

# Francis Bacon Final Paper

杨润康

2022533080

## Question:

*Summarize Francis Bacon's attack on Aristotle's physics. What do you think is Bacon's strength and weakness when he attacks the traditional sciences?*

## Answer:

Francis Bacon's famous work, "Novum Organum," presented a comprehensive critique of Aristotelian physics. To understand Bacon's critique, it is essential to consider the intellectual atmosphere of the Renaissance era. Aristotle's impact on medieval scholasticism was significant, as his writings served as the foundation for both scientific and philosophical thinking. The prevailing scientific perspective during this time was heavily influenced by Aristotle's physics, which relied on deductive reasoning and a teleological interpretation of nature. This perspective dominated the scientific landscape.<sup>i</sup> However, the Renaissance, characterized by a revived interest in classical knowledge and a passion for exploration and discovery, initiated a reevaluation of these long-standing principles.

Francis Bacon's "Novum Organum" directly challenged the Aristotelian approach. His critique was not merely an opposition to Aristotle's specific theories but a broader condemnation of the methodological approach to science. Bacon argued that the reliance on deductive reasoning, syllogisms, and speculative philosophy led to a superficial understanding of the natural world, devoid of practical application. He accused Aristotelian physics of being excessively theoretical, failing to produce tangible scientific advancements.

The cornerstone of Bacon's critique was his advocacy for empirical observation and inductive reasoning. Bacon posited that true knowledge of the natural world could only be attained through a systematic collection of data and observations, followed by careful generalization. This method contrast to Aristotle's deductive approach, which began with assumed principles and applied them to specific cases. Bacon argued that this new method would lead to a more profound and practical understanding of the natural world.

Bacon's methodological innovations included his emphasis on experimentation and the systematic elimination of false hypotheses. Unlike Aristotle, who often relied on abstract reasoning, Bacon advocated for a hands-on approach, where experimentation played a crucial role in verifying or refuting scientific theories. Bacon argued that general principles should be derived from specific observations, a process that ensures that scientific theories are closely aligned with empirical data. This approach was revolutionary, as it allowed for the formulation of hypotheses that could be tested and refined over time. His approach fostered an environment of intellectual curiosity and skepticism, crucial for scientific progress. By freeing science from the shackles of tradition, Bacon paved the way for innovative thinking and new discoveries. His focus on practical application was a departure from Aristotle's theoretical approach. Bacon's vision of science was not just an intellectual exercise but a tool for solving real-world problems, which significantly influenced the direction of scientific research. His critique of Aristotle's physics was grounded in his rejection of deductive reasoning and speculative philosophy, advocating instead for a methodological shift towards empirical observation and inductive reasoning.<sup>ii</sup> His challenge to the Aristotelian approach represented a radical difference from traditional sciences, introducing concepts and methodologies that would become central to the scientific revolution.

Bacon's critique of Aristotle had far-reaching implications for the development of the scientific method. By advocating for empirical observation and inductive reasoning, Bacon fundamentally transformed how scientific research was conducted. His approach encouraged a more dynamic interaction with the natural world, where hypotheses could be developed, tested, and

refined based on empirical evidence. Bacon's methodologies laid the groundwork for modern scientific disciplines. His focus on experimentation and observation became central principle of the scientific revolution, influencing generations of scientists. The method of systematic experimentation and observation is a cornerstone of fields ranging from physics to biology. Apart from that, his work fostered an environment of skepticism and critical inquiry, essential for scientific progress.<sup>iii</sup> He challenged the unquestioned acceptance of traditional doctrines, urging scientists to verify and validate their findings through experimentation. This attitude of questioning and testing is a distinctive feature of contemporary scientific investigation.

In his groundbreaking approach to scientific inquiry, Francis Bacon made substantial contributions, especially in advocating for a more empirical methodology that emphasized observation and experimentation. This approach marked a significant departure from the heavily deductive and speculative methods predominant in his time, particularly those rooted in Aristotelian philosophy. However, in this pursuit of a more hands-on, practical form of knowledge, Bacon inadvertently overlooked some key aspects of scientific inquiry. Bacon's critique of Aristotelian methods led to an underestimation of the importance of theoretical frameworks within the scientific process. While empirical data and observation are undeniably crucial in understanding the natural world, theoretical models play an equally vital role. These models help make sense of the data collected as well as understanding and interpreting complex phenomena. In the modern scientific landscape, the interplay between theory and experiment is fundamental, with each influencing and refining the other. This balance between empirical evidence and theoretical understanding, which was not fully developed in Bacon's methodology, is now seen as essential in advancing scientific knowledge. Another aspect where Bacon's approach lacked was in his skepticism towards deductive reasoning. His criticism of the over-reliance on deduction in the Aristotelian tradition, while valid, led him to underestimate the value of this reasoning method in science. Deductive reasoning, particularly when used in conjunction with inductive methods, provides a more comprehensive framework for understanding natural phenomena. It helps in formulating hypotheses which can then be tested through empirical methods, thus fostering a cyclical process of hypothesis and verification, theory, and experiment.<sup>iv</sup> Apart from that, Bacon's emphasis on the practical utility of scientific knowledge, while pioneering and beneficial for technological advancements, sometimes overshadowed the intrinsic value of scientific discovery. The pursuit of knowledge for its own sake, a principle upheld by many in the scientific community, was not as pronounced in Bacon's philosophy. This pragmatic approach, though instrumental in driving applications, has the risk of narrowing the scope of scientific exploration to what is immediately utilitarian. It could potentially limit exploration in more abstract, theoretical domains which, while not evidently practical, have often led to significant breakthroughs in understanding and innovation. Another notable limitation in Bacon's methodology was his skepticism of mathematics and its role in comprehending the natural world. Bacon did not fully recognize how crucial mathematical models and theories would become in the future of scientific inquiry. In contemporary science, mathematics is integral, particularly in fields like physics and chemistry, where it aids in formulating and testing hypotheses, especially for phenomena that are not directly observable. His failure to appreciate the role of mathematics was a significant oversight, given its eventual centrality in the advancement of scientific knowledge.

Despite these weaknesses, Bacon's influence on the scientific method was profound. He shifted the focus from speculative reasoning to empirical investigation, a change that has had lasting effects on the scientific community. His methodologies encouraged a more systematic approach to scientific inquiry, emphasizing the importance of observation, experimentation, and the gradual accumulation of knowledge. His critique of Aristotle's physics introduced groundbreaking changes to scientific methodology. His emphasis on empirical observation, inductive reasoning, and practical application represented a significant shift from traditional Aristotelian science. While not without its weaknesses, Bacon's approach laid the foundations for the modern scientific method, fundamentally altering how we approach and understand the natural world.<sup>v</sup>

So we can see that Francis Bacon's critique of Aristotle's physics was not just a criticism of a philosophical approach but a call for a new vision of science. His advocacy for empirical observation and inductive reasoning was a call to break free from the constraints of traditional methodologies. Bacon developed a science that was dynamic, constantly evolving through experimentation and observation, and firmly grounded in the practical realities of the world. While Bacon's method had its limitations, particularly in its neglect of theoretical frameworks and mathematical approaches, its core principles remain integral

to the science. Bacon's lasting impact serves as evidence of the profound influence that arises from challenging established norms and staying dedicated to acquiring knowledge through empirical methods.

---

<sup>i</sup> Elodie Cassan, 'A New Logic: Bacon's Novum Organum', *Perspectives on Science*, 29 (2021), 255–274(p.255).

<sup>ii</sup> Horton, Mary, 'In defence of Francis Bacon: A criticism of the critics of the inductive method', *Studies in History and Philosophy of Science Part A*, 4.3 (1973), p.241.

<sup>iii</sup> Cintas, Pedro, 'Francis Bacon: An Alchemical Odyssey Through the Novum Organum', *Bulletin for the History of Chemistry*, 28.2 (2003), 65-75(p.66).

<sup>iv</sup> Larsen, Robert E., 'The Aristotelianism of Bacon's Novum Organum', *Journal of the History of Ideas*, 23(1962),p.430.

<sup>v</sup> Cushing, James T., "Aristotle and Francis Bacon," in *Philosophical Concepts in Physics: The Historical Relation between Philosophy and Scientific Theories* (Cambridge: Cambridge University Press, 1998), pp.15–28(p.20)