world is a coherent cosmos rather than a mere aggregation of independent entities, is often accounted for through references to the efficient cause.

Throughout this study, I will examine key Aristotelian passages where this explanatory shift occurs, demonstrating how Aristotle integrates efficient causation to account for natural continuity while still upholding the broader

[5] Theophrastus criticizes Aristotle's signature theories of the Unmoved Mover and teleology in his *Metaphysics*. However, it appears that he is unaware of the central and later books of Aristotle's *Meta*, focusing his comments instead on the earlier books, particularly Book *Lambda*. See Gutas (2010, 5–6) and Frede (2000, 47–49).

teleological orientation of the cosmos. By engaging with these textual nuances, this thesis seeks to offer a more refined understanding of the interplay between final and efficient causation in Aristotle's natural philosophy.

Given that some modern interpreters regard the boundary of Aristotle's final causation in providing a unified explanation as a question influenced by Theophrastean critique[6], it is essential to clarify Aristotle's own position. To this end, I will quote a significant passage from Theophrastus' *Metaphysics*, composed within the intellectual milieu of Aristotle's school, to provide further insight into Aristotle's concerns:

> But again, the actual assignment of a formal account to each entity by referring to something for the sake of which in all cases is difficult, in the case of animals and plants and in the very bubble[7];—unless it happens through the order and change of other things that all sorts of shapes and varieties of things in the air and on earth arise; the main example of which according to some are the facts of yearly return of the seasons, on which generations of animals, plants and fruits depend—the sun being, so to speak, the begetter. These questions too call for an inquiry into them somewhere here, requiring as they do a delimitation of how far the ordered extends, and why more of it is impossible or the change would be for the worse.
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> *Meta* 7a19–b8 (trans. M. van Raalte)

In this passage, Theophrastus critically examines the boundaries of final causal explanation in providing a unified account of the universe. He raises concerns about the applicability of final causes, especially in cases where assigning a teleological purpose to entities appears problematic. Specifically, Theophrastus questions whether every entity—down to the smallest organic forms such as animals, plants, or even ephemeral phenomena like bubbles—can meaningfully

[6] See e.g., Lennox (1985, 259–279; 2001a, 226–227); Repici (1990, 182–213); Johnson (2005, 35–37). Lennox (1985, 259–279) treats Theophrastus' text as a critic of Aristotle's teleology. Repici (1990, 182–213) criticizes Lennox's position by documenting much agreement between Aristotle and Theophrastus. But Lennox (2001a, 226–227) then responds to Repici's critique, and clearly treats Theophrastus' arguments as a concern shared by Aristotle. Johnson (2005, 35–37) summaries these interpreters' comments and follows Lennox's view.

[7] For 'in the very bubble', Theophrastus, in his short treatise *Metaphysics*, explicitly raises the problem of the appropriate role of purposive and normative terminology in scientific explanation, with respect to everything from the heavenly bodies to the structure of the bubble. For the structure of 'bubble', see also Aristotle, Prob 913a19–33, 936b1–9; 939a25–7.

be explained "for the sake of" some overarching purpose. He further observes that many phenomena, particularly those found in cosmology, meteorology, and biology, resist straightforward teleological explanation. For instance, Theophrastus suggests that certain features of the natural world, such as the annual recurrence of the seasons, might be better understood as arising from the interactions and transformations of other phenomena, such as the movements of the sun. In this view, the sun acts as a kind of generative principle, indirectly bringing about the cycles that sustain life, including the reproduction of animals, plants, and fruits. This leads Theophrastus to propose an important philosophical question: to what extent does the order in the universe extend, and where does it encounter its boundaries? He suggests that there is a need to delimit the scope of teleological explanations, asking why the universe is not more ordered than it is and whether any further ordering would result in adverse changes. These reflections invite further inquiry into the nature and limits of the teleological framework within Aristotle's philosophical system, challenging the universality of final causation as a principle for explaining all aspects of reality.

Building on the problem raised by Theophrastus, we are led to ask: what solution does Aristotle offer regarding the limitations of final causal explanation? In key passages of Aristotle's corpus, the continuity and coherence of the cosmos—understood as its spatial and temporal continuity—is attributed not solely to final causes but also to the operation of chains of efficient causes. These efficient causes play a crucial role in linking distinct phenomena and ensuring the interconnectedness of the cosmos across its various domains.

While final causes are essential for understanding the teleological order of the universe, certain phenomena resist explanation solely in terms of "the sake of which". In such cases[8], efficient causes provide a mode of explanation that offers a more comprehensive understanding of things happening in the cosmos. This perspective suggests that efficient causation plays a pivotal role in ensuring the coherence of reality, particularly in contexts where the teleological orientation or inherent goodness of specific phenomena is less immediately evident. Chains of efficient causes establish the dynamic linkages necessary to sustain spatial and temporal continuity throughout the cosmos.

This tension highlights a significant and contentious issue in Aristotle's

[8] For detailed discussion of these critical passages, see chapter 3.

philosophy: the achievability of a unified account of the universe, one that adequately explains its spatial and temporal continuity. The possibility of such an account depends on reconciling the teleological primacy of the final cause with the operational significance of efficient causation. This thesis investigates this question by highlighting the critical role of efficient causation in Aristotle's natural philosophy, focusing particularly on the function of efficient causal chains. Efficient causes, in Aristotle's framework, directly account for the chains of interaction between otherwise disconnected domains of the universe. For example, they help bridge the explanatory gap between the heavenly realm and the sublunary world, which are characterized by fundamentally different natures and modes of operation. The heavenly bodies, governed by eternal and unchanging circular motion, do not interact directly with the mutable, perishable entities in the sublunary realm. Yet, through efficient causation—such as the influence of celestial movements on terrestrial phenomena like the changing seasons—Aristotle establishes a causal link that integrates these distinct regions of the cosmos. This approach allows Aristotle to maintain the coherence of his natural philosophy while acknowledging the complexity and diversity of causal relationships that underlie the functioning of the universe. This investigation seeks to demonstrate that Aristotle's use of efficient causes serves as a complement to his teleological framework, thereby ensuring that the cosmos is intelligible as a unified and interconnected whole.

While this study acknowledges the foundational importance of all four causes in Aristotle's system, it deliberately focuses on efficient causation, recognizing its distinctive contribution to maintaining the cosmos as a unified and ordered whole. Aristotle's fourfold schema of causation—material, formal, efficient, and final—offers a comprehensive framework for understanding natural phenomena, with each cause playing a unique and indispensable role. Material causes constitute the substratum or matter from which entities are formed, while formal causes define their essential structure and identity. These causes are vital for explaining the composition and essence of natural substances and their capacity for change. However, this study is specifically concerned with the problem of unity in Aristotle's cosmos, particularly the spatial and temporal continuity that binds disparate phenomena into a coherent and intelligible whole. While material and formal causes constitute the essence and composition of individual entities, they do not directly account for the dynamic processes that sustain the

interconnectedness and continuity of the cosmos as a unified system. In this context, efficient causation emerges as a critical explanatory principle, addressing the mechanisms through which distinct phenomena are linked and the integrity of the cosmos is preserved.

In this dissertation, I have deliberately chosen not to focus on material and formal causes, as my primary objective is to examine the relationship between final and efficient causes in Aristotle's philosophy, particularly their role in grounding the unity and continuity of the cosmos. This decision is motivated by the specific nature of my research question and the central argument of this thesis: to examine how efficient causation operates in relation to, or even in contrast with, the teleological framework established by the final cause. A detailed analysis of material and formal causes risks diverting attention from this focus on the complementary relationship between final and efficient causation, thereby exceeding the scope of this study and detracting from its contribution to understanding cosmic unity through these two causes. This decision is a methodological choice aimed at ensuring clarity and precision in addressing the research question. While this thesis acknowledges the basic significance of material and formal causes within Aristotle's framework, their treatment is confined to a secondary role, emphasizing instead the critical relationship between final and efficient causation as the primary factors in explaining the unity and continuity of the cosmos. By narrowing the focus in this way, the thesis seeks to provide a deeper understanding of how these two causes interact to sustain Aristotle's vision of the universe as a coherent and purposive whole.

Moreover, it is crucial to emphasize that the concept of unity in the context of this dissertation, as informed by Aristotle's philosophy, can be understood as the coherent interconnection of diverse phenomena within the cosmos, achieved through the interplay of causative principles, particularly the final and efficient causes. This unity encompasses several dimensions, each shedding light on the intricate relationships that sustain the cosmos as a unified whole.

The final cause, epitomized by the Unmoved Mover, provides the teleological grounding of the cosmos by functioning as its ultimate end or purpose. This framework establishes a teleological coherence, in the sense that that all natural phenomena are goal-directed and oriented toward the realization of the good. In this sense, unity is both operational and explanatory, reflecting the cosmos's alignment with an overarching purpose, even if this alignment is not always

immediately apparent in every phenomenon.

Another aspect of unity concerns the spatial and temporal continuity of the cosmos. Aristotle's universe is conceived as a coherent whole, wherein all parts and processes are dynamically interconnected. Efficient causal chains play a pivotal role in sustaining this continuity, providing the necessary linkages through which motion and change are transmitted. Even in contexts where the teleological orientation of the final cause is less evident, efficient causes ensure the interconnectedness of phenomena by enabling the processes that maintain the cosmos's coherence.

Additionally, unity arises from the interconnection of causes. While the final cause offers the ultimate rationale for the order of the cosmos, efficient causation operationalizes this order, connecting disparate processes into a cohesive system. This unity is not the result of any single cause operating in isolation but emerges from the interplay of all four causes. Efficient causes, in particular, shape and sustain the material and formal causes while complementing the teleological primacy of the final cause, ensuring the cosmos's dynamic and enduring coherence.

The relationship between teleology and continuity also underscores the nature of unity in Aristotle's philosophy. The final cause ensures the goodness and purpose of the cosmos, while efficient causation guarantees its continuity and coherence, particularly in instances where teleological connections are less directly observable. Unity, therefore, is both static, rooted in an ultimate purpose, and dynamic, manifested through ongoing causal processes. Teleological explanations, grounded in the final cause, and mechanistic explanations, provided by efficient causation, are not mutually exclusive but are reconciled to offer a comprehensive understanding – and thus: a unified explanation – of the cosmos.

Aristotle's universe is not only physically unified but also comprehensible as a coherent system. Efficient causal explanations articulate this dynamic coherence, ensuring that the cosmos can be understood as a continuous and integrated whole, even in cases where teleological frameworks alone might appear insufficient.

In summary, unity in Aristotle's philosophy, as explored in this dissertation, is multi-dimensional. It encompasses (1) the teleological coherence grounded in the final cause, (2) the continuity of the cosmos sustained by efficient causation, (3) the interplay of causes that integrates disparate phenomena, and (on a different level) the intelligibility of the cosmos as a coherent whole.

This study will focus on Aristotle's treatises on natural philosophy to explore how the problem of unity in his universe is addressed. Central to this investigation is the question of whether final causal explanation is confined to living beings or extends to the cosmos as a whole. If there are limits to the explanatory scope of the final cause, to what extent can it serve as a comprehensive principle for the universe as a whole? Furthermore, how can a full explanation of Aristotle's cosmos be ensured, given that final causation alone appears insufficient to account for its entirety? This inquiry also seeks to clarify the specific role of efficient causation in Aristotle's account of cosmic unity. How does Aristotle incorporate efficient causes as complementary explanatory principles, particularly in the light of his recognition of the constraints of final causal explanation? Finally, this study will explore the concept of unity at the foundation of Aristotle's philosophy of nature, focusing on the role of efficient causation in sustaining the continuity and coherence of the cosmos within a teleological framework. By complementing and extending the teleological function of the final cause, efficient causation contributes to a comprehensive understanding of the cosmos as a unified and ordered system.

In this dissertation, I propose a new approach to addressing the problem of a unified explanation of Aristotle's universe by emphasizing the role of efficient causation in ensuring the continuity and coherence of the cosmos within the framework of final causal explanation, as outlined in Aristotle's physical treatises. To achieve this aim, the dissertation is divided into three main parts. In the first part (Chapter 1), I use *Meta Lambda* as a starting point to examine the central role of the final cause in Aristotle's unified explanation of the cosmos. This chapter also explores the precise limits of the final cause's explanatory scope across different domains of the universe. In the second part (Chapter 2), I turn to *Phys* VIII to investigate the specific contribution of efficient causation to the unified explanation of Aristotle's universe. This chapter examines the role of efficient causes in various fields of the cosmos, assessing whether and how they complement final causation in providing a cohesive explanatory framework. Finally, in the third part (Chapter 3), I analyze how Aristotle integrates final and efficient causes to construct a unified explanation of the universe. This chapter explores the relation between these two types of causation, evaluating their combined role in Aristotle's broader philosophical project of explaining the unity of the cosmos.

The sequence of my investigation into the contributions of the final and efficient causes to the unified explanation of Aristotle's universe aligns with Aristotle's own framework for the study of nature, as outlined in the prologue to the *Meteorology:*

> We have previously discussed the (1) the primary causes of nature, and natural change in general; (2) also the stars ordered according to their motion; (3) and the corporeal elements, how many there are and what they are like, and how they change into others; (4) and generation and corruption in general. (5) It remains still to theorize about a part of this inquiry, which all our predecessors called meteorology… (6) Once we have dealt with these things, we will consider whether we are somehow able to give, in accordance with the method indicated, an account of animals and plants, both in general and separately. Once this is discussed, perhaps the whole of what we established at the outset will be complete.[9]
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> *Meteor* I.1, 338a20–339a10 (trans. M. R. Johnson)

In this passage, Aristotle outlines a comprehensive program for the systematic inquiry into the natural world, presenting a sequence of investigations that are distinct yet deeply interconnected. The order of these inquiries reflects Aristotle's structured approach to the study of nature, progressing from the general to the specific and from the universal to the particular. He begins with an examination of the primary causes of nature and natural change in general, establishing the foundational principles of his natural philosophy. This foundational inquiry is followed by the study of the celestial realm, encompassing the stars and their ordered motions, which provides a framework for understanding the larger, immutable structures of the cosmos. Aristotle then shifts to the examination of the corporeal elements—their nature, properties, and the processes by which they transform into one another. This study bridges the immutable celestial sphere and the mutable terrestrial domain, serving as a basis for understanding change and motion within the sublunary world. He continues with an inquiry into meteorological phenomena, focusing on the intermediate region between the Moon and the Earth, where the elements interact dynamically to produce a variety

[9] I discuss the role of final cause and efficient cause following Aristotle's outline of his study of nature, since (1) (2) is the field of cosmology; (3) (4) is the field of the motions of elements; (5) is the field of meteorology; while (6) is the field of biology.

of natural occurrences, such as winds, precipitation, and other atmospheric phenomena. The program culminates in an investigation of the sublunary world, particularly the growth, motion, and behavior of plants and animals. This final stage reflects Aristotle's interest in understanding living beings both in general and in their particular forms, extending his study of natural processes to encompass the principles of life itself. By following this structured progression, Aristotle's natural philosophy moves from abstract, universal principles to the specific, concrete realities of living organisms, illustrating a unified and hierarchical view of the cosmos.

This passage not only provides a recommended order for investigating the natural world but also reveals the interrelations between Aristotle's various natural treatises. His works on cosmology, the motion of the elements, meteorology, and biology are interconnected, forming a coherent framework for understanding the unity of nature. Each domain contributes to the overall picture, with the earlier inquiries providing the foundation for the later ones. For example, the study of celestial motions informs the understanding of the elemental motions, which in turn underpin the phenomena of meteorology and the dynamics of life in the sublunary sphere.

Following this Aristotelian order of inquiry, my analysis reflects the natural progression outlined by Aristotle himself, beginning with the foundational principles of causation and culminating in their application to the study of living beings. By adhering to this sequence, my work not only remains faithful to the Aristotelian method but also emphasizes the interconnectedness of his natural writings, offering a holistic perspective on the unity of nature as understood in Aristotle's philosophy.

Chapter 1 serves as the definition of Aristotle's final causation and efficient causation. I prefer first to examine Aristotle's causal framework and the hierarchical model of explanation in *Physics* II.7. The second step aims to provide a clear definition of Aristotle's concept of the final cause. This investigation begins with a careful examination of his explicit discussions on final causation. Generally speaking, Aristotle is considered terminologically consistent throughout his corpus of natural philosophy when referring to the final cause. [10]

[10] On Aristotle's terminologically consistent use of final causes, see Johnson (2005, 64) and Leunissen (2010a, 4).

The recurring phrase we encounter, which Aristotle employs to denote the final cause, is "that for the sake of which". [11] However, as we will see, Aristotle also uses other formulations of the final cause in his theoretical works. [12] This raises an important question: how are the various notions of the final cause, which Aristotle appears to employ, systematically interrelated in his natural philosophy? Exploring these different formulations of the final cause across Aristotle's treatises can help refine some of the key terms used in this study to discuss his concept of the final cause more precisely.

As for the efficient cause, I aim to provide a definition as derived from Aristotle's treatises on natural philosophy. Aristotle's most characteristic formulation of the efficient cause is found in *Meta* I.3, where he defines it as "where the origin of the motion [comes] from" (984a27–28). [13] Similarly, in *Phys* II.3, the efficient cause is described as "that from which the origin of the change or the staying unchanged comes" (194b29–30). These definitions highlight two key features of Aristotle's notion of the efficient cause: (a) it is identified in directional terms as the source from which motion originates; and (b) it is also the point of origin for change or the persistence of a state.

Chapter 2 seeks to examine whether and how the final cause can serve as an explanation for the entirety of the universe as presented in Aristotle's natural philosophical treatises. This inquiry is framed in light of the critiques by many modern interpreters, who have highlighted the limitations of the final cause's role in certain aspects of the universe. For the sake of clarity, I structure the investigation of final causal explanation into four distinct steps.

From the first step to the fourth step, I focus on examining whether and how Aristotle's concept of the final cause can serve as an explanation across different domains of his universe—specifically in cosmology, the motion of elements, meteorology, and biology.[14] In the first step, I explore the role of the final cause in providing an explanation of Aristotle's universe within the domain of cosmology. My investigation begins with Aristotle's *Meta Lambda*, where the final cause is conceived as a teleological principle applicable to everything in the

[11] E.g., *Phys* II.3; *Meta* I.3; *GA* I.1; *NE* I.1; *Post* II.11.

[12] E.g., 'to the benefit of which'; 'aim of something'. (See detailed discussion in chapter 2.1)

[13] Tuozzo (2014, 23)

[14] In Chapters 2 and 3, the order of the investigation follows the order of Aristotle's investigation of nature: see above.

universe. This perspective suggests that the entire cosmos is effectively unified through the operation of the final cause. Following Aristotle's line of reasoning, I focus on the discussion at the end of *Lambda* 5, which is directly relevant to the exploration of the final cause. Here, I analyze Aristotle's treatment of the relationship between causes and argue why certain causes can be applied universally, while others cannot. Subsequently, I extend my investigation to *Lambda* 6–10, as well as other related treatises, to examine whether and how Aristotle's conception of the final cause—epitomized by the Unmoved Mover[15]—can serve as an explanation for the entire universe. The second step shifts to an analysis of the final cause's contribution to the explanation of Aristotle's universe within the field of the motion of elements. This involves addressing three key points: (a) why some commentators interpret the orientation of each element toward its proper place as an instance of Aristotle's final causal explanation, (b) the limitations of the final cause's role in explaining the motion of sublunary elements, and (c) the constraints on the final cause in accounting for the motion of celestial elements.

In the third step, I examine the role of the final cause in providing an explanation of Aristotle's universe within the field of meteorology, addressing the question of whether final causal explanation can be meaningfully applied to meteorological phenomena. A key component of my argument involves analyzing the well-known example of rainfall, which has been extensively discussed by many interpreters in relation to final causal explanation.

The fourth step investigates the contribution of the final cause to the unified explanation of Aristotle's universe within the realm of biology. This analysis focuses on the extensive use of direct final causal explanation found in Aristotle's biological treatises. It is widely acknowledged that final causal explanation is most effectively and successfully applied in Aristotle's biological works.[16] Given that Aristotle's biological works are grounded in the foundational principles laid out in *DA*, it is necessary to begin by examining the presupposition in *DA* that the soul functions as the final cause of living beings. Following this, I turn to Aristotle's biological treatises to investigate his use of final causal explanations in relation to living organisms, their parts, and their movements. First, I will explore

[15] 'Unmoved Mover' also can be called as 'first mover' or 'primary mover' in Aristotle.

[16] See Nussbaum (1978, 101–106).

whether the final cause, epitomized by the soul of a living being, can serve as a unified explanation in the field of biology. Next, I will examine Aristotle's attempt to establish a unified explanation in his biological works, with the soul as the organizing final cause. Finally, although the application of final causal explanation in biology is widely regarded as the most successful expression of Aristotle's concept of the final cause, certain exceptional cases within this domain resist explanation through final causation alone. I will analyze these special cases and critically assess the limitations of the final cause in Aristotle's biological framework.

In Chapter 3, I examine the role of Aristotle's efficient cause across different domains of the universe to assess whether and how efficient causes contribute to the unified explanation of Aristotle's cosmos. My interpretation suggests that Aristotle implicitly recognized the limitations of final causes in accounting for universal unity. In addition, efficient causal principles are necessary to ensure the continuity and coherence of the cosmos within a teleological framework. In this chapter, I aim to examine whether and how Aristotle's efficient cause can provide a unified explanation of the whole universe across various domains of his natural philosophy—namely, cosmology, the motion of elements, meteorology, and biology.

First, I explore the role of the efficient cause in the unified explanation of Aristotle's universe within the field of cosmology, using *Phys* VIII as the starting point. In this treatise, Aristotle describes the Unmoved Mover operating as an efficient cause that unifies all changes and motions in the universe. To analyze the role of efficient causation in this context, I focus on the continuous chains of efficient causation extending from the Unmoved Mover to the heavenly bodies. Given that the Unmoved Mover is also presented as a final cause in *Meta Lambda*[17], I will compare and contrast the causal explanations in *Phys* VIII and *Meta Lambda* to clarify their differences and interconnections.

Second, I investigate the contribution of efficient causation to the unified explanation of Aristotle's universe in the field of the motion of elements. This investigation is divided into two parts: (1) the efficient causal chains that govern the motion of the four sublunary elements and (2) the efficient causal chains linking the motion of the sublunary elements with the motion of aether.

[17] See Chapter 2.2.1 (or: 2.1.1?)

Third, I analyze the role of efficient causation in the unified explanation of the universe within the field of meteorology. Many modern scholars have criticized Aristotle for a perceived disconnection between the celestial and sublunary regions in his cosmology. However, I argue that, in Aristotle's framework, these two regions are directly and closely connected by efficient causal chains. The unified explanation of the universe in meteorology is supported by the continuous operation of efficient causes, which I analyze in two ways: (1) the heat produced by the Sun as an efficient cause of generation and corruption in the sublunary world and (2) the continuous efficient causal chains linking the celestial and sublunary realms within the domain of meteorology.

Fourth, I examine the role of efficient causation in the unified explanation of Aristotle's universe in the field of biology. According to Aristotle, the vital heat produced by the Sun serves as an efficient cause for the reproduction of living beings in the sublunary world, distinct from the ordinary heat generated by the Sun. [18] I will investigate the contribution of this vital heat in detail, focusing first on the role of heavenly bodies as efficient causes in the generation of living things. Subsequently, I will evaluate whether continuous efficient causal chains exist to support a unified explanation of the universe within the biological realm.

Armed with a detailed analysis of the roles of the final and efficient causes in providing a unified explanation of Aristotle's universe across these different domains, I will then turn to address the relation of the final and efficient causes within Aristotle's broader philosophical project.

Chapter 4 examines how the relationship between final and efficient causation establishes Aristotle's unified explanation of the universe. For the sake of clarity, the discussion is divided into four steps. The first step is to explore the relation between final and efficient causation in Aristotle's *Meteor* and *PA*. Here I focus on discussing *Meteor* I.9, IV.11, and IV.12, along with *PA* I.1 and II.9, to explore the relationship between Aristotle's efficient and final causes because these texts provide a comprehensive framework for understanding how these two causal principles interact across different domains of nature. By engaging with these texts,

[18] Aristotle clearly puts forward the concept of 'vital heat', deriving the 'vital heat' from the heat of the Sun for the research in biology and ascribing to it the function of generating living beings. Although Aristotle himself did not explicitly bring forward the concept of 'ordinary heat', his theory of the vital heat produced by the Sun actually implies the distinction between the 'ordinary' heat produced by the Sun and 'vital heat' Compare Longrigg (1975, 213).

I aim to show how efficient and final causes are employed in different yet interconnected ways to account for both the mechanisms and purposes of natural phenomena, highlighting their complementary roles and the scope of teleology in Aristotle's philosophy.

The second step is to analyze the fundamental role of final causation in Aristotle's unified explanation of the cosmos. I will first examine the fundamental role of Aristotle's final cause with respect to the fact that the final cause is always taken as primary within Aristotle's unified explanation of the universe. And then investigate the fundamental role of Aristotle's final cause with respect to the fact that the continuous efficient causal chains are directed toward the final cause.

The third step is to investigate how efficient causation complements the teleological framework provided by the final cause. I will explore the complementary role of efficient causation in Aristotle's philosophy by ensuring the continuity and coherence of the universe within a teleological framework. In order to show that, by integrating efficient causation into the teleological framework of final causation, Aristotle achieves a comprehensive understanding of the natural world, balancing purpose and process in a harmonious whole.

The fourth step is to explore the commensurability and non-competition between final and efficient causation. The commensurability and non-competition between Aristotle's final and efficient causation are fundamental to understanding how efficient causation ensures the continuity and coherence of the universe within his teleological framework. Efficient causation explains the how of phenomena, offering an account of the processes or mechanisms that bring change into being, while final causation explains the why, providing the ultimate purpose or goal (telos) toward which these processes are directed. Here I will focus on examining how the relation between final and efficient causation ensures Aristotle's unified explanation of the universe.