



# THE GENEALOGY OF PHILOSOPHY AS THE FOUNDATION OF SCIENCE: A LITERATURE STUDY ON HISTORY, TERMINOLOGY, AND CLASSIFICATION

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## ABSTRACT

This study investigates the historical and conceptual interconnections between philosophy and science as epistemological foundations. Employing a literature-based approach, it traces how philosophy has not only served as the origin of scientific disciplines but also continues to provide a reflective, critical, and normative framework for their development. The findings suggest that science has never been entirely autonomous; it consistently relies on philosophical assumptions concerning reality, logic, and truth. Comparative insights from Western and Eastern traditions enrich the epistemological discourse, combining rational analysis with holistic perspectives. Case studies on the role of philosophy in research ethics such as the *Nuremberg Code*, Hans Jonas's ethical reflections, and social hermeneutics highlight its enduring relevance in safeguarding science as a humane and responsible endeavor. The study concludes that a comprehensive understanding of science is unattainable without engaging its philosophical genealogy, and that the integration of philosophy and science is indispensable for building knowledge that is value-conscious, reflective, and sustainable.

**Keywords:** Islamic Philosophy of Science, Epistemology, Philosophical Genealogy, Scientific Method, Science and Values

## ABSTRAK

*Penelitian ini menelaah keterhubungan historis dan konseptual antara filsafat dan ilmu pengetahuan melalui pendekatan genealogis. Dengan metode studi pustaka, penelitian ini menelusuri bagaimana filsafat berperan sebagai fondasi epistemologis yang tidak hanya melahirkan disiplin ilmu, tetapi juga terus membentuk kerangka reflektif, kritis, dan normatif dalam perkembangannya. Temuan utama menunjukkan bahwa ilmu tidak pernah sepenuhnya otonom; ia selalu bersandar pada asumsi filosofis tentang realitas, logika, dan kebenaran. Perbandingan antara tradisi Barat dan Timur membuka perspektif epistemologis yang lebih komprehensif, menggabungkan rasionalitas analitis dengan pendekatan holistik. Studi kasus tentang filsafat dalam etika penelitian seperti Nuremberg Code, pemikiran Hans Jonas, dan hermeneutika sosial menunjukkan relevansi kontemporer filsafat dalam menjaga ilmu tetap manusiawi dan bertanggung jawab. Kesimpulan penelitian menegaskan bahwa integrasi filsafat dan ilmu merupakan prasyarat bagi pengembangan pengetahuan yang bernilai, reflektif, dan berkelanjutan.*

**Kata Kunci:** Filsafat Ilmu Islam, Epistemologi, Geneologi Filsafat, Metode Ilmiah, Etika dan Riset, Ilmu dan Nilai





## INTRODUCTION

Philosophy, as the root of all branches of knowledge, plays a fundamental role in shaping the rational, systematic, and critical framework that characterizes scientific activity. From the pre-Socratic era (Kirk, Raven, & Schofield, 1983) to the modern age, philosophy has not only emerged as a reflective inquiry into reality but has also functioned as the epistemological foundation that underpins the birth of various scientific disciplines. Throughout its historical trajectory, modern science cannot be separated from the contributions of philosophical traditions in the conceptualization of truth, the development of methodology, and the delineation of the ontological boundaries of inquiry.

Although philosophy has long served as the theoretical basis for diverse sciences, holistic studies that explicitly trace the origins of its terminology, the dynamics of its historical development, and the classification of its branches as the foundation of knowledge remain relatively scarce. Most philosophical research tends to be fragmented: some focus on historical elements, others on classification, or merely on the ways philosophy has influenced the evolution of science, without presenting the systematic interrelation of these elements. As a result, the understanding of philosophy as the conceptual framework that sustains the structure of science becomes incomplete. Within the increasingly specialized and pragmatic system of modern science, this fragmentation creates an epistemological gap between science and philosophy. Accordingly, this research focuses on integrating three core elements—terminology, history, and classification of philosophy in order to reconstruct the philosophical foundations of science in a systematic and reflective manner.

This study introduces a new approach in the philosophy of science by applying these three elements as a systemic unity. Its novelty lies in the comprehensive integration of elements that have generally been examined in isolation within the literature. This approach enables the construction of a genealogical map of philosophy that is not only historical but also epistemologically relevant in explaining the conceptual foundations of modern science. Consequently, this research contributes to strengthening reflective and methodological dimensions in the development of knowledge, while fostering closer dialogue between philosophical traditions and contemporary scientific practice. The purpose of this study is to trace and integrate the terminology, history, and classification of philosophy as the epistemological foundation of science. It is expected to enhance conceptual understanding of the relationship between philosophy and science and provide a reflective basis for the development of scientific methodologies grounded in values and ethics.

Based on the identified problems, this research systematically examines the genealogy of philosophy through a literature review approach, emphasizing three central elements: terminology, historical emergence, and the classification of philosophical branches. The study aims to present a comprehensive conceptual map of how philosophy has evolved from early ideas in ancient Greece to the establishment of classificatory frameworks underlying modern scientific structures. This approach not only enriches the field of philosophy of science but also provides a reflective basis for reinforcing epistemology across various disciplines. Although there are studies that address particular aspects such as history or classification, relatively few have explicitly integrated terminology, history, and classification as a unified framework for



developing epistemology. Much existing scholarship tends to situate itself either in historical analysis or in viewing philosophy as an intellectual tradition detached from other sciences.

The increasing body of work addressing this theme, yet overlooking the vital link between philosophy and the development of contemporary scientific methodology, has produced conceptual distortions. These distortions obscure the recognition that philosophy's basic concepts have been the principal drivers for the emergence of scientific disciplines. Moreover, the systematization of philosophical classification as a methodological discourse underpinning modern science has become increasingly difficult to trace due to the narrative discontinuity between the history of ideas and their application in scientific practice. This research seeks to fill this gap by integrating the three elements of philosophy into a unified whole that constitutes the epistemological basis of science.

## **METHOD**

This study employs a qualitative approach with a literature review design, focusing on the genealogy of philosophy as the epistemological foundation of science. A qualitative approach allows for reflective and critical analysis of primary and secondary philosophical texts that serve as theoretical anchors.

The primary sources include the works of philosophers representing historical trajectories and conceptual developments of philosophy as the basis of science. For the classical period, figures such as Plato (1997) and Aristotle (1984) are examined for their contributions to metaphysics and logic as foundational structures of scientific reasoning. Islamic philosophers such as Al-Farabi (1981) and Ibn Sina (1973) are also studied to understand the synthesis of Greek thought with the Islamic rational and systematic tradition. In the modern era, Immanuel Kant (1998) is regarded as a pivotal reference for his reflections on the limits of human knowledge and cognitive structures. Meanwhile, Karl Popper's falsification theory (Popper, 2002) and Thomas Kuhn's concept of paradigms and scientific revolutions (Kuhn, 1962) provide the framework for analyzing the dynamics of scientific methodology. For contemporary contexts, the works of Martha Nussbaum (2000), Peter Singer (2011), and Luciano Floridi (2014) are considered to reflect the challenges philosophy poses to the development of science and technology.

Data collection was conducted through the selection and review of literature obtained from reputable academic databases such as JSTOR, Scopus, and Google Scholar. Data analysis employed a thematic approach by identifying patterns and major themes related to the terminology, history, and classification of philosophy. Theoretical triangulation was conducted by comparing perspectives from different philosophers to enrich interpretation.

The research setting is non-empirical, as it does not involve field observations or human subjects as respondents. The subject of the research is philosophical ideas themselves, in the form of texts, thoughts, and concepts critically analyzed. In this sense, the "location" of the research can be understood as the intellectual and discursive domain of the philosophical tradition spanning from the classical to the digital era.

With this design and procedure, the study not only provides descriptive contributions but also aims to present a conceptual synthesis relevant for strengthening epistemology across various disciplines. Its ultimate goal is to construct a genealogical map of philosophy that is not



only retrospective but also capable of explaining the future direction of philosophy in relation to science and global contemporary challenges such as artificial intelligence, bioethics, and posthumanism.

## RESULT AND DISCUSSION

### The Concept of Science and Its Philosophical Foundations

Science refers to a system of knowledge acquired through specific methods, primarily observation, experimentation, and logical reasoning. It is systematically organized and aims to explain phenomena in the universe in ways that are testable, verifiable, and replicable. One of the primary characteristics of science is its pursuit of objectivity, predictability, and logical consistency. Science operates by developing hypotheses, testing them experimentally, and subsequently formulating general theories and laws. Yet behind its methodological and seemingly objective character, science cannot be understood as an autonomous system. Rather, it is the outcome of an intellectual process that has, from the outset, been shaped and influenced by philosophical foundations.

The basic assumptions underlying science are in fact philosophical: for instance, the belief that the universe is rational and comprehensible through human reason; that the laws of nature apply universally; and that reality is ordered and governed by causality. These assumptions are not validated by scientific methods themselves but are presupposed as the intellectual framework that makes science possible. A sharp separation between science and philosophy is therefore mistaken, both historically and conceptually. Long before science became a formal institution, early scientists were in fact philosophers such as Thales, Pythagoras, Aristotle (1984), and Ibn al-Haytham (Sabra, 1989) who not only studied nature but also reflected on the methods and purposes of the pursuit of knowledge itself.

Modern knowledge began to develop significantly during the Scientific Revolution of the seventeenth century, marked by contributions from key figures such as Galileo Galilei, Isaac Newton, and Francis Bacon (2000). These figures not only advanced scientific theories but also articulated methodologies of inquiry grounded in logic and experimentation. Francis Bacon (2000), for example, is renowned for his inductive method, which sought to organize knowledge by moving from concrete observations toward broader generalizations. René Descartes (1996), meanwhile, emphasized the importance of deduction and systematic doubt as the basis for reliable thinking. Although their approaches differed, both emerged from philosophical reflection on how humans can attain valid knowledge.

Over time, the sciences underwent specialization and institutionalization, creating the appearance of separation from philosophy. Nevertheless, scientific disciplines have remained deeply entangled with philosophical problems, especially concerning methodology, ethics, and logic. In quantum physics, for example, concepts such as uncertainty, non-locality, and the reality of particles provoke philosophical debates about determinism and objectivity (Heisenberg, 1958; Bohr, 1934). In biology, evolutionary theory (Darwin, 1859) raises profound questions about the origins of life, consciousness, and ethics. Even in computer science and artificial intelligence, philosophical inquiry is indispensable in addressing issues of machine consciousness, autonomy, and the ethical limits of technological innovation (Floridi, 2014).





Science also faces serious challenges regarding the boundaries of its validity, particularly when addressing complex and multidimensional phenomena such as consciousness, social interaction, or moral values. Here philosophy provides a reflective background for assessing the limitations of science and creating space for transdisciplinary approaches. Science is therefore not merely a value-free, objective system of knowledge but part of humanity's broader endeavor to understand the world, always situated within systems of values, cultures, and worldviews.

A comprehensive understanding of science thus requires deep engagement with its philosophical foundations. Without philosophical reflection, science risks falling into reductionism, restricting its vision of reality to quantifiable and measurable aspects while neglecting meaning, values, and the complexity of human existence. Integrating philosophy and science therefore not only reinforces the epistemological basis of scientific knowledge but also makes it more humane, critical, and visionary in addressing today's global challenges.

### **The Foundational Nexus of Philosophy and Science**

Knowledge does not emerge in an intellectual or historical vacuum; rather, it is a continuation of philosophical traditions that preceded it as humanity's earliest systematic attempt to understand the natural world and the self. The relationship between science and philosophy can be analogized to the roots and trunk of a tree: philosophy provides the reflective, methodological, and normative foundations, while science develops into specialized, technical, and applied branches of knowledge. Since antiquity, philosophers have raised fundamental questions that became the groundwork for the emergence of modern scientific disciplines.

One of the earliest examples can be found in Aristotle (1984). As a student of Plato (1997), he not only expanded metaphysical and ethical theories but also articulated the principles of logic, defining it as a form of deductive reasoning that continues to play a vital role across disciplines. In his works *Physics* and *Metaphysics*, Aristotle sought to analyze phenomena of change, movement, and the essence of natural entities—efforts that laid the groundwork for biology and physics. His classification of living organisms became the basis for the development of biological taxonomy.

In the modern era, René Descartes (1996) contributed through his method of systematic doubt. By articulating the principle *cogito ergo sum* ("I think, therefore I am") as a foundation for epistemic certainty, Descartes opened the possibility of a rationalist and skeptical approach. While he did not reject experimentation outright, he emphasized reflective variation in method. Cartesian deductive reasoning long influenced scientists to formulate hypotheses verifiable through systematic and rational inquiry. By contrast, Francis Bacon (2000) advanced inductive processes, introducing empirical experiments leading toward generalization.

Philosophy contributes significantly to meta-scientific questions such as the definition of science, its justification, and the demarcation between science and pseudoscience. These questions are explored within the philosophy of science, a branch that examines the foundations, methods, and rational bases of scientific inquiry. Karl Popper (2002), for instance, proposed falsifiability as a criterion of demarcation, while Thomas Kuhn (1962) emphasized paradigms and scientific revolutions as shaping forces in the non-linear progress of knowledge.

The dependence of science on philosophy remains essential. Philosophy provides guidance, boundaries, and critical scrutiny for scientific fields. It serves as a reflective tool for





examining assumptions, ethical issues, and the aims of inquiry. In rapidly evolving domains such as Artificial Intelligence (AI), philosophy plays a central role. Philosophical discussions about machine consciousness, algorithmic moral responsibility, and the social impact of technological autonomy have become inescapable topics in modern technology ethics (Floridi, 2014; Bostrom, 2014). Philosophy also raises ontological questions such as: Can machines “think”? Can consciousness be replicated algorithmically?

This interaction is equally evident in the ethical dimensions of knowledge. Scientific advances enabling genetic modification, cloning, or neurological manipulation compel philosophy—particularly ethics—to ask fundamental questions about moral appropriateness, consequences, and human dignity (Jonas, 1984). Ethics here functions not merely as regulation but as a reflective framework for grasping the depth of scientific innovation’s impact on human values.

Rather than being understood dichotomously, philosophy and science should be conceived dialogically. Philosophy safeguards values, logical coherence, and critical reflection, while science produces information, technological innovation, and practical solutions. Their interaction gives rise to holistic knowledge that is not only methodologically rigorous but also existentially meaningful. This relationship is especially crucial in today’s era of rapid technological advancement, which generates complex moral and existential dilemmas.

Thus, a comprehensive understanding of scientific knowledge requires more than familiarity with methodologies; it also demands philosophical-reflective competencies that incorporate historical, ethical, and anthropological considerations. The interrelation of science and philosophy reflects two dimensions of the same human endeavor: the quest for a fuller understanding of reality.

### **Philosophical Genealogy and the Evolution of Scientific Rationality**

Philosophical genealogy serves not merely as a historical record of the origins of philosophical ideas but as an intellectual cartography that traces the spiral evolution of modes of inquiry from traditional patterns of thought to systematic reasoning. This genealogy functions as a crucial background in the development of knowledge, where scientific thought did not descend from the sky fully formed but rather emerged as a continuation of philosophical traditions that had already shaped foundational understandings.

Since Aristotle (1984), intellectuals have recognized the profound interrelation between philosophy and science. Aristotle not only formalized deduction as a logical tool for valid reasoning but also meticulously categorized knowledge into distinct domains such as physics (the study of nature), metaphysics (the study of existence), and ethics (the study of action). His system of classification provided a framework that underpinned scientific investigation for centuries. The development of deductive syllogism became a paradigm of logical inference and a model of scholarly discourse well into the modern period.

By the seventeenth century, however, the dominance of deductive methodology was challenged. Francis Bacon (2000) introduced induction as a more empirically grounded alternative. For Bacon, knowledge had to be built upon concrete experience and gradually expanded through sustained observation. This inductive turn laid the foundation for what researchers now recognize as the modern scientific method, rooted in the primacy of empirical



data as the basis for theory. Here, methodological change was not only technically motivated but also philosophically grounded.

Soon after, René Descartes (1996) articulated philosophical skepticism as a primary epistemological principle. His insistence on rational certainty, epitomized in *cogito ergo sum*, became the cornerstone of modern rationalism. Descartes argued that authentic knowledge derives from deduction based on *clarus et distinctus* truths, a methodology that later shaped mathematics and theoretical physics.

In the twentieth century, Karl Popper (2002) proposed the hypothetico-deductive method as a bridge between deduction and induction. Rejecting verification as the standard of science, he replaced it with falsification—the principle that the strength of a scientific theory lies in its susceptibility to refutation. For Popper, scientific progress occurs not through definitive proof but through the systematic correction of error.

From a structural-historical perspective, Thomas Kuhn (1962) advanced the concepts of “paradigm” and “scientific revolution.” In his influential *The Structure of Scientific Revolutions*, Kuhn argued that scientific progress is not linear or cumulative but shaped by radical paradigm shifts. A dominant paradigm may undergo crisis and be replaced by an entirely new framework. Though often read as a history of science, Kuhn’s work is deeply concerned with the theoretical foundations of scientific practice.

The historical evolution of science is thus intrinsically dependent on its philosophical underpinnings. The disputes between rationalism and empiricism, transcendentalism and constructivism, as well as contemporary debates on ethics in science and humanity, all stem from profound philosophical questions. Philosophical traditions remind us that science is not merely an accumulation of facts but a diverse process of cognitive construction.

Understanding this genealogy allows scholars to grasp that science is not autonomous or independent but a continually evolving intellectual pursuit shaped by shifting conceptions of reality and human existence. In this sense, philosophy provides not only theoretical scaffolding but also safeguards science by keeping it open to re-evaluation, reflective critique, and sensitivity to the complexities of an ever-changing reality.

### **Epistemological Comparison between Western and Eastern Philosophical Traditions**

Western and Eastern philosophical traditions have long developed contrasting yet complementary approaches to the pursuit of knowledge and the understanding of reality. While Western philosophy has typically emphasized rationality, logic, and analytic clarity, Eastern philosophy has tended to foreground holism, intuition, and spiritual consciousness. These divergent orientations have shaped not only how truth is conceived but also how scientific inquiry has evolved across history. Although their epistemological frameworks appear distinct, both traditions have contributed significantly to the intellectual foundations of science, albeit through different pathways of inquiry.

The Western tradition, rooted in ancient Greece, established rational analysis as the central tool for understanding the world. Thinkers such as Aristotle (1984) formalized deductive reasoning and introduced systematic classifications of knowledge, laying the groundwork for subsequent scientific inquiry. This orientation reached a turning point with René Descartes (1996), whose dualism drew a sharp boundary between body and mind, subject and object,



reinforcing the notion of knowledge as an objective pursuit independent of the knower. Such a framework, further strengthened by Auguste Comte's positivism (Comte, 1975), positioned science as the study of observable and verifiable phenomena. Precision, replicability, and methodological control became hallmarks of the Western scientific ethos, fueling rapid advances in fields such as physics, chemistry, and modern medicine.

By contrast, Eastern philosophy has traditionally adopted a holistic and integrative mode of understanding that resists the compartmentalization of knowledge into discrete categories. Emerging from traditions such as Hinduism, Buddhism, Confucianism, and Taoism, it views reality as an inseparable unity, where all phenomena are interconnected and cannot be adequately comprehended in isolation (Radhakrishnan & Moore, 1957; Confucius, 1979; Lao Tzu, 1988). Knowledge, in this perspective, is not acquired solely through rational deduction or empirical measurement but also through intuitive insight and heightened states of consciousness. Taoist cosmology, for instance, frames the natural world as a process of harmony and flow that eludes purely analytic approaches, while Indian Ayurveda and Chinese medicine conceive of health not merely as physical well-being but as the balance of body, mind, and spirit. This emphasis on harmony and inner awareness has increasingly influenced Western thought, particularly in the development of transpersonal psychology and mindfulness-based therapies (Kabat-Zinn, 1990).

Although these traditions diverge in method and orientation, their respective contributions to scientific knowledge are indispensable. Western philosophy has endowed science with rigorous methods of observation, experimentation, and logical deduction, providing the backbone of technological and medical progress. Eastern philosophy, though less dominant in the natural sciences, has enriched scientific discourse by offering perspectives that emphasize interconnection, balance, and the ethical dimensions of human life. Contemporary practices that integrate meditation into psychotherapy or apply mindfulness to stress reduction exemplify how Eastern insights can complement the empirical rigor of Western science, particularly in addressing questions of mental health and human flourishing.

In the contemporary global landscape, the interaction between Western and Eastern epistemologies has opened new possibilities for knowledge production. Rather than being seen as mutually exclusive, analytic rationality and holistic spirituality can be synthesized into a more comprehensive framework of inquiry. This synthesis is particularly evident in fields such as neuroscience and psychology, where studies on the effects of meditation demonstrate how ancient Eastern practices can be examined through modern scientific methods without losing their philosophical depth (Goleman & Davidson, 2017). Such integrative approaches suggest that the future of scientific inquiry lies not in privileging one tradition over the other, but in fostering dialogue that broadens the epistemic horizons of both. In this sense, philosophy remains a vital foundation for science, ensuring that the pursuit of knowledge remains open to reinterpretation, ethically grounded, and responsive to the complexities of human existence.

## CONCLUSION

This study has shown that philosophy and science are not autonomous domains but mutually constitutive traditions that continuously shape and enrich one another. Through genealogical analysis, it becomes clear that science is deeply indebted to philosophy, not only





for its conceptual frameworks and methodological principles but also for the ethical orientation that underpins its practices. By situating science within its philosophical genealogy, this research underscores that a comprehensive understanding of scientific knowledge cannot be achieved without acknowledging its philosophical foundations.

The findings further imply that in a world increasingly marked by technological advancement and moral complexity, philosophy retains an indispensable role in guiding the trajectory of science. Far from being a merely historical precursor, philosophy continues to ensure that scientific progress remains value-conscious, humane, and ethically responsible. This genealogical approach thus contributes to ongoing debates in the philosophy of science, opening pathways for future inquiry into how philosophical reflection can sustain a reflective and responsible scientific enterprise in the face of emerging global challenges.

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