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An Analysis of Aristotle's Principles in Al-Farabi's Study of Logic in the History and Philosophy of Science

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Abstract: The era in which Abū Naṣr al-Fārābī emerged as a canonical scientist significantly contributed to his education and shaped his scientific worldview. The formation of al-Farabi's spiritual worldview and his ideas is directly associated with embracing the ancient philosophical tradition, more precisely, Aristotle's philosophy and logic. The focus of the article is al-Farabi's analysis of Aristotle's principles in the study of logic and their further development. Al-Farabi's worldwide reputation as the Second Teacher after Aristotle, the First Teacher, in the East is directly rooted in his mastery and

advancement of the science of logic. In simple terms, the philosopher states that logic leads a person to a straight path to being capable of radically discerning between good and bad, truth and lies, and honesty and deceit. This, in turn, steers humanity away from succumbing to mistakes or getting into trouble. Al-Farabi constructs a comprehensive scientific analysis of the socio-cultural foundations of Aristotle's doctrine of logic and the ability to adapt it in his unique way to society. The study of the theoretical basis of al-Farabi's teachings on logic and its significance involves employing hermeneutic, comparative, and stylistic methods in the research of the texts.

Keywords: *Al-Farabi, antiquity, Aristotle, civilization, East and West, Greek philosophy, logic, philosophy, Plato, science, society, state, treatises*

Introduction

The legacy of Abū Naṣr al-Fārābī (870–950) covers a wide variety of situations in society and the state and is primarily dedicated to humanity. Throughout his life, he was involved in the service of the general public. His works focused on the individual, the well-being of man, the country, the Earth, the broader world and the universe, and sought to solve long-standing problems that were vigorously contested in many circles. Therefore, his scientific research still continues to be relevant. Al-Farabi's legacy covers numerous branches of philosophy, music, mathematics, logic, astronomy, philology, and natural sciences. Every consideration or opinion expressed by the scholar in his time, upon analysis, touches on some of the accumulated problems of advancing modern society. Over time, Abū Naṣr al-Fārābī's legacy has not diminished, instead, it has matured through the years, signifying that the origins of his work lie in humanism.

It is natural for a nation to consider its past and focus on its future. Therefore, it is our duty to promote the study of the spiritual values of historical figures. The spiritual legacy of the great Eastern philosopher and scientist, Abū Naṣr al-Fārābī, has made an immeasurable contribution to the advancement of global science and civilization.

In his own works, al-Farabi expressed his views on morality, humanity, and friendship of his time, philosophical thoughts, art, and state structures. In particular, in works such as *Principles of the Opinions of the Citizens of the Virtuous*

City, *Treatise on Logic*, *The Political Regime*, and *The Proverbs of the Statesmen*, he substantiates such categories as man and society, leader and subordinate, combining them with philosophical research and formulating his own theory of social structure.

The main goals and objectives set for this article include:

- Exploring the foundations of al-Farabi's views and conclusions on logic;
- Analyzing al-Farabi's perspective on the logical views of Aristotle and other Greek scholars;
- Evaluating al-Farabi's acceptance of Aristotle's logic and justification of his conclusions on some issues;
- Connecting the views of ancient logic with al-Farabi's medieval Muslim worldview;
- Identifying the influence of ancient philosophers on the formation of al-Farabi's Eastern philosophy;
- Observing al-Farabi's contribution to the study of the legacy of ancient philosophers from a thousand years ago to the present time.

The logical continuity of al-Farabi and Aristotle

It is known that Abū Naṣr al-Fārābī wrote commentaries on several works of the Greek thinker Aristotle in the field of philosophy: *Categories*, *Metaphysics*, *De Interpretatione*, *Rhetoric*, *Poetics*, *Prior* and *Posterior Analytics*, *Topics*, *On Sophistical Refutations*, and others (Suleimenov, 2019, p. 147). In doing that, al-Farabi not only listed the gems of thought of the West and the East, but also combined them, introduced the West to the East, and reviewed the most important opinions of his time. The scholarly community, acknowledging his research, later hailed him as "the Second Teacher" and highly praised his merits in science.

Al-Farabi's socio-philosophical, scientific, and cognitive approach can be viewed as a result of the emergence and evolution of medieval philosophical and scientific thought in a specific historical context of Arab Eastern culture, originating in the Near and Middle East. Taking into consideration the period of its existence, it is necessary to pay attention to its interrelated mechanisms, focusing on different cultural traditions (Altayev, 2019, p. 34).

Al-Farabi's reputation as "the Second Teacher," after Aristotle, and "the Father of Islamic philosophy" is directly associated with his mastery and advancement of the study of logic. Recent translations of several works by the famous scholar and philosopher Abū Naṣr al-Fārābī from the Kazakh steppe, from the original version into our native Kazakh language, offer insights into the scholar's main ideas. This article aims to analyze Aristotle's principles through al-Farabi's study of logic, and focuses on al-Farabi's categorization of logic into different branches.

One of the most important doctrines in al-Farabi's works is logic. A comparative analysis of Aristotle's principles in al-Farabi's study of logic aims to reveal the scientific concepts explored by foreign and Kazakh scientists in their research, and to determine that 'logic' stands as the central concept in the thinker's philosophy. In the analysis of the doctrine of Aristotle's and al-Farabi's logic and its theoretical significance, methods of comparative scientific-theoretical research have been used. To understand the logical concepts of Aristotle and al-Farabi, it is necessary to first provide some information about Aristotle.

Aristotle, born in 384 BC in Stagira, Greece, received initial education in philosophy and medicine from his father, Nicomachus, a confidant and friend of the King of Macedonia. At the age of 17, Aristotle joined Plato's Academy, where he studied for twenty years under Plato and other teachers. Satisfied with his achievements in education, Plato bestowed on Aristotle the title of "Reason" of the Academy. Aristotle, having reached maturity, challenged Plato's principles and proposed new ones. There was a rumour that Aristotle opposed Plato, who claimed that there was another path to a certain truth. This is not true. Although he disagreed with Plato's basic tenets, Aristotle said: "I care about Plato and the truth. However, the sacred duty of humanity is to keep truth above all else," from which is derived the saying "Plato is dear to me, but dearer still is truth." (Kubesov, 1971, p. 18)

As a graduate of Plato's school, Aristotle paid special attention to theoretical sciences. Plato says that the world is rooted in a spiritual entity, that is, an idea, while Aristotle says that the source of the world is a material entity, that is, matter. This is where the idealistic and materialist approach comes from.

Summing up the achievements of ancient Greek science, Aristotle substantiates the study of logic. He was the first to examine the laws of human thinking and judgment. Aristotle's logic, as noted by David Dzhokhadze (1975, p. 147), researcher of ancient philosophy, was "the first historical contribution to the dialectical work of the logical form of the human system of thought." We see

Aristotle's logical theories in his works *Categories*, *Prior* and *Posterior Analytics*, *Topics*, and others.

Logic (from Greek *logos*), embodies two aspects: first, the ability to think accurately, that is, logically; and second, the doctrine of identity, similarity, and its negation, consistency, compliance with logic, and methods of cognition. This is a definition of logic from the perspective of generality. Its development across various stages and deep history, its schools and directions, and the views of previous philosophers in this area, pose substantial challenges in themselves. The word 'logic' was first introduced by the Stoics, who founded the school of Stoicism that endured for almost 500 years, with Zeno as its founder, and Aristotle, "the Father of Logic," who was the founder of logic as a science (Nurysheva & Tolentaeva, 2020, p. 54).

Before considering Aristotle's influence on al-Farabi's teachings, the following two factors should be kept in mind: first, the distance between the two thinkers spanning more than a thousand years, and second, the evolutionary path of Aristotle's work during this time through the Peripatetics, Stoics, Skeptics, and Nestorian Christians. It is said that al-Farabi drew on the oral tradition of transmitting Aristotle's legacy from his teachers Yuhanna ibn Haylan and Abu Bishr Matta ibn Yunus, who were representatives of this tradition. This intellectual tradition comes to al-Farabi through the Syrian school, from Alexander of Aphrodisias, Themistius, Porphyry, Ammonius, Philoponus, and Simplicius (Kasymzhanov, 1975, p. 77).

Aristotle held a materialistic view of the world, and so his valuable ideas on materialism were distorted by some medieval religious movements, erroneously attributing even works of Greek idealists to him. In the course of studying Aristotle's legacy, al-Farabi tried to cleanse it from such misconceptions and restore its integrity. Although the thinker's views also showed prevalence of Neoplatonism and Islamic Sufism, he was successful in this task. This is one of al-Farabi's major scientific contributions to the East and the West, as well as to the past and the future (Kubesov, 1971, p. 40).

Al-Farabi studied Aristotle's works from all angles and was also engaged in natural sciences, maximizing the potential of science and the power of human mind in the knowledge of the world. Demonstrating knowledge and art in his efforts to theologically explain science and worldview is one of al-Farabi's greatest contributions to the history of education and culture. He carefully rebuilt the philosophical and logical basis of science, established the order of study and

teaching, tried to identify the subject, and distinguish the content of each of them.

According to Nicholas Rescher, al-Farabi was the first scientist to conduct research in logics among Arabic-speaking scientists. His treatise *Short Commentary on Aristotle's Prior Analytics* is the first work on the issues discussed in *Prior Analytics* (Rescher, 1963, p. 23).

Al-Farabi was not only an expert of Aristotle's works, but also a prolific scientist who wrote several unique scientific works. Only half of his 48 treatises on logic have survived. In the second chapter of al-Farabi's treatise *On the Enumeration of the Sciences*, the following definition of the science of logic is proposed:

> The art of logic provides a set of principles aimed at improving the mind. It guides a person to the right path, to the truth, in all cases of recognizing the objects of the mind that can be mistaken. The mind teaches the principles that protect certain objects from mistakes, omissions, and delusions. It provides principles that can be verified if there is no guarantee that a person is not mistaken in recognizing the object. (Al-Farabi, 2020a, p. 13)

It should be noted that in al-Farabi's works, logical and epistemological issues appear first. Elements of his logical theories are found in all his writings. Al-Farabi's directly logical works include *Preparation or Essay Introducing Logic*, *Categories*, *Dialectics*, *Syllogism*, *Situations of Sophistry*, *Treatise on the Art of Poetry*, and others.

While spiritually profoundly influenced by Aristotle, Al-Farabi was "a deep thinker," a student who did not copy his teacher but was able to critically and creatively master the "accepted teachings" (Burabayev, Ivanov & Kharenko, 1982, p. 4). His legacy extensively reflected and built upon Aristotle's ideas, using them as a starting point for his logical system (Gafurov & Kasymzhanov, 2019, p. 12). He emphasizes that the laws and rules of logic are consciously applied in human thought system.

One of the most important issues raised by al-Farabi in the field of logic is proving the lies and truths, which have a special meaning in the Islamic world picture. In Greek philosophy, Aristotle argued namely that logic was concerned with a wide range of problems: subject and predicate, arguments, counter-arguments, the relationship between proof and falsehood, and other "methods" of epistemology. However, in al-Farabi's time, logic solves a wide range of epistemological problems. There was also a way to connect thought and real life.

Similarly to Aristotle's logic, al-Farabi's systemic logic, as a science that studies ways of thinking, was not only analytical but always aimed to reconcile ideas with objective reality.

Al-Farabi claims: "The purpose of logic is to indicate that the valuation of science is extensive in all situations in which we want to approve of ourselves and convince others, as well as persuade others about us" (Al-Farabi, 2020a, p. 14). He summarizes his thoughts by questioning how we can be confident that we will obtain the truth and not make mistakes when we study something. If "we are not acquainted with logic, why do we affirm that a person is right, how and in what way his assumption is correct, how can his arguments be confirmed, or if a person is wrong, how, in what way he is fallacious what is defective and how his arguments are correct," making it clear that we cannot know what we do not know.

> A good accomplishment of the principles of logic is an indispensable tool in determining the level of people who consider themselves educated. If we are not literate in the science of logic, we cannot evaluate superiority. As a result, we consider them all educated or, conversely, condemn them all or deliberate only one of them superior. In this case, it is a deficiency of a logical argument. When we think of someone as a good person, there is no guarantee that he will not turn out to be a liar. We may unknowingly support a person who is lying and helping someone who is entertaining of us. In the same way, the person we criticize and avoid may, on the contrary, uprise to be good. Here are the pros and cons of not knowing logic. Those who do not want to be limited in their beliefs and opinions to the conjecture, that is, to the assumption of a person who does not trust him, should move to the logic of searching evidence. And whoever desires to rely on speculation in his opinion, allow it remain so. (Al-Farabi, 2020a, p. 17)

In his treatise *On the Enumeration of the Sciences*, al-Farabi states that in order to know the world from a scientific point of view, it must first be through the recognition of substance and accident. Substance is the immutable essence, the content of a thing, it is in motion, in unity, it can be recognized by the mind. Here, substance represents the concept of matter, and accident is a different manifestation of substance. Al-Farabi (2020a) said, "Substance is perceived only by the mind, and accident is the link between the two. The mind knows that behind the color there is something painted, and behind the sound there is something that emits that sound. It's the same with emotions." Al-Farabi's main questions about the relationship between the "first matter"

and the "first form" should be noted. He accepts only the external side of this Aristotle's description but considers form and matter as an inseparable unit: matter cannot be without form, and form cannot be without matter. While Aristotle gives priority to form, al-Farabi indicates the importance of matter. He always emphasizes the place of matter: form always requires matter, "it can only be viable in matter." According to al-Farabi, infinity in the transformation of matter cannot disappear indefinitely, and form is limited in certain body types (Al-Farabi, 1982, pp. 58, 59).

The similarity of al-Farabi's and Aristotle's views on the doctrine of logic resides in the doctrine of syllogism as a deductive concept that was metaphysical.

> For example, in a syllogism, 'all people are mortal, Socrates is a man, therefore Socrates is mortal,' it is not merely that the conclusion is deduced correctly according to the formal laws of logic: Aristotle assumes that the conclusion is verified in reality. He presupposes, therefore, a realist theory of knowledge and for him logic, though an analysis of the forms of thought, is an analysis of the thought that thinks reality, that reproduces it conceptually within itself, and in the true judgment […]." (Copleston, 2003, p. 20)

Aristotle in philosophical science according to al-Farabi: Analysis and development of logic

Syllogistics, founded by Aristotle and developed further by al-Farabi, is considered the classical theory of deductive thought formulation, which is of great importance in developing the principles of systematic teaching. Al-Farabi's treatise *Syllogism* consists of 18 parts that reveal the meaning of syllogism. In his work, the thinker attaches a certain distinction to reasoning, and therefore to reasoning which affirms some conceptual meaning associated with the definition of non-being. According to al-Farabi's understanding, the dialectic of the general and the individual is realized through quantitative and qualitative indicators.

In Chapter 5 of the treatise, having determined the truth and falsehood of the essence of the statements of individual thought, al-Farabi argues:

> both cannot simultaneously be true and false, because if one is true, the other is false, and if one of them, whatever it is, is false, the other is true. Such (a situation) is preserved in all situations and matters, both forms of thought

> statements, as necessary (apodic), impossible or possible (problematic), (even) contradictory to each other. (Al-Farabi, 1975b, p. 251)

In relation to the transcendental concepts in the question of universal ideas, al-Farabi takes a position characteristic of Platonic medieval worldview. First Aristotle, and later al-Farabi, criticized the superficial rather than theoretical definition of deduction by representatives of Platonism, while acknowledging some of their principles.

In the Muslim philosophical system, using the deductive approach as a way to prove truth through syllogism revealed not only the fact of man's connection to the outside world, but also the phenomenal connection of man with the world created by God. These developments in logic were widely used in the modern era, and so the works of René Descartes, Gottfried Wilhelm Leibniz, Immanuel Kant, and other scientists were devoted to the problems of deduction, viewing the deductive approach not only as a method of formal logic, the meaning of which was to formulate a thought, but also as a method of understanding the world.

Al-Farabi's treatises *Preparation, or Essay Introducing Logic*, *Analytics*, *Expressions Used in Logic* are aimed at revealing the essence of the doctrine of logic, method, proof, syllogism, and deduction.

In his treatise *On Sophistical Refutations*, Aristotle states that the representatives of sophistry have a definite goal, of which they name five:

> refutation, fallacy, paradox, solecism, and fifthly to reduce the opponent in the discussion to babbling—i.e. to constrain him to repeat himself a number of times: or it is to produce the appearance of each of these things without the reality. For they choose if possible plainly to refute the other party, or as the second best to show that he is committing some fallacy, or as a third best to lead him into paradox, or fourthly to reduce him to solecism, i.e. to make the answerer, in consequence of the argument, to use an ungrammatical expression; or, as a last resort, to make him repeat himself. (Aristotle, 1978, p. 537)

Thus, Aristotle strongly criticized Sophist perspectives in his works.

Although al-Farabi supports Aristotle's vision of sophistry, he suggests understanding the reason why sophistry is so well-known, determining what its rational essence is, if any. His treatise *Situations of Sophistry* emphasizes the

fallacies and misunderstandings in logic and how to solve them, addressing conflicts, forms, and ways of thinking. Al-Farabi, considering the origin of sophistry, decided to logically justify approaches and techniques that refute Sophist conclusions. In the work, he criticizes the position of Sophists, especially Protagoras, whose statement "Man is the measure of all matter" provided a great opportunity for the hermeneutics of the relativism of human knowledge, used by many Sophists.

Al-Farabi believes that in defining the essence of sophistry lies the discovery of false methods of proof, because they lead to a distorted concept of the object and a distorted way of thinking:

> now let's talk about the methods in which the seeker makes mistakes in relation to the object he is looking for, to show consciousness in the form of false truth and to mislead a person in relation to the object he wants to recognize... When these tricks are known to us, when we consider the things that have been told to us, how to get rid of their influence, or what we have proved ourselves, there is no secret to what is proved by others. (Al-Farabi, 1975a, p. 365)

Sophists dismissed any proof of truth or principle from paralogism, as it is associated with various deviations in logical formulation. Paralogism, or logical errors, are caused by difficulties and ambiguities in logical reasoning. Consciously made logical errors are Sophism, not paralogism. Aristotle was the first to systematize paralogism, which was continued by Al-Farabi, who focused on correcting and systematizing logical errors and widely used the method and technique of refuting Sophism in various teachings of his time. In his treatise *Short Syllogism* (*Logic of the Theologians*), he reveals in more detail the doctrine of logic and expresses its possibilities in gnoseology. Al-Farabi turns to mathematical proofs in the formation of his cognitive theory. Sensing difficulties in proving the existence of universal concepts of sensory and rational cognition, al-Farabi made it possible to perceive concepts like 'circle' and 'triangle' in mathematics and geometry as general concepts, but examples in empirical practice made it easy to understand that we will never encounter a 'common triangle,' or a 'common square.'

In his work *Categories*, an interpretation of Aristotle's *Categories*, al-Farabi reflects on the essence, necessity, and universal commonality of categories. The work relies on logical-metaphysical problems. Continuing the teachings of the Stagirite, al-Farabi argues that logic is not a science that is detached from life,

but serves as a means to understand the essence of objective things through categories. Through these categories, three identical methods of cognitive activity are implemented: thinking about things, learning the laws of thinking and, thus, knowing the world. The logic of Abū Naṣr al-Fārābī, constructed upon such a system, is determined by the tasks of metaphysics.

The ten categories considered by Aristotle, and then by al-Farabi, may be far from what is proposed in the modern dictionary of philosophy: "A category is a general fundamental concept that reflects the essential and legitimate connections and relationships of true being and knowledge" (*Filosofskiy entsiklopedicheskiy slovar*, 1989, p. 254), but the first universal understanding and method of its recognition was developed by Aristotle. Its ten categories, defined as of general significance, are the connecting link in the relationship between the world and man in the process of cognitive activity. Some philosophers and researchers have criticized that his definition of 'category' is insufficient. For example, Bertrand Russell has said that in Aristotle, "[t]he only definition offered of the term 'category' is: 'expressions which are in no way composite […]" (Russell, 1945, p. 200), and Valentin Asmus argued: "Due to the lack of consideration of logical and linguistic problems of relations and relationships of category, the categories found by Aristotle are neither being nor knowledge, nor the category of language" (Asmus, 1976, p. 352).

In addition, depending on the number of categories, Asmus, based on Aristotle's other treatises on 'categories,' states that they vary from ten to six, sometimes up to four: "But they mention only ten in *Categories*, and eight or six or even four in other works. In terms of composition, Aristotle does not give a final conclusion: 'In metaphysics, after the category of place, the category of action is indicated as a category, which has not been mentioned anywhere before.'"(Asmus, 1976, p. 352) Before criticizing Aristotle, it is necessary to mention four factors: first, Aristotle's works are not chronologically defined; second, his treatises are not completely up to date; and third, the Stagirite's works may change during translation or due to certain political views. The fourth factor is that in ancient times the sciences were not classified (which started only in the Middle Ages with al-Farabi), the meaning of the categories is intertwined with the philosophical or philological sciences, which should be considered a reflection of the science of that period. Therefore, it is a mistake to draw scientific conclusions only on the basis of the available works.

Al-Farabi, in turn, divides categories in ten: change of substance (value), quantity, quality, relation, time, place, situation, state, action, and change of action. Like

Aristotle, al-Farabi, who understood category as a general property that defines a being, said in his treatises on logic: "All the top rocks are ten" (Al-Farabi, 1975a, p. 58).

In logic, the regularity of the emergence of category is the origin of all essence and substance. His definition of substance leads to an ontological problem about substance.

> A substance does not provide any knowledge about any distributor beyond its essence. There are two kinds of matter with this property: one is the universality of a substance that teaches the essence of its distributors; the other is the individual of this substance, who gives no doctrine of the essence of any transmitter, nothing beyond its essence. (Al-Farabi, 1975a, p. 356)

As for 'quantity,' Al-Farabi (1975a, p. 174) understood that "everything measured by the whole is a quantity, including, for example, a number, a line, a body surface, time, a word, and a sentence." His definition of the quantity of any substance he created was of great importance in the process of scientific knowledge.

Regarding 'quality,' he stated:

> The basis of quality is a form in which it is possible to tell what it is about individuals; for any individual: something that answers the question of what it is. Quality is divided into four intermediate types only as the highest: 1) quality and condition; 2) something called natural properties; 3) involuntary quality and involuntary condition; 4) quality in proportion. (Al-Farabi, 1975a, p. 174)

Categorizing 'quality' into four types, al-Farabi defines the essence of any entity as a unit of quality and quantity.

The category 'relationship' is

> a relationship between two things that can be established by comparing them in this way... The things that give the concept of relation are subject to all other things. They belong to the category of sizes, for example, six and three, six is three, which is taken twice, and three is half of six. They also refer to the category of substance—for example, Zeid and Amr, the bearer of fatherhood and sonhood, or the bearer of this relationship, while one of them is the master and the other is the slave. (Al-Farabi, 1975a)

Relying on Aristotle's doctrine of the four causes of the existence of matter, al-Farabi analyzes the meaning of the category 'relation,' which he claims is a source of communication between objects and phenomena. In revealing the importance of other categories, al-Farabi defines them in dialectical unity. Like Aristotle, al-Farabi explains that 'category' is not just a form of mental understanding or a matrix of understanding: categories are the true form of being in the extraterrestrial world, a bridge between logic and metaphysics (the main subject of his research is substance) (Al-Farabi, 2007, p. 112).

Al-Farabi's treatise *Book of Dialectics*, dedicated to the logical, theoretical-cognitive, and methodological problems of Eastern Peripatetics, leads to the study of nature, universal categorical forms, that is, to the knowledge of generality. Al-Farabi not only accepted these concepts but developed them further. He classifies logic as a category of practical sciences, designating theoretical knowledge as science, and practical knowledge as art, that is, profession. In simple terms, the thinker's conclusion suggests that logic leads a person to a straight path that enables him to radically distinguish between good from bad, truth from lies, and honesty from deceit. This, in turn, contributes to the fact that a person does not succumb to mistakes, does not get into trouble.

As for the improvement of logical thinking in some branches of science, the philosopher argued:

> A person who has mastered judgments and dialectical statements or knows the science of mathematics, for example, a person who has trained in geometry and arithmetic, does not need to learn the principles of logic. After all, these sciences allow a person to test every word, testimony, and opinion. In all science, without errors, it leads to truth, to true knowledge. (Al-Farabi, 2007)

However, this should not lead to the misconception that logic is replaced by these sciences. Al-Farabi elaborates,

> Thus, I would like to say to those who state that "mathematics suppresses logic": for those who master judgments and dialectical pronunciation, it is not necessary to learn grammar, because these sciences are already used to memorize poems and words, improve the language, give a person the opportunity to check whether every word is pronounced correctly or incorrectly. Therefore, dialectical poetics serves as a grammar. (Al-Farabi, 2007)

And continues, "in this regard, if a person needs to follow grammar, then in the above case, he must master logic perfectly." (Al-Farabi, 2007)

Speaking about the essence and benefits of the science of logic, al-Farabi notes that there are natural logical concepts in human existence that correspond to reason. For example, there are obvious things such as "the whole is larger than its part," "blue is different from white," and "the number 4 comes in pairs." And some vague thoughts can lead to erroneous opinions. Therefore, it will also be necessary to prove it. It will require its own rules and regulations. Through such laws, thought is protected from errors. Here, the laws of logic can be compared to the science of grammar in a language. If the grammar of the language had not been preserved, the complex content of thought would have consisted of arbitrary, unjustified, unorthodox sets of words. Therefore, society always needs people who can transfer the ability of thought from theory to practice, which is difficult for a person who does not have a logical thinking system to talk, discuss, and draw conclusions on a particular topic. (Al-Farabi, 2021, p. 30)

Aristotle, in his ability to correctly express his ideas about logic to his contemporaries, provided examples of the words and situations of that time. However, merely translating these examples from the Greek society into the Arab society of al-Farabi's time, a thousand years later, would not be able to fully convey the main idea, so in conveying the main idea, al-Farabi was able to present examples from his time, to allow the reader to grasp it.

> Firstly, we need to explain how syllogism, deduction, and the unknown things we need to know are defined: how many types of syllogism exist, how each of them relates, what they are made of, what rules are followed, and what are the things that Aristotle used in the art of logic. In most of them, it is desirable to have specially formed words originated from words known to the owners of the Arabic language, and to explain these laws, it is necessary to have examples that are understandable to our contemporaries. In his book, Aristotle used sentences made up of simple words in his own language to prove these things and gave examples that were known and widely used by his contemporaries. If the assembly of sentences in the owners of this language was not in the customs of other countries, and the examples known in that era were not known in another, then the examples used by Aristotle to explain the same things would be blurry and incomprehensible to people of our time. Even many people of our time would be close to throwing away their books on logic, considering them useless. (Al-Farabi, 2021, p. 32)

Conclusion

Al-Farabi became a follower of Aristotelian logic, transcending its limitations in apodeicticity, expanding the science of logic, critically mastering the legacy of the Stoics and Epicureans, and developing their rational doctrines. In logic, new scientific terms were introduced, conclusions and principles were systematized. While Aristotle divided the discussion into argumentative (apodeictic), dialectical, and sophistic (heuristic) methods, al-Farabi expanded the number of discussion methods to five, adding rhetorical and poetic methods.

Abū Naṣr al-Fārābī's logic laid the foundation for the logic of modern times, which has become a universal law for generalizing the historical and material world. A new innovation that al-Farabi introduced into the field of logic is the ability of the ancient Greeks to combine the logical system with Islamic principles. His logical treatises, along with Aristotle's works, were recognized in Western countries, reconciling religion and philosophy and earning him the titles "the Second Teacher" and "the Father of Islamic logic."

Owing to research that lasted for about one and a half thousand years, the science of logic became one of the main disciplines in medieval educational system. Al-Farabi's logical system served as a textbook for teaching logic in all educational institutions of the caliphate for several centuries. Great thinkers such as Ibn Rushd, Ibn Sina, Ibn Tufail, Ibn Khaldun, al-Ghazali, and Ibn Arabi studied his treatises. Even today, the *Treatise on Logic* is a real textbook for those who wish to learn the art of thinking.

Al-Farabi's philosophy is a type of Islamic content and form in the category of a new school of thought based on Aristotle's wisdom and Plato's philosophy. According to scholars, it was nourished by Aristotle in logic and natural sciences, by Plato in ethics and politics, and by Plotinus in metaphysics. Again, al-Farabi emphasizes that the visions of Plato and Aristotle are closer to each other than those of other thinkers, and there is no single way to recognize a common reality (Al-Farabi, 2020, p. 9).

As to these two giants of philosophy, al-Farabi said:

> Plato and Aristotle are two geniuses who created philosophy. They laid the beginning and origin of philosophy and completed some of its branches. In individual and in general, in small and important matters, these two are referred to. (Mutanov, 2020, p. 123)

Al-Farabi's contribution to the study of logic, based on his predecessors, can be said to have expanded the Arabic lexicon to such an extent that it encompassed equivalents to all terms present in Aristotle's works. He took unsuccessfully chosen terms from the texts of translators and combined them, created neologisms that were not noticed by translators, but entered the daily life of later philosophers, discarded foreign terms because the peculiarities of the Arabic language made it impossible to read these. In addition, he wrote comments on all the books of the *Organon*, proposed a definition of the basic logical concepts of Aristotle, and made them available for assimilation in the scientific thought of his era. Professor Mark Webb, head of the philosophy department at Texas Technological University, highlighted al-Farabi's significance for Europe as a custodian of classical philosophy. He underscored al-Farabi's and other Islamic thinkers' role in translating Aristotle's texts into Arabic, resurrecting ancient Greek wisdom in Europe. Consequently, medieval Christian philosophers, including Saint Thomas Aquinas, gained access to Aristotle's texts, fostering the development of Christian philosophy. This makes al-Farabi a significant figure shaping both medieval Christian and Islamic philosophy. (Altayev, 2017, p. 12)

Aristotle and al-Farabi did not conceive a comprehensive logical system but created a system that requires further advancement rather than a logical system that requires a conclusive "end."

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