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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Chapter 1: Aristotle's Definition of Final Cause and Efficient Cause

In Aristotle's philosophy, final causation and efficient causation are not isolated concepts but are deeply related within his broader teleological framework. A thorough understanding of the role of efficient causation in ensuring the continuity and coherence of the universe requires a careful examination of both efficient and final causation. This dual focus is necessary because Aristotle's causal system operates holistically, with each type of cause contributing to an integrated explanation of natural phenomena.

The clarification of Aristotle's definition of final causation is essential for several reasons. First, final causation represents the ultimate purpose or end (telos) toward which all efficient causal processes are directed. In Aristotle's teleological framework, efficient causes are not random or purposeless; they act for the sake of a specific end. For example, the efficient cause of a house—the activity of the builder—makes sense only in relation to the final cause, which is the purpose of the house as a place of shelter. Clarifying the definition of final causation will help to articulate the teleological orientation that underpins Aristotle's understanding of natural processes and the universe as a whole. This clarification is indispensable to avoid a fragmented interpretation of efficient causation, ensuring that its role is fully contextualized within Aristotle's system.

Equally important is the need to clarify Aristotle's definition of efficient causation. While efficient causation is often understood as the source or agent of change, Aristotle's treatment of this concept is nuanced and extends beyond mere mechanical causality. For Aristotle, efficient causation operates not only in the realm of artifacts but also in nature, where it interacts dynamically with material, formal, and final causes. For example, in the case of a tree, the efficient cause is the source of motion or generation that brings about its growth and existence, which is inextricably linked to its material constitution (the seed), its formal cause (its inherent structure), and its final cause (its full maturity as an organism). By elucidating the precise nature of efficient causation, this thesis aims to demonstrate how Aristotle's conception of causality avoids reductionism and provides a coherent account of change and motion in the natural world.

The relation of efficient and final causation is particularly evident in Aristotle's cosmology. For instance, in the case of the Unmoved Mover, the distinction between these two types of causation is seemingly blurred: the Unmoved Mover functions both as the efficient cause of the cosmos, initiating motion, and as the final cause, being the ultimate aim of all motion.[19] Clarifying these definitions is crucial for understanding how Aristotle integrates the continuity of motion with the teleological orientation of the universe, which is the central concern of this thesis.

Therefore, the clarification of both final and efficient causation is indispensable for a comprehensive account of Aristotle's philosophy. Final causation provides the teleological framework that explains why efficient causes operate as they do, while efficient causation accounts for how change and motion occur. By examining these definitions in detail, this thesis seeks to illuminate the relation between these two causes and their joint contribution to a unified account of Aristotle's universe.

1.1 Aristotle's Causal Framework and the Hierarchical Model of Explanation in *Physics* II.7–8

Aristotle's theory of the four causes—material, formal, efficient, and final—establishes a comprehensive explanatory system for natural and artificial processes (*Phys* II.3, 194b23–195a3). These causes function together to provide a full account of why a particular entity or event occurs. The material cause explains what something is made of, the formal cause specifies its defining essence or structure, the efficient cause identifies the agent or mechanism that brings it into being, and the final cause explains its purpose or end (*Phys* II.8, 198b10–198b35). Aristotle's teleological approach is built on the principle that natural entities exhibit intrinsic purposes that guide their development and functions.

However, in *Physics* II.7, Aristotle introduces an apparent problem: how do we reconcile the primacy of the final cause with the existence of events that do

[19] For detailed discussion on this point, see chapter 4.2.

not seem to exhibit purposeful direction, such as chance occurrences (*Phys* II.7, 198a5–198a30)? If final causation is the ultimate principle of explanation in nature, why do some events appear to occur without reference to a goal or purpose? Aristotle resolves this issue by distinguishing between essential causes (which provide necessary explanations) and accidental causes (which arise incidentally and do not have the same explanatory priority (*Phys* II.8, 199b15–199b32). Aristotle argues that both chance and spontaneity are accidental causes rather than fundamental explanatory principles (*Phys* II.7, 197a36–197b15). Unlike the four essential causes, which provide intrinsic explanations for why things occur, chance and spontaneity operate within preexisting causal structures as incidental byproducts of multiple causal interactions. To clarify this point, Aristotle differentiates between spontaneity and chance. Spontaneity refers to natural events that occur without deliberation but still follow an inherent tendency. For example, a stone falling to the ground does so in accordance with its natural motion, but if it happens to hit something upon landing, that result is spontaneous rather than intentional. Chance, on the other hand, is a subcategory of spontaneity that applies specifically to human actions, occurring when a rational agent acts with intention but produces an unintended outcome due to the convergence of independent causal chains (*Phys* II.7, 198a5–198a18).

Crucially, Aristotle maintains that chance events are still causally intelligible. Even though they lack an explicit final cause, they are not uncaused or purely random. Instead, they result from a convergence of efficient causes (*Phys* II.8, 198b10–198b35), meaning that while they lack purposiveness at the level of the specific event, they still fall within the broader structure of causal necessity.

Aristotle's treatment of accidental causation in *Physics* II.7–8 has important implications for his teleology. While he insists that the final cause is the highest explanatory principle in nature, he recognizes that not every event can be directly accounted for in teleological terms (*Phys* II.8, 199a3–199a20). In cases of chance and spontaneity, continuity the interplay of different causal processes takes precedence over the immediate fulfillment of a teleological goal. In other words, while the universe as a whole is directed toward the good, Aristotle acknowledges that when certain processes are impeded or interfered with (ἂν μή τι ἐμποδίζῃ, *Phys* II.8, 199a10–11), their outcomes are best explained by efficient causation rather than final causation. Aristotle's discussion of cause here serves to refine his overall causal model by clarifying that not all events are best explained through

the final cause alone (*Phys* II.8, 199a30–199b10). While the cosmos as a whole exhibits teleological order, Aristotle maintains that the explanation of specific natural phenomena often depends on the interplay between efficient causes and material causes — the latter introducing a dimension of natural necessity (ἐν γὰρ τῇ ὕλῃ τὸ ἀναγκαῖον, *Phys* II.9, 200a14). In certain cases, matter may interfere with the realization of form and purpose, as in the generation of malformed animals (τέρατα), where the formal cause is correct but the material conditions fail to support its proper actualization (GA IV.4, 769b4–12). I will return to this problem in section 1.2.2, "Nature Does Nothing in Vain" and the Limits of Final Cause. This is also particularly evident in his discussion of meteorological phenomena and biological processes, where efficient causes often provide the most immediate and relevant explanation (*Phys* II.9, 200a1–200a20).

However, Aristotle does not treat this as a rejection of teleology. Rather, he introduces a hierarchical model of explanation. Firstly, at the highest level, the cosmos as a whole is teleologically oriented toward the good, as Aristotle suggests in his discussion of nature and motion (*Phys* III.1, 200b10–20). Secondly, at the level of individual natural processes, some phenomena are best explained through a combination of efficient, material, and formal causes, rather than through explicit reference to a final cause (*Phys* II.8, 199b15–199b32). Thirdly, at the level of incidental occurrences, chance and spontaneity arise as byproducts of multiple intersecting causal sequences, yet they remain intelligible within Aristotle's causal system (*Phys* II.6–7, 198a5–198a18).

By integrating chance and spontaneity within his broader framework, Aristotle preserves the intelligibility of nature while allowing for contingency. His treatment of causation thus ensures that his teleological account remains robust without requiring every single occurrence to exhibit explicit purposiveness.

In sum, Aristotle's discussion in *Physics* II.7–8 refines his causal framework by demonstrating that final causation, while primary, does not provide the sole explanatory principle for all natural occurrences. By distinguishing between essential and accidental causes, he accounts for events that appear contingent while preserving the intelligibility of nature within a structured causal hierarchy. His hierarchical model of explanation accommodates different levels of causal explanation: teleological order governs the cosmos as a whole, while efficient and material causes play a dominant role in explaining individual natural processes, and chance and spontaneity emerge as incidental yet intelligible occurrences

within this broader structure. This approach allows Aristotle to reconcile teleology with the presence of seemingly purposeless events, reinforcing the coherence of his explanatory system while acknowledging the complexity of causal interactions in the natural world.

1.2 Aristotle's Definition of the Final Cause

According to the discussion above, in Aristotle's philosophy, the concept of "cause" is multifaceted, and within the notion of the final cause lies a crucial distinction between its role as a motivating principle, object of desire and its explanatory function. The final cause, as exemplified by the Unmoved Mover, does not act in the sense of direct intervention or physical causation. Instead, it is characterized by " actuality," existing as an ultimate object of desire that inspires motion and change without itself undergoing any change or engaging in any specific action. This conception emphasizes the Unmoved Mover's role as a teleological principle that underpins the cosmos' order and unity.

At the explanatory level, appeals to the final cause serve to illuminate the inherent purposefulness and goodness within the cosmos. Such explanations aim to uncover how natural phenomena strive toward what is best, revealing the teleological orientation of nature. For example, the orderly circular movements of the heavenly bodies can be understood as directed toward their highest fulfillment, guided by their wish to be as similar as possible to the final cause. However, not all phenomena lend themselves easily to such teleological explanations. Certain domains, such as meteorology or the irregular behavior of elemental substances, pose interpretative challenges. These phenomena, while still encompassed by Aristotle's framework, resist straightforward accounts of their purpose or alignment with an ultimate good.

Thus, Aristotle's concept of the final cause functions on two complementary levels: as the ultimate motivating principle that provides the cosmos with its order and coherence, and as an explanatory framework that seeks to reveal the purposefulness inherent in natural processes.

This section aims to provide a clarification of Aristotle's notions of the final cause. Scholars have adopted various approaches to elucidate Aristotle's concept

of the final cause, reflecting its complexity and centrality within his philosophy. Leunissen[20] identifies three distinct types of final causation based on Aristotle's *Phys*. First, a final cause can refer to the completed natural substances or artifacts that represent the end results of generative processes. Second, it encompasses the functions performed by parts of substances. Third, it includes the objects of desire that serve as the aims of deliberative actions. Kullmann[21] offers a similar division of final causation, focusing on the relationship between the cause and its end. He explains that when something exists for the sake of another, its orientation toward the end may be inherent in itself, serve the interest of another, or depend on an interaction between the two. Charles[22] emphasizes the goal-oriented nature of Aristotle's final cause, which he defines as the good to be achieved. He further interprets the logical structure of the final cause in terms of hypothetical necessity, highlighting its alignment with the goals inherent in natural processes. Gotthelf[23] argues that the final cause—particularly as it pertains to the development, structure, and functioning of living organisms—is a central tenet of Aristotle's philosophy. He underscores that this concept is empirical in nature, emerging from observations of the natural world rather than being imposed as a presupposition. Furley (2002), taking a broader perspective, examines Aristotle's final cause within the context of the four causes. He explores the interconnections between the final cause and the material, efficient, and formal causes, illuminating the distinctions and relationships among them in Aristotle's framework. These scholarly interpretations collectively highlight the multifaceted nature of Aristotle's final cause and its fundamental role in his explanation of natural phenomena.

In this section, I concentrate on clarifying and refining some of the key terms and concepts I use in discussing Aristotle's final cause. By engaging with these perspectives, I seek to establish a nuanced framework that underscores the role of the final cause within Aristotle's teleological system while situating it in relation to the efficient cause, which forms the central focus of this study.

[20] Leunissen (2010a, 12–13).

[21] Kullmann (1985, 172).

[22] Charles (2012, 2–9).

[23] Gotthelf (1987a, 222–229).

1.2.1 Aristotle's Notions of Final Cause

The various explanations of the 'final cause' (τὸ τέλος, 'end') found in Aristotle's physical treatise are often taken as one homogeneous category. Generally speaking, when referring to Aristotle's final cause, Aristotle is considered to be terminologically consistent throughout his corpus of natural philosophy.[24] The phrase employed by Aristotle for the notion of the final cause, is 'that for the sake of which' (τὸ οὗ ἕνεκα)[25].

I will start with a careful examination of his direct discussion of the final cause in *Phys* II.3, where Aristotle puts forward the doctrine of four causes, which is also one of the essential points of his *Phys*. While Aristotle discusses final causal explanation in a wide range of natural philosophy, this passage contains his key definition:

> And lastly, there is the *end* or purpose, for the sake of which the process is initiated, as when a man takes exercise for the sake of his health. 'Why does he take exercise?' we ask. And the answer 'Because he thinks it good for his health' satisfies us.
>
> *Phys* II.3, 194b32–35 (trans. P. H. Wicksteed and F.M. Cornford)

In this passage, Aristotle introduces the concept of the final cause by emphasizing that there is always something "for the sake of which" a thing exists or an action occurs. This notion, central to Aristotle's teleological framework, identifies the purpose or end that explains why phenomena occur or why entities possess specific features (*Phys* II.3, 195a1–15). Aristotle's discussion in this chapter extends beyond merely introducing the final cause to include a methodological exploration of how to identify and articulate it within causal explanations. By emphasizing causal relevance, Aristotle demonstrates how statements about final causes uncover the true nature of purposeful activity, whether in natural or artificial contexts.

To illustrate the explanatory power of the final cause, Aristotle provides

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

[25] *to hou heneka*: e.g., *Phys* II.3; *Meta* I.3; *GA* I.1; *NE* I.1; *Post* II.11.

several examples that emphasize its role in clarifying the connection between purpose and action. In the example of someone walking (above, *Phys* II.3, 194b33–35), health functions as the final cause of walking, as it provides the rationale for the action. The final cause does not compel an individual to walk indiscriminately; rather, it directs them to walk only under conditions conducive to health. For instance, the final cause governs the manner and timing of walking to ensure it promotes well-being, reflecting its role as a guiding principle that aligns action with its ultimate purpose.

Aristotle further elucidates the nature of final causation with the example of a saw's sharp teeth (*Phys* II.9, 200b5–10). The sharp teeth are explained by their purpose: cutting. The final cause of the teeth is sawing, and their existence and configuration are determined by their utility in achieving this end. Explicitly, the teeth exist "for the sake of" cutting, with their shape and structure adapted to fulfill this purpose. This example illustrates Aristotle's teleological framework, where the functional characteristics of an object are intrinsically linked to its intended goal, offering a clear rationale for its design and features.

In both examples, Aristotle underscores the explanatory primacy of the final cause in accounting for actions, structures, and phenomena. The final cause does not function in isolation but interacts dynamically with other causes, such as the efficient cause, to bring about the realization of an end. For instance, in the case of walking, the efficient cause—the physiological mechanisms enabling motion—operates in service of the final cause, health. Likewise, the efficient cause in crafting a saw's sharp teeth is guided by the final cause, which dictates their purpose and functionality.

These examples illuminate the broader implications of final causation within Aristotle's philosophical system. The final cause not only explains individual phenomena and artifacts but also reveals the teleological organization of the natural world. By identifying the "for the sake of which" in each instance, Aristotle demonstrates how final causation integrates purpose, structure, and activity into a unified explanatory framework. This framework applies across both natural and artificial domains, highlighting the centrality of teleology in Aristotle's philosophy, where the final cause serves as the ultimate principle of explanation.

This reflects his concern with the relationship between structures and functions. The finished house is both the fully realized structure and the final cause

of the craft of house building, while the activity's ultimate purpose—providing shelter—serves as the function and final cause of the finished house. Thus, providing shelter emerges as a function that follows from the presence of the house.[26] This interconnection of structure and function also characterizes Aristotle's treatment of the final cause in his biological works. In *PA* II–IV, Aristotle examines the substances constituting specific organs and their role in performing fundamental life functions. He explains biological examples of final causation in terms of structure and function. For instance, bones exist for the sake of flesh (*PA* II.8, 653b33–37; II.9, 654b28–655a4), serving to support and protect it (structure). Similarly, the liver exists for the sake of concoction (*PA* III.7, 670a28–b17), aiding digestion (function). Aristotle presents a hierarchy of final causation in living organisms. Bones exist for the sake of supporting and protecting flesh, but flesh itself serves a higher purpose. The notion that "bones are for the sake of flesh" suggests two things: bones are necessary prerequisites for the flesh's existence, and the flesh provides a sufficient reason for the existence of bones. In this way, final causes explain the indispensable prerequisites of a thing's function or structure. By linking the concepts of function, structure, and purpose, Aristotle establishes a teleological framework that applies across crafts and biological processes. This demonstrates how final causation integrates disparate elements into a coherent explanatory model, underscoring its centrality in his philosophy.

In *PA*, Aristotle uses the term "for the sake of which" to describe the end of a developmental process in relation to its preceding stages (*PA* I.1, 639b25–30). In this context, the final cause explains the development of an animal: certain types of matter must be present as prerequisites for the animal to exist as the ultimate end. This matter undergoes successive changes, moving step by step toward the end goal—becoming a fully realized animal. The development occurs "for the sake of" this end, which provides both the purpose and explanation for the process. Aristotle employs a similar perspective in *DA*, where he describes the soul as both the cause of motion and change and the "for the sake of which" in the developmental processes of living things. Here, the soul functions as the final cause that organizes and directs the unfolding of life, integrating matter and form

[26] Leunissen (2010a, 12) describes the function performed by artifacts as the second kind of final cause in the second book of the *Phys*.

into a unified living being.[27] In the second book of the *Phys*, Aristotle further elaborates on the final cause as a mode of causation expressed in terms of an "end" [28]. This is exemplified in the process of house building, where the finished house represents the final end of the activity.[29]The end provides a sufficient reason for the preceding stages of construction, while those earlier stages are indispensable prerequisites for achieving the finished structure. Across these discussions, Aristotle underscores that the final cause serves as both the purpose and the organizing principle of a process. It not only explains why a process unfolds as it does but also ties together its stages into a coherent whole. Whether in the development of animals, the activity of living beings, or the crafting of artifacts, the final cause reveals the teleological orientation inherent in Aristotle's explanatory framework, where every stage is directed toward and justified by its ultimate purpose.

Aristotle complicates our understanding of final causation by attributing two distinct meanings to the phrase "for the sake of which" in at least five different passages (*DA* II.4, 415b1–7; 415b19–22; *Phys* II.2, 194a33–36; *Meta* XII.7, 1072b1–5; *EE* VII.15, 1249b14–16). Despite its significance, this distinction has received relatively little attention in the scholarly literature on Aristotle.[30] I argue that clarifying this twofold meaning is essential for a more comprehensive understanding of his concept of final causal explanation. In both *Phys* (*Phys* II.2, 194a33–36) and *Eudemian Ethics* (*EE* VII.15, 1249b14–16), Aristotle briefly mentions that "for the sake of which" has a twofold meaning without elaborating further. However, in *DA* (*DA* II.4, 415b2–3) and *Meta* (*Meta* XII.7, 1072b1–5), he explicitly defines the twofold distinction. According to Aristotle, "that for the sake of which" (τὸ οὗ ἕνεκα) can refer either to "that towards which" (τινος)—the end to be achieved—or to "that for which" (τινι)—the being in whose interest the action or process occurs. This distinction reveals that "for the sake of which" in

[27] See *DA* II.4, 415a23–27; 415b15–21.

[28] 'Again, there is a mode of cause (final cause) in the sense of the end'. (*Phys* II.3, 194b32)

[29] See *Phys* II.9.

[30] See Kullmann (1985, 170–172) and Johnson (2005, 65). Other interpreters tend to disregard this distinction, for example, Gotthelf (1987a, 210) holds that 'the passages which identify or refer to two ways in which 'for the sake of which' is "said", are intended to isolate the sense of "that for the sake of which" which plays a technical role in Aristotle's philosophy from an ordinary use, approximating "beneficiary", and as such are neither intended to nor do shed light on that technical sense'. Hicks (1907, 340) remarked on 415b2 that 'this is of the nature of a footnote' and 'Probably either here or there it is out of place'.

Aristotle's framework encompasses two key ideas: purpose and beneficiary. Purpose refers to the goal or end of an action or process, while beneficiary denotes the entity for whose benefit the action is undertaken. By distinguishing between these meanings, we gain a deeper understanding of Aristotle's teleological explanations, as they integrate both ends and interests into his broader causal framework.

1.2.2 "Nature Does Nothing in Vain" and the Limits of Final Cause

By this point, we have examined the various expressions and notions that explicitly invoke the final cause— "that for the sake of which". However, Aristotle's physical treatises also present a broader final causal explanation encapsulated in the principle that "nature does nothing in vain" (τὸ μάτην)[31]. This principle occupies a pivotal role in Aristotle's causal framework, shedding light on the intricate relationship between final and efficient causes and raising important questions about the limitations of final causation in providing a comprehensive explanation of natural phenomena.

The term "in vain" (μάτην) is explicated in *Phys* II.6 (197b22–29), where Aristotle connects it directly to the concept of "that for the sake of which." According to Aristotle, an action or process is considered "in vain" when it occurs without being directed toward any proper telos (goal), rather than merely failing to achieve its intended outcome. While artificial activities, such as an aimless walk, may lack a determinate purpose, natural processes do not occur arbitrarily. Even when they fail to fully realize their end—such as an acorn failing to develop into an oak tree—this does not undermine the teleological structure of nature. Instead, such failures are exceptions within an ordered system where natural entities are intrinsically oriented toward their characteristic ends. For instance, walking aimlessly, with no purpose—neither to aid digestion, nor to reach a destination, nor for any other end—can be described as"in vain". However, if one walks with the goal of aiding digestion but this effect does not follow, the action is not strictly "in vain" in the Aristotelian sense, since it remains oriented toward an intelligible

[31] See *DA* III.12, 434a31–32; *Cael* II.11, 291b12–13; *PA* V.8, 788b20–22.

purpose, even if unsuccessful. Aristotle's assertion that nature "does nothing in vain" does not imply that every natural process invariably attains its intended outcome; rather, it affirms that natural processes are never arbitrary. Even when they fail to fully realize their ends—such as in the case of malformed animals—this does not undermine the teleological structure of nature, but instead reflects the inherent limitations and contingencies within natural development. Aristotle elaborates that the term expresses a teleological relationship between activities, presupposing an inherent expectation that one action will ordinarily lead to another within a purposeful framework. Importantly, Aristotle emphasizes that the notion of "in vain" cannot be applied to unrelated phenomena. For example, it would be absurd to claim that "washing is in vain because the sun is not eclipsed" (*Phys* II.6, 197b27). This clarification underscores that "in vain" presupposes a meaningful teleological connection and reinforces its close association with the concept of "that for the sake of which."

Building on this foundation, Aristotle derives the broader principle that "nature does nothing in vain," meaning that "everything in nature is for the sake of something" (*DA* III.12, 434a31–32). This principle encapsulates Aristotle's teleological outlook, asserting that natural processes are inherently purposeful. However, as Lennox points out, Aristotle does not apply this principle in a vague or universal manner. Rather, he employs it in a specific and methodological way — to explain particular phenomena that require teleological clarification, such as the structure of animal organs or the arrangement of natural processes.[32] In Aristotle's scientific practice, this principle guides the formation of hypotheses based on empirical observation: since nature does nothing in vain, we should expect that any regular feature or structure we observe must exist for some purpose. For example, in Generation of Animals (*GA* V.8, 788b20–22), Aristotle argues that nature never fails nor produces anything without purpose, so far as it is possible given the conditions of each case. This methodological use of final causation also implies that final causes operate in coordination with other causes, particularly material and efficient causes.

The interconnection of final and efficient causes is evident in Aristotle's framework. While final causes provide the rationale behind why something exists or occurs— "that for the sake of which"—efficient causes explain the mechanisms

[32] Lennox (2001a, 210–220).

that bring about these ends. For example, the celestial movements are themselves directed by a final cause, namely, the stars' desire to imitate the unmoved mover through eternal circular motion (*Phys* II.8, 198b10–13). These celestial motions, in turn, produce regular physical effects on the sublunary world — such as the orderly progression of the seasons — which serve the teleological purpose of sustaining life on Earth. In this way, while celestial motion originates from final causation, the resulting natural processes on Earth unfold through efficient causation, ensuring the coherence of the cosmos. In this way, efficient causes serve as the dynamic processes that actualize the purposes outlined by final causation.

Aristotle's principle "nature does nothing in vain" also raises critical questions about the limits of final causation. While teleological explanations are fundamental to his philosophy, Aristotle acknowledges that their applicability may not be universal. In domains such as meteorology or inanimate motion, final causes may be less apparent or entirely absent. Instead, material and efficient causes may take precedence in explaining phenomena. This flexibility in Aristotle's causal framework reflects his recognition of the diversity of natural phenomena and the necessity of adapting explanations to their specific contexts.

Frede argues that the concept of μάτην (in vain) is closely tied to Aristotle's teleological framework, as it helps illuminate the conditions under which final causation is properly invoked.[33] According to Frede, Aristotle's notion of μάτην is not limited to the failure of achieving an intended goal; rather, it designates cases where actions or processes occur without any proper reference to a telos at all. This reading highlights that, for Aristotle, acting μάτην is not merely about failing to reach a purpose, but about lacking purposive direction altogether. Nevertheless, Frede does not suggest that such cases are typical within nature. On the contrary, the very point of Aristotle's teleological framework is to show that natural processes — by their essential nature — tend to be directed towards ends. Apparent cases of μάτην are exceptional and typically signal some defect, disorder, or external interference. They do not undermine the general teleological structure of the natural world, but rather presuppose it. Moreover, Frede also highlights the importance of efficient and material causes in cases where teleological connections are tenuous, suggesting that Aristotle's system is both hierarchical and context-sensitive. Hankinson similarly notes that while teleological

[33] Frede (1987c, 125–150).

explanations dominate Aristotle's account of natural processes, the reliance on efficient causation ensures the explanatory system remains grounded in observable mechanisms.[34]

Aristotle's emphasis on the interconnectedness of causes is most apparent in his assertion that "there are many causes of the same thing" (*Phys* II.7, 198a24–26). This statement illustrates that the four causes—material, formal, efficient, and final—are not isolated explanatory categories but are interwoven within a unified framework. The final cause provides the overarching purpose, the formal cause defines the essence, the material cause offers the substrate, and the efficient cause brings the phenomenon into being or sustains its existence. Together, these causes create a comprehensive explanatory system that balances teleological principles with the practical realities of natural processes.

The principle "nature does nothing in vain" emerges not merely as a statement of teleological optimism but as a cornerstone of Aristotle's causal philosophy. It encapsulates the relation between final and efficient causes, illustrating how these types of causation collectively sustain the unity, continuity, and coherence of the cosmos. Moreover, this principle serves as a lens through which to evaluate the limits of teleology and the extent to which final causation functions as a unifying principle across diverse fields, including cosmology, meteorology, and biology.

1.3 Aristotle's Definition of Efficient Cause

This section aims to provide a clarification of Aristotle's definition of the efficient cause.[35] A variety of Aristotle's explanations of the 'efficient cause' (τὸ ποιητικόν) can be found throughout his treatises of natural philosophy. Generally speaking, when referring to Aristotle's efficient cause, the most characteristic formulation is from *Meta*:

[34] Hankinson (1998, 132–153).

[35] The definition of Aristotle's efficient cause is generally considered to be 'whence there is a first beginning of change or rest', based on Aristotle's definitions in *Meta* and *Phys* (see Suárez (1994, 17.1.1–2), Huismann (2022, 663–664) and Tuozzo (2014, 25–26)). In this part, I shall carefully examine the definitions of Aristotle's efficient cause in these two treatises, as well as in his other natural philosophical treatises.

> And to seek this is to seek the second cause, as we should say, —that from which comes the beginning of movement.
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> *Meta* I.1, 984a27–28 (trans. W. D. Ross)

The definition 'that from which comes the origin of the motion (or change)' highlights two features of Aristotle's notion of the efficient cause[36]. On the one hand, the efficient cause is defined in directional terms: it is '*where*' the change or motion originates. This shows its feature of direction and means that the efficient cause directly explains the source of the change or motion and shows the chains of interaction where the change or motion happens. On the other hand, the efficient cause is also where the '*beginning*' of the change comes from. This shows its feature of origin and means that the efficient cause directly explains the origins of the change or motion and shows the causal chains of the change or motion. Thus, Aristotle's definition of the efficient cause in *Meta* clearly manifests the features of direction and origin. Similarly, in *Phys*, Aristotle defines the efficient cause as:

> Again, the primary source of the change or rest.
>
> *Phys* II.3, 194b29–30 (trans. R. P. Hardie and R. K. Gaye)

This definition shows these two features of efficient cause in *Meta*, and shows that efficient causes can directly explain where the source of motion or rest originates. Aristotle also provides some cases to explain the efficient cause, for instance, the father is the efficient cause of a child. Similarly, in *Phys*, Aristotle elsewhere defines the efficient cause as the cause where the motion comes from (*Phys* II.3, 195a8–9), which also shows the role of efficient cause as the source of motion or change, and he illustrates hard work as the efficient cause of fitness. Moreover, the efficient cause is described as 'the primary moving cause' (*Phys* II.7, 198a33–35), since the efficient cause is the primary moving cause to explain change and motion, and in terms of coming to be, the efficient cause is the main cause to investigate, for instance, 'what comes to be after what?' and 'what was the primary agent or patient?' And so, in this way, each step of the efficient causal series can be studied. In addition, Aristotle also has some similar definitions of the efficient cause in his other natural philosophical treatises. In *DA*, Aristotle defines the efficient cause as 'the first thing from which the local movement arises' (*DA* II.4,

[36] See Tuozzo (2014, 25) on the two features of Aristotle's efficient cause in *Meta* I.1, 984a27–28.

415b21–22), when he considers the soul to be the efficient cause[37] of living things as the original source of locomotion[38].

Furthermore, with respect to such definitions, the efficient cause directly explains the causal chains of the motion, and it seems that the definition of efficient cause is closely related to Aristotle's concept of motion. The term 'relative' (τὸ πρός τι) is applied sometimes with reference to excess and defect, sometimes to agent and patient, and generally to what can move and what can be moved (for what can cause movement is relative to what can be moved, and vice versa, *Phys* III.1, 200b31–32). The motion comes from the mover and occurs in the moved, and whatever is in motion is moved by something[39]. Such things will act and be acted on by another thing in many ways: each of them will be capable at the same time of acting and of being acted upon, and thus, what causes motion as an agent can also be moved: when such a thing causes motion, it is itself also moved. The result that everything moved is moved by something enables Aristotle to argue the chains of moved movers concerning their source, and to conceive of 'links' in such chains acting upon the next simultaneously[40].

And Aristotle then argues that all chains of movers that cause another motion must originate from a first cause[41], either something which moves itself, and thereby something else, or something unmoved that moves something else, and that either way, since what moves itself contains an intrinsically moved and an intrinsically unmoved part, all causal chains originate from an intrinsically Unmoved Mover. By supposing the existence of an Unmoved Mover, Aristotle also deals with the complication of infinite regress of the chains of moved movers.

Consequently, it can be seen that Aristotle views the efficient cause as the source or the origin of chains of interaction that operate as efficient causal chains

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[37] For detailed discussion on the soul as efficient cause of living things, see chapter 3.4.

[38] However, the power of locomotion (ἡ κατὰ τόπον κίνησις) is not found in all living things, but change of quality and change of quantity are also due to the soul (*DA* II.4, 415b24–25).

[39] See *Phys* VIII.4. But Aristotle criticizes some people who suppose that every mover can be moved, since he claims that it is possible for a thing to cause motion, though it is itself incapable of being moved (*Phys* III.1, 201a22–27). It can be seen that although Aristotle says that whatever is in motion is moved by something, he posits the existence of a first mover, which causes motion without itself being moved. For detailed discussion, see chapter 3.1.1.

[40] On 'links' of moved movers in Aristotle, see Blyth (2015, 103–105).

[41] Aristotle deals with the complication of infinite regress of moved movers by supposing that all chains of movers that cause another motion must originate from a first cause, which is an Unmoved Mover.

in the universe.

In order to investigate the role of final causation and efficient causation in Aristotle's unified explanation of the universe, it is then necessary to survey the role of the final cause and efficient cause to a unified explanation in different fields of the universe, namely, in cosmology, in the motion of elements, in meteorology and in biology.