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The Contribution of Philosophy to the Advancement of Modern Science

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ABSTRACT
This article discusses the history of the birth of philosophy and its contribution to the development of modern science. The discussion is motivated by the fact that the advancement of science and technology not only requires technical skills, but also a foundation of thought that explains the object of knowledge, how to obtain the truth, and the purpose of using knowledge. The writing uses a qualitative approach with the type of literature research. Data was obtained through the study of philosophy books, history of thought, and Islamic sources that have been used in the paper, then analyzed descriptively-analytically by grouping ideas based on historical developments and their philosophical functions. The results of the study show that philosophy developed from the rational tradition of ancient Greece, gained enrichment through Islamic thought in the Middle Ages, and became one of the important foundations for the formation of modern science. Its contributions include its position as the parent of science, the provider of ontological, epistemological, and axiological foundations, the formation of scientific methods, the strengthening of critical and rational attitudes, the supervision of scientific ethics, and the integration of knowledge holistically. In the context of sharia economics, a philosophical foundation is needed so that the development of science remains rational and open to testing, as well as oriented towards justice, balance, and benefit. This study emphasizes that philosophy is not just a historical heritage, but a reflective device to direct the development of modern science.
Keywords: Axiology; Epistemology; Philosophy of Science; Modern Science; Ontology

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INTRODUCTION

Humans are creatures endowed with reason and curiosity. Since the beginning of their civilization, humans have continued to ask questions about the origin of the universe, the nature of life, human existence, and how to acquire correct knowledge. These fundamental questions encourage the birth of philosophy as a thinking activity that seeks to understand reality in a radical, systematic, and comprehensive way. In the development of the history of knowledge, philosophy then became one of the roots for the growth of various branches of science (Suriasumantri, 2005).

From an Islamic perspective, the use of reason to read and meditate on the signs of Allah's greatness is an important part of scientific activity. The first revelation, as contained in QS. al-'Alaq/96:1–5, commands the activity of reading, while QS. Āli 'Imrān/3:190–191 invites people to pay attention to the creation of the heavens and the earth and to learn from them. This encouragement shows that the activity of thinking and the search for knowledge has an important place in the life of a Muslim. Reason is used to understand reality, while revelation provides an orientation of values and moral guidance.

Modern science has developed rapidly and produced various discoveries and technologies that have changed human lives. These developments are supported by a long process of forming ways of thinking, methods of inquiry, and traditions of testing knowledge. Philosophy plays a role in providing a framework for questioning what is the object of knowledge, how knowledge is obtained, and for what purpose knowledge is used. These three questions are related to ontology, epistemology, and axiology (Bakhtiar, 2012). Without philosophical reflection, science can develop technically, but it loses its orientation regarding its responsibilities and usefulness.

The history of philosophy shows that the development of science does not take place in isolation from the debate of ideas. The ancient Greek tradition introduced a rational explanation of nature. The thought of Socrates, Plato, and Aristotle expanded the discussion of man, knowledge, logic, and ethics. In the later period, Muslim thinkers developed, criticized, and integrated the heritage of Greek philosophy with the intellectual tradition of Islam. Entering the modern era, rationalism, empiricism, and criticism formed the basis for increasingly specialized methods and disciplines (Bertens, 1999; Kartanegara, 2005; Hadiwijono, 1980).

The relevance of philosophy becomes more evident when modern science is confronted with ethical issues. Technological advances, for example, do not in themselves guarantee the achievement of a more just and humane life. The development of technology can raise environmental problems, genetic engineering, artificial intelligence, and exploitative economic practices. Therefore, the advancement of science requires an assessment of its purpose, impact, and limits of use. Philosophy helps provide a space for reflection so that knowledge is judged not only on technical success, but also on moral responsibility.

For the development of Islamic economics, this discussion has a special meaning. Economics has its roots in the tradition of moral philosophy; Adam Smith, for example, was known as a thinker of moral philosophy before his contributions to classical economics (Smith, 1759). Islamic economics also faces the need to combine rational and empirical analysis with the values of revelation. Thus, an understanding of the philosophy of science can help build a scientific framework that is critical, open, and still oriented towards justice and benefit.

Based on this background, this article focuses on two issues. First, how the history of philosophy was born and developed from ancient Greece to modern philosophy, including

the contribution of Islamic civilization. Second, how philosophy contributes to the advancement of modern science. The purpose of this article is to explain the historical development of philosophy and analyze its contribution as a foundation, method, scientific attitude, ethical guidelines, and framework for knowledge integration.

METHODS

This article uses a qualitative approach with the type of library research. This approach was chosen because the discussion is directed to understand the ideas and development of philosophical thought through written sources, not to measure the relationship between variables or collect field data. The sources of study are in the form of books on philosophy of science, history of Western philosophy, Islamic philosophy, integration of science, and works that discuss the development of scientific thought as listed in the bibliography.

Data collection is carried out through the review of documentation of these sources. Relevant information is grouped into two main themes, namely the history of the development of philosophy and the contribution of philosophy to modern science. The analysis is carried out in a descriptive-analytical manner: ideas from library sources are presented, compared based on themes, and then interpreted to explain the relationship between the development of philosophical thought and the formation of modern science. Since this study is literature, the results are a conceptual synthesis of the literature used and are not intended as empirical findings in the field.

RESULTS AND DISCUSSION

Previous Literature Review

The review of the previous literature was conducted to identify the thoughts and concepts that have been developed by previous authors regarding the history of philosophy, philosophy of science, and scientific integration. This review is the basis for compiling a synthesis of the contribution of philosophy to the advancement of modern science. Some relevant literature is presented in Table 1.

Table 1. Mapping of Past Literature Review

No.	Author and Year	Title of Work	Study Focus	Relevance to Research
1	Bertens (1999)	History of Greek Philosophy	The development of Ancient Greek philosophy and the shift of thought from myth to rationality.	Explain the early history of the development of philosophy and the birth of the tradition of rational thinking.
2	Suriasumantri (2005)	Philosophy of Science: A Popular Introduction	The position of philosophy as the basis for the development of various scientific disciplines.	Explains the historical and conceptual relationship between philosophy and modern science.
3	Bakhtiar (2012)	Philosophy of Science	Ontological, epistemological, and axiological foundations in science.	It is the basis for analysis of the scientific foundation and responsibility

				for the use of knowledge.
4	Tafsir (2010)	General Philosophy: Reason and Heart from Thales to Capra	The development of philosophical thought from classical to contemporary times.	Provides an overview of the development of philosophical thought and its influence on science.
5	Kartanegara (2005)	Integration of Science: A Holistic Reconstruction	Inter-disciplinary relations and the integration of science and religion.	It is the basis for discussing the integration of science in an Islamic perspective.
6	Nasution (1973)	Philosophy and Mysticism in Islam	The development of philosophical thought and intellectual traditions in Islamic civilization.	Supporting the discussion of the contribution of Muslim thinkers to the development of philosophy.
7	The Witch (1980)	A History of Western Philosophy 1 and 2	The development of Western philosophy from the classical, medieval, to modern periods.	Explains the changes in philosophical thought and the development of modern rationality.

Source: Processed by the author based on the literature used in the research.

Based on Table 1, the literature reviewed shows that the discussion of philosophy includes several important aspects, namely the history of the development of thought, the philosophical foundation of science, the method of acquiring knowledge, and the relationship between science and religion. Suriasumantri (2005) and Bakhtiar (2012) provide a basis for understanding the position of philosophy in the scientific structure, while Bertens (1999), Tafsir (2010), and Hadiwijono (1980) provide historical perspectives on the development of philosophical thought. Meanwhile, Nasution (1973) and Kartanegara (2005) enrich the discussion through the perspective of Islamic philosophy and scientific integration.

Based on this mapping, this article synthesizes various previous thoughts by focusing on two main aspects, namely the history of the development of philosophy and its contribution to the advancement of modern science. The discussion is also directed to explain the relevance of these philosophical contributions to the development of Islamic economics. Thus, this article does not claim to find new theories, but offers a conceptual synthesis of the literature used.

History of the Development of Philosophy

1. The Development of Ancient Greek Philosophy

Based on a study of the historical literature of philosophy, the development of Ancient Greek philosophy shows a change in human mindset from mythological explanations (mythos) to rational explanations (logos). These changes became one of the important bases for the birth of the tradition of scientific thought. Natural phenomena that were previously explained through myths began to be studied using reason and observation of reality.

This thought can be seen in the ideas of natural philosophers, such as Thales who viewed water as the basic principle of life, Anaximander with the concept of apeiron, and Anaximenes who placed air as the origin of all things. Furthermore, Heraclitus emphasized change as the main character of reality, while Parmenides viewed the essence of existence as fixed. Democritus then developed the idea of atoms as the basic constituent elements of the universe (Bertens, 1999; Russell, 1946).

Literature review also shows that the development of Greek philosophy was not only oriented to natural problems, but began to lead to human problems, knowledge, and social life. Socrates developed the method of dialogue to test the truth of a thought, Plato proposed a theory about the world of ideas, while Aristotle developed logic as the basis for the systematic preparation of reasoning. Aristotle's thought made an important contribution to the development of science because it encouraged a structured process of classification, observation, and reasoning (Tafsir, 2010).

2. Development of Medieval Philosophy and Islamic Civilization

The results of the literature review show that the development of philosophy in the Middle Ages took place through the relationship between the tradition of Greek thought, religious thought, and the intellectual development of Islam. In the Western tradition, philosophical thought is largely directed at trying to understand the relationship between reason and faith. This thought was developed by Augustine and Thomas Aquinas (Hadiwijono, 1980, among others).

In Islamic civilization, the development of philosophy received great attention through the translation and study of Greek philosophical works during the Abbasid period. These activities encouraged the birth of Muslim thinkers, such as Al-Kindi, Al-Farabi, Ibn Sina, and Ibn Rushd. They not only studied previous philosophical thoughts, but also developed thinking based on Islamic intellectual traditions. Meanwhile, Al-Ghazali paid attention to the issue of the relationship between philosophy, religion, and the limits of human reasoning (Nasution, 1973; Kartanegara, 2005).

From the results of the literature comparison, it can be understood that Islamic civilization has a role in maintaining, developing, and continuing scientific traditions. The thoughts of Muslim scientists also contributed to the development of various fields of knowledge, such as medicine, mathematics, astronomy, optics, and chemistry. These works were then translated into Latin and became part of the process of European intellectual development (Kartanegara, 2005).

3. The Development of Modern Philosophy

A study of the history of modern philosophy shows that the development of thought during this period was marked by a growing attention to the ability of human reason and empirical experience as the basis for acquiring knowledge. These changes were related to the development of the Renaissance which encouraged freedom of thought and a critical study of the authority of previous knowledge.

Rene Descartes placed methodical doubt as the first step to obtaining the certainty of knowledge through the expression cogito ergo sum. Meanwhile, Francis Bacon developed an inductive approach by emphasizing the importance of observation and experience. Empirical thought was also developed by John Locke and David Hume who placed experience as an important source of knowledge. Immanuel Kant then sought to explain the relationship between empirical experience and human rational ability in the process of knowledge formation (Hadiwijono, 1980).

Based on this comparison of thought, the development of modern philosophy shows that knowledge is not enough based only on the acceptance of an authority, but needs to

be tested through reasoning and experience. This change became one of the important foundations for the development of the modern scientific method and science.

The Contribution of Philosophy to the Advancement of Modern Science

1. Philosophy as the Foundation of the Development of Science

The results of the literature synthesis show that philosophy provides a conceptual foundation for the development of various disciplines. At the beginning of its development, various problems about nature, humans, and life were discussed in one philosophical framework of thought. Along with the development of knowledge, these fields then developed into more specialized disciplines.

This relationship shows that philosophy has a contribution to forming the basis of thought and the conceptual framework of a science. The development of economics, for example, has a historical connection with the discussion of morality and ethics. Adam Smith through The Theory of Moral Sentiments (1759) shows that economic problems cannot be completely separated from moral considerations in human life.

Thus, philosophy not only plays a role in the history of the birth of science, but also helps explain the assumptions and basis of thought used in the development of a discipline.

2. Philosophy as an Ontological, Epistemological, and Axiological Foundation

The results of the analysis of the philosophical literature of science show that the contribution of philosophy can be explained through three main foundations, namely ontology, epistemology, and axiology. The three have different functions, but they are interrelated in building scientific understanding.

Ontologically, philosophy helps explain the object that is the study of science and the essence of reality being studied. Epistemologically, philosophy discusses the source, method, and validity of knowledge. Meanwhile, axiologically, philosophy examines the value, benefits, and purpose of using science in human life (Bakhtiar, 2012).

These three foundations show that the progress of modern science is not only related to the ability to produce new knowledge, but also concerns the clarity of the object of study, the accuracy of the method, and responsibility for its use. Therefore, philosophy is an important part in evaluating the direction of scientific development.

3. Philosophy as the Basis for the Development of the Scientific Method

Based on the study of the thought of philosophers, it was found that the development of the scientific method is closely related to the development of logic and the philosophy of knowledge. Aristotle contributed through the development of deductive logic, while Francis Bacon emphasized an inductive approach based on observation of facts. Descartes developed methodical doubt as a way of testing the basis of knowledge, while David Hume paid attention to empirical experience.

This development is further strengthened by Karl Popper's thought which emphasizes the principle of falsification, which is that a scientific theory must be open to the possibility of testing and proving its errors. Thomas S. Kuhn through the concept of paradigm explained that the development of science does not always take place in a linear manner, but can undergo changes through paradigm shifts in the scientific community (Popper, 1959; Kuhn, 1962).

From the synthesis of thought, it can be understood that the scientific method is not formed separately from philosophy. Philosophy provides the basis for the process of preparing arguments, testing theories, and evaluating the truth of knowledge.

4. Philosophy in Forming a Critical, Rational, and Open Attitude

The results of the literature review show that philosophy contributes to building a critical and rational attitude towards various problems. Philosophical thinking encourages people not to accept a statement directly, but to examine the basis of argument, the consistency of thought, and the evidence that supports it.

This contribution is important in the development of modern science because knowledge is always open to testing and refinement. A critical attitude allows scientists to evaluate existing theories, while openness encourages acceptance of new evidence and perspectives. In the context of Islam, this attitude is related to the Qur'an's encouragement for humans to use reason and meditate, as reflected in the expressions afala ta'qilun and afala tatafakkarun. QS. Ali Imran verses 190–191 also directs humans to pay attention to the creation of the heavens and the earth and to reflect on the signs of Allah's greatness.

Thus, critical and rational thinking do not contradict Islamic values. Both can be the basis for the development of knowledge that combines analytical acumen with spiritual awareness.

5. Philosophy as the Foundation of Ethics and Responsibility of Science

A review of the literature shows that scientific progress does not always automatically produce benefits for humans. The development of technology, artificial intelligence, genetic engineering, and the exploitation of natural resources shows that there are problems regarding the limits of the use of science and its impact on life.

In this context, philosophy plays a role through the study of axiology and ethics to question the purpose and consequences of the application of science. Science is not only judged based on its ability to generate innovation, but it also needs to consider benefits, risks, justice, and social responsibility.

This perspective is relevant to the development of science in Islam which places the values of justice, balance, and benefit as important considerations. Therefore, the integration between scientific knowledge and ethical considerations is necessary so that the development of science is not only oriented to technical progress, but also to human welfare.

6. Philosophy in Building Scientific Integration

The results of the synthesis of philosophical thought show that the problems of human life often cannot be explained through only one discipline. Economic problems, for example, are related to social, political, cultural, legal, and moral aspects. Therefore, an approach that relies on only one point of view has the potential to produce limited understanding.

The idea of knowledge integration developed by Mulyadhi Kartanegara (2005) pays attention to the importance of building interdisciplinary relationships. This integration allows various fields of knowledge to complement each other in understanding reality more comprehensively.

In the context of modern science, philosophy helps bridge differences in interdisciplinary approaches and assumptions. Thus, scientific integration does not mean eliminating the characteristics of each discipline, but building mutually supportive relationships to produce a more comprehensive understanding.

Based on the overall results of the study, the main contribution of philosophy to the advancement of modern science lies in the formation of the basis of thought, methods of acquiring knowledge, critical attitudes, ethical foundations, and scientific integration. These conceptual findings show that philosophy still has relevance in the development of modern science, including in the development of Islamic economics which requires the integration of scientific rationality, moral values, and Islamic principles.

CONCLUSION

Based on the results of literature research and descriptive-analytical analysis of various literatures, it can be concluded that the development of philosophy has a close relationship with the progress of modern science. The journey of philosophy, which began in the tradition of Ancient Greek thought, developed in the Middle Ages through the contributions of Islamic thinkers, to entering the era of modern philosophy shows that there has been a change in the way humans understand reality, acquire knowledge, and test the truth. These developments have become the basis for the formation of a scientific tradition that is rational, systematic, and open to testing.

The contribution of philosophy to the advancement of modern science is reflected in several main aspects, namely as a conceptual foundation for the development of science, an ontological, epistemological, and axiological basis, as well as the foundation for the development of scientific methods. In addition, philosophy encourages the formation of a critical, rational, and open attitude, provides an ethical foundation in the use of science, and builds interdisciplinary integration. These various contributions show that philosophy not only plays a role in the history of the birth of science, but is also still needed to direct the development of science so that it has a clear basis of thought and goals.

In the context of the development of Islamic economics, philosophical thinking has relevance in integrating scientific rationality with Islamic values. Islamic economics is not only oriented towards achieving efficiency and profit, but also needs to pay attention to justice, balance, ethics, and benefits. Thus, philosophy is an important foundation for developing Islamic economics that is not only academically strong, but also has moral and spiritual responsibilities.

This research is limited to literature studies so that the conclusion is a conceptual synthesis of the analyzed literature. Further research can develop discussions through more specific studies on the application of philosophical foundations in the development of certain disciplines, especially sharia economics.

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