

Islamic Philosophy of Science as Reflected in Prolegomena to Sciences

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In postclassical Islamic history (ca. 1200-1900), there is extensive literature on proper introductions to a discipline which, I suggest, reflects premodern philosophy of science in the Islamic world. This literature can be traced to the prolegomena of commentaries and glosses on handbooks in various disciplines including logic, legal theory, and theology, beginning no later than the thirteenth century.¹ Discussions on the necessity of introducing a discipline emerged from the need to conceptualize the said discipline before getting into its main problems. Thus, a discipline was introduced by defining it, explaining what constitutes its subject matter, and identifying its purpose. These preliminary issues, which may include other topics as we will see below, not only reflected the theory of science that was prevalent at the time, but also provoked further engagements with it.

The dominant theory of science at the time was that each science consisted of three things: (1) subject matter (*mawḍūʿ*), (2) principles (*mabādiʿ*), and (3) inquiries (*masāʾil*). These were known as elements or parts of sciences (*ajzāʾ al-ʿulūm*). Basically, according to this theory, a given science involved positing a subject matter and investigating its conditions or features. These investigations usually were based on prior knowledge or assumptions that were viewed as principles of the science.

This theory was first proposed by Aristotle in his *Posterior Analytics*. In this work, Aristotle theorized about certain or demonstrative knowledge, which was arrived at in the demonstrative sciences. Aristotle classified demonstrative sciences as consisting of what they hypothesize to exist (subject matter), common axioms (principles) that are primitives from which its

demonstrations proceed, and attributes (inquiries).² Aristotle's articulation ultimately became the basis of later theoretical reflections on the nature of science, and remained influential up until the modern period when a new notion of science emerged. During the modern period, while method was considered the criterion of differentiating science from non-science, Aristotelian philosophy centered constitutive elements as the criterion of being a science. In other words, in the Aristotelian approach, which was appropriated in Islamic philosophy, the emphasis was on the nature of a discipline, i.e., its key constituents or elements, rather than the kind of methods it used.

After Aristotelian theory of science was transmitted into Arabic-Islamic civilization with his logical and philosophical corpus during the ninth century, Muslim philosophers adapted and reframed that theory slightly to encompass all disciplines that were considered a science in the Islamic world. In this regard, al-Fārābī (d. 339/950) and Ibn Sīnā's (Avicenna) (d. 428/1037) engagement with Aristotelian scientific theory are noteworthy.³ Although Ibn Sīnā occasionally describes the elements of sciences as a feature of demonstrative sciences (in line with Aristotle), at other times, he describes them as the elements of sciences, without any restriction. I argue that this more inclusive description reflects an adaptation of the theory to reflect realities of that period since by that time, Muslims had already developed bodies of knowledge that constituted the religious sciences. Thus, after the theory of science became prevalent at the hands of Muslim as well as non-Muslim philosophers in the Islamic world, it was taken as a framework for presenting native Islamic disciplines as sciences.

Two religious disciplines, namely Islamic theology (*'ilm al-kalām*) and Islamic legal theory (*uṣūl al-fiqh*), played a key role in the appropriation of the philosophical theory of science and its application to religious disciplines. These disciplines were particularly apt for interdisciplinary engagement with philosophical sciences because of their subject matter, which overlapped with philosophical inquiries. *Kalām* shared many topics with metaphysics, while legal theory included epistemological as well as ethical issues, both of which aspired to prove themselves based on rational argumentation rather than mere reports. Hence, they particularly bear the influence of philosophical theories. Beginning the eleventh century, we can see not only the impact of specific philosophical issues, but also the more general philosophy of science in the way *kalām*

and legal theory were envisioned as sciences. The works of two major scholars in these two fields, namely al-Juwaynī (d. 1085) and al-Ghazālī (d. 1111), reflect this trend.⁴

Disciplines that were deemed to be traditional rather than rational, such as exegesis (*tafsīr*), *ḥadīth*, and positive law (*fiqh*) were also framed according to the dominant theory of science. Eventually, all disciplines that were cultivated in Islamic civilization were presented according to the Aristotelian theory of science as illustrated by treatises on prolegomena of sciences (*muqaddimāt al-‘ulūm*) and ten preliminary beginnings of sciences (*mabādi’ al-‘ulūm al-‘ashara*). These treatises relate and apply the theory behind the preliminary beginnings of sciences to disciplines that were popular in *madrassa* education. Thus, such treatises reflect the idea of a science that is shared by all disciplines. Below are two examples, one from the eighteenth century and the other from the late nineteenth century.

The first treatise is entitled *Muqaddimāt al-‘ulūm (Prolegomena of Sciences)*. Some manuscript copies that I accessed do not clearly indicate the author, while a few of them attribute it to Abū Sa‘īd al-Khādimī (d. 1762).⁵ The *Prolegomena* is a brief treatise that introduces various sciences by mentioning their definition, subject matter, and purpose. However, the author first provides a brief account of the long debated, and by then normalized, theory behind having a proper prolegomenon.⁶

According to this brief account, each student should know the preliminary matters in a science before beginning the objectives or main topics of investigation in the science. In order to illustrate the importance of prolegomena to a science, the author provides an analogy of their relationship as akin to that between ablution and the obligatory prayer for Muslims. As the prayer is invalid without the ablution, similarly, a science cannot be acquired without a proper introduction because an introduction or prolegomenon is the thing upon which beginning a science depends. The author mentions three preliminary topics that precede investigation of the main topics of a science: (1) the quiddity of a science, (2) its subject matter, and (3) its utility.⁷ Although there were other preliminary topics, as we shall see from the discussion of the other treatise on the issue that will be introduced below, these three are the most important.

The author then mentions the benefit of knowing these three preliminary matters. Knowing the quiddity, that is, the definition of a science, is helpful in avoiding the unknown. The author is alluding to the well-known paradox of seeking the unknown, which is also known as Meno's paradox. For the second, knowing the subject matter of a science is beneficial in differentiating it from other sciences, leading to the third, which is that knowing the purpose or utility of a science gives the beginning student insight so that their efforts are not in vain. Therefore, all students who wish to be insightful in their studies must know the prolegomena of all sciences they wish to study, otherwise, their efforts will be futile and misguided. They will not attain what they seek, and they will waste their years of study. The author seeks refuge in God from such a scenario and prays that they acquire appropriate paths and knowledge that are conducive to begin studying.⁸

These general remarks on the importance of knowing the above-mentioned three things are followed by introducing the sciences that were studied in the *madrāsas*, beginning with the Arabic linguistic sciences, including morphology (*'ilm al-ṣarf*) and grammar (*'ilm al-naḥw*), followed by religious and instrumental sciences such as creed, law, legal theory, semantics (*al-ma'ānī*), logic, dialectic (*ādāb al-baḥth*), principles of prophetic reports, and exegesis (*tafsīr*), and ending with arithmetic and the science of dividing inheritance.

A few examples of how some of these sciences are introduced will be sufficient to show a uniformity across disciplines due to their shared underlying philosophy of science. The science of Arabic morphology (*ṣarf*), for instance, is introduced as a science by which one would learn about transformation and contraction in the form of Arabic words. Its subject matter is the Arabic word, and its purpose is knowing transformation (*i'lāl*) and contraction (*idghām*).⁹

Another example is creed, which is introduced as a science by which God's essence, attributes, and actions, as well as the afterlife, prophethood, and leadership are known. Its subject matter is these six things, and its purpose is to affirm or authenticate true belief and refrain from false ones.¹⁰

Logic, as the last example from that work, is defined as a science in which concepts and assertions are investigated insofar as they are beneficial in being conducive to the unknown. The author mentions two views on the subject matter of logic. According to the later logicians, its subject matter is conceptions and assertions, and according to early logicians, it is secondary intelligibles (*ma'qūlāt thāniya*). Essentially, the purpose of logic is to protect the mind from error in thinking, i.e., argument.¹¹

As we can see from these examples, the author consistently introduces each science by its definition, subject matter, and purpose. This process demonstrates consistency with other prolegomena in that the definition of a science was typically drawn either from its subject matter or purpose, and sometimes both. The author also keeps the examples brief by reiterating the same thing three times; for instance, by defining the discipline through its subject matter, mentioning this as the subject matter, and noting its benefit or purpose as knowing this subject matter.

As we can see from the *Prolegomena of Sciences*, all disciplines, be they religious, linguistic, or natural-philosophical were considered as a science. They are introduced by some standard information such as definition, subject matter, and benefit which were accepted by scholars as features of a science. (This conception of science differs from the modern approach in which the methodological and epistemological features of scientific knowledge are emphasized. For example, positivism and falsification are two modern approaches to scientific knowledge which present methodological standards for scientific knowledge.) Although the classical sources such as al-Fārābī and Ibn Sīnā suggest that sometimes two sciences differ by the kind of demonstrations they use, in later periods, this topic was neglected. Perhaps because Muslim scholars realized that method could not be the criterion for the differentiation of sciences, as not all disciplines used shared demonstrative methods, the role of differentiating sciences was given to the subject matter or benefit of a science, since all sciences were supposed to have different subject matters or benefits.

A similar, but much more comprehensive, work on the prolegomena of sciences which illustrates the pre-modern theory of science in the Islamic world is Maḥmūd b. 'Umar al-Jarkasī's *Risāla fī*

muqaddimāt al-‘ulūm (Treatise on Prolegomena of Sciences), published in 1311/1893.¹² Al-Jarkasī introduces himself as a neighbor of the famous institution of learning, al-Azhar. He notes that as he observed beginners were in need of knowing the preliminaries of the sciences they were about to study, that is the prolegomena of the sciences, and that existing works on the topic were difficult and demanded a prior study of the discipline. Therefore, he set out to compose them in an accessible manner for beginners and as a reminder for those who had already mastered the sciences.¹³

Al-Jarkasī, like the previous author, begins with the established theory on properly introducing a science prior to delving into its issues. Accordingly, he notes that beginners necessarily must possess two things. The first is a conception of the science from any perspective because seeking the unknown is impossible. The second is an affirmation of any benefit whatsoever for the science because beginning a science is a voluntary action, and thus, one should know that the science has a benefit; otherwise, beginning it would be impossible. Al-Jarkasī refers the reader to al-Taftāzānī’s (d. 1390) *Tahdhīb al-manṭiq wa-l-kalām* for other preliminary matters, which were known as “the eight headings” (*al-ru’ūs al-thamāniya*) by the ancients and were discussed further in the commentaries of *al-Tahdhīb*.¹⁴ He includes a poem that enumerates the ten topics which should precede studying the proper issues of a science. It states:

The Beginnings of each science are ten
Definition, subject matter, then benefit
Virtue, relation, and author
Name, origins, religious value
Inquiries. Some remained satisfied with some
Whoever comprehends all gains nobility¹⁵

Al-Jarkasī recounts the famous argument for knowing the aspect of unity in a science, which focuses on three of the abovementioned preliminary items, i.e., definition, purpose, and subject matter, to which the previous treatise on prolegomena had also limited itself. The argument for the knowledge of these three is that anyone who wishes to acquire multiple things that are connected by an aspect should know those multiple things from that aspect so that they do not

miss what they intend and waste their time in unintended matters. Acquiring a science means acquiring multiple things because each science consists of multiple inquiries. Hence, both authors state, students must conceive of the science they intend to study by a definition that is either drawn from its essential or accidental aspect of unity so that they thus acquire a general knowledge of the science.¹⁶ Al-Jarkasī reiterates the importance of knowing the unifying aspect in a science, that is, to be able to seek the intended science specifically, gain insight during the study, and not go astray.

In addition to the conceptualization of a science by one of its unifying aspects, al-Jarkasī emphasizes awareness of the subject matter of the science as well, that is, affirming the subject matter as the subject matter such that it becomes distinct in the student's mind. He reiterates the assumption that sciences are distinguished by the distinction of their subject matters. By way of example, al-Jarkasī mentions the difference between Islamic law and legal theory due to their distinct subject matters. Although law investigates the actions of liable people in terms of whether those actions are permissible, forbidden, etc., legal theory investigates authoritative indicants insofar as religio-legal judgments are deduced from them. Therefore, given that these two disciplines investigate distinct subjects, they are developed as separate and independent sciences.¹⁷

Last, al-Jarkasī mentions the importance of knowing the benefit of a science before delving into its issues. If no benefit is regarded in studying a science, then beginning it seems inconceivable, as an insightful beginning is not conceivable without detecting a benefit in the science. However, conceiving a worthy benefit that is based on acquiring the science would increase a student's desire to study it, and this desire would further increase during the study by observing connections between inquiries and the anticipated benefit.¹⁸

The remainder of al-Jarkasī's treatise consists of introducing the following sciences: law (*fiqh*), exegesis (*tafsīr*), prophetic tradition (*ḥadīth*), lexicon (*luḡha*), legal theory (*uṣūl al-fiqh*), Arabic rhetorical and linguistic disciplines including semantics (*ma'ānī*), clarity (*bayān*), and originality (*badī'*), grammar (*naḥw*), etymology (*ishtiḳāq*), and morphology (*taṣrīf*), logic, theology (*kalām*), a few disciplines related to poetics (*'arūd*, *qawāfī*, *qarḍ al-shi'r*), and writing (*kitāba*).

Treatment of these topics is analytical as al-Jarkasī breaks down the title of each section and then goes through the extended list of preliminary issues that one should know to begin studying a science. These include its definition, subject matter, the person who established the discipline, the name of the science, its reliance on other sciences, the religious judgment on its permissibility, its inquiries, its benefit, its purpose, its relation to other sciences, and its virtue over other disciplines. For instance, in the first section entitled “Chapter on Prolegomena of the Science of Law (*fiqh*),” al-Jarkasī discusses the notion of prolegomenon (*muqaddima*) and *fiqh* (lit. “understanding,” and as a technical term, “Islamic law”) and then provides the definition of the science of law, again analyzing and discussing each term.

Al-Jarkasī lists various meanings of the word *muqaddima* (“prolegomenon”). It originally referred to the vanguard of an army but was used as a term for preliminary matters. There was a heated debate on the notion of *muqaddima* in the fourteenth century on whether the prolegomenon, as used in some handbooks, referred to the prolegomenon of the book or of the science. Al-Jarkasī mentions both, noting that the *muqaddima* of a science is the thing on which beginning issues of a science depends, while the *muqaddima* of a book is a number of statements that precede the objective due to their connection with it or being useful to it. He states that prolegomenon of a science consists of meanings, while that of the book consists of words. They are distinct from each other. The reader is referred to *al-Muṭawwal* of al-Taftāzānī and its glosses, which includes the gloss of al-Jurjānī.¹⁹ This reference also affirms that the author indeed was informed by the fourteenth-century debates on the concept because the definition of prolegomena was a heated issue between al-Taftāzānī and al-Jurjānī in several of their other works.

Next, al-Jarkasī goes through list of preliminary issues and provides a detailed explanation for each of them. Beginning with the definition of *fiqh*, al-Jarkasī notes its literal meaning, that is, understanding, and provides its terminological meaning as the name of a discipline. In this latter sense, he provides Abū Ḥanīfa’s definition that *fiqh* is the soul’s knowledge of that which is beneficial to it and that which is not.²⁰ After discussing various interpretations of this definition, al-Jarkasī reports a definition given by Shāfi’ī scholars as well, which states that *fiqh* is knowing

practical religious judgments based on their detailed indicants. In discussing this definition, and elsewhere in the work, al-Jarkasī reiterates various meanings of the concept of *‘ilm*, one of which, I would argue, can be translated as science. Al-Jarkasī offers a detailed analysis of the three meanings of *‘ilm*: (1) rules or principles (*qawā’id*), (2) disposition (*malaka*), and (3) perception (*idrāk*).²¹ Clearly, the meaning of the term *‘ilm* as perception signals the sense of knowledge rather than science, while defining it in terms of rules or principles is more akin to what we would associate with sciences even today. Taking *‘ilm* to mean disposition is a subject-centered approach that frames it from the perspective of the one who is learned in the science. These definitions for *‘ilm* are referred to consistently in describing various sciences, perhaps because al-Jarkasī considered that a student might glance at just one discipline rather than the whole book, if, for instance, he is in need of general knowledge about a particular area of science.

The subject matter of *fiqh* (Islamic law) is the actions of those who are subject to legal or religious orders in so far as they are responsible. It was established as a discipline by Abū Ḥanīfa, though it is said that the Prophet ﷺ was the first to establish *fiqh* and Abū Ḥanīfa was the first to write a book on it. The name of the discipline is *al-fiqh*, which means “understanding,” as noted previously. Its sources are the Qur’ān, the Prophet’s ﷺ tradition, scholarly consensus, and analogy. Religious judgment about the study of *fiqh* is that it is obligatory for each and every Muslim in so far as they can practice valid rituals. If they learn more so that they are able to give a ruling or legal opinion (*fatwa*), then that would be obligatory for some in the community; however, if they learn so as to resolve new problems by legal exercise, then that would be commended. The use of *fiqh* as a means of inquiry is the connection of subjects and predicates of its propositions such as, “According to Abū Ḥanīfa four things are obligatory for taking ablution, and according to Shāfi’ī they are six” and “this action is obligatory,” etc. Its benefit (*fā’ida*), that is, the fruit (*thamara*) of *fiqh*, is protecting the legally or religiously responsible person from error in their actions, and gaining happiness in both worlds. The purpose of the discipline is the fulfillment of obligations and avoidance of prohibitions. As such, it is one of the religious sciences. The virtue of *fiqh* over other disciplines is that it is the most virtuous because licit (*ḥalāl*), and illicit (*ḥarām*) things are known by it, and it protects the actor from error in all of

their actions.²² Al-Jarkasī quotes several authorities on the virtue of Islamic law, and concludes this section with some historical information on the development of this discipline.

Al-Jarkasī's prolegomena to other sciences follow a similar outline. Besides concluding each section with an overview of the issues discussed in the science that is introduced, the treatise includes a final conclusion as well that deals with the issue of praising (*ḥamd*) and thanking (*shukr*) God. Muslim scholars had a custom of prefacing their works by praising God and praying for the Prophet ﷺ, which also gave rise to significant debates. In addition to adjusting the theory of science to the Islamic context, such customary features of scientific texts further attest to their Islamic outlook.

Both treatises on the prolegomena of sciences show a shared conception of science that was not limited to certain disciplines but rather applicable to all sciences. That conception of science can be seen in books in the genre of the classification of sciences as well as in the representation of sciences. In sum, Muslim philosophers and theologians held that each science has a topic whose conditions are investigated. However, these investigations had to start with some prior knowledge or principles because, as indicated by the paradox of Meno, learning about the utter unknown was thought to be inconceivable. Postclassical works also extensively debated aspects of this theory. For instance, whether the subject matter of a science has an absolute unity or perspectival unity, what kind of inquiries were proper in a given science, and the type of axioms and principles that were admissible in a science, were all debated.

To conclude, treatises on the prolegomena of sciences reflect a specific approach towards sciences which I contend are foundations for an Islamic philosophy of science. They share the dominant theory of science in the pre-modern period in that each science has a subject matter by which it is distinguished from other sciences, and that each science has a benefit that provokes students to study it. In addition, Islamic philosophical writings bear the influence of religious values as they typically begin with preliminary remarks praising God and sending peace upon the Prophet. Beyond these standard introductory remarks, scholars conceived of the sciences in a way that was inclusive of religious sciences. Therefore, I believe the philosophy of science that is reflected in prolegomena to sciences can be dubbed Islamic philosophy of science.

¹ For a study on postclassical debates on the notion of prolegomenon and its proper content as reflected in interpretations of a prolegomenon of a logic handbook, see Kenan Tekin, “The Conception of Science in Postclassical Islamic Thought (647–905/1250–1500): A Study of Debates in Commentaries and Glosses on the Prolegomenon of Al-Kātibī’s Shamsiyya” *Journal of Islamic Philosophy*, vol. 13, 2022, pp. 83–123, <https://doi.org/10.5840/islamicphil2022136>.

² Aristotle, *Posterior Analytics*, 2nd ed., trans. and commentary Jonathan Barnes (Oxford: Oxford University Press, 2002), 15.

³ Al-Fārābī, *Kitāb al-Burhān* in *al-Mantiq ‘inda l- Fārābī*, ed. Rafiq al-‘Ajam (Beirut: Dār al-Mashriq, 1987); Ibn Sīnā, *al-Burhān* in *al-Shifā al-Mantiq* (Cairo: Matba‘a al-Amīriyya, 1956).

⁴ Al-Juwaynī, *al-Burhān fī ‘ilm al-Uṣūl*, ed. Abd al-‘Azīm al-Dīb, (Qatar: 1399), vol. 1, 83-85; Al-Ghazālī, *Al-Mustasfā* (Egypt: Matba‘at Mustafa Muhammad, 1937). For a study that further details this interaction, see my forthcoming article “Beginnings or Principles: Commentaries and Glosses on the Notion of Mabādī’ in Ibn Ḥājjib’s Mukhtaṣar al-Muntahā” in *Nazariyat*.

⁵ Manuscripts that do not indicate the author include 06 Mil Yz A 2427/7 and 06 Mil Yz A 1444/10. The latter copy includes a few concluding sentences which are lacking in the former. For my analysis in this paper, I used 06 Mil Yz A 2427/7 because it is more legible. Esad Efendi 3734/2 (fol. 5b-6a) and Esad Efendi 3695/5 also do not indicate the author, while the manuscript at Çorum Hasan Paşa il halk kütüphanesi 3139 (fol. 50a-51a) mentions that a certain Seyyid Hasan scribed it (*harrarahu*). Manuscripts that include an attribution to al-Khādimī are Yazma Bağışlar 1292/7 (fol. 34b). In the title of this manuscript the following is written: “*Muqaddimāt bayān mawdu‘āt al-‘Ulūm li’l-‘ālim ar-Rabbānī al-Khādimī*” (Prolegomena explaining subject matters of sciences by Divine scholar al-Khādimī). However, this manuscript lacks preliminary statements on the importance of knowing prolegomenon of a science. Another manuscript copy, Yazma Bağışlar 607/15 (fol. 135a-b), is mistitled and lacks the introduction, while its colophon states that “the treatise that is attributed to Muhammad al-Khādimī is completed.” The colophon of Yazma Bağışlar 1284/13 (fol. 46a-b) also indicates Muhammad al-Khādimī as the author. While most copies either lack an attribution or are attributed to al-Khādimī, the colophon of a copy cataloged as Ulucami 3148/3 (in Bursa İnebey Manuscript Library) mentions a certain al-Hāj Mustafa as the author. All in all, we cannot at this stage be certain of the author, but it is possible that al-Khādimī may have written this treatise given that his alleged student Gözübüyükzade also wrote two treatises on the topic.

⁶ Tekin, “The Conception of Science in Postclassical Islamic Thought (647–905/1250–1500),” 95-115.

⁷ MS 06 Mil Yz A 2427/7 (Ankara: Milli Kütüphane), fol. 109b.

⁸ MS 06 Mil Yz A 2427/7, fol. 109b.

⁹ MS 06 Mil Yz A 2427/7, fol. 110a.

¹⁰ Ibid.

¹¹ MS 06 Mil Yz A 2427/7, fol. 110b.

¹² Mahmūd b. ‘Umar al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm* (al-Matba‘a al-‘ilmiyya, 1311AH).

¹³ al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 2.

¹⁴ al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 2-3. Al-Taftāzānī’s *Tahdhīb al-Mantiq wa l-Kalām* is a handbook of logic and Islamic theology. The part on logic was copied as a stand-alone work in later periods and subjected to many commentaries and glosses. For an edition of the book that includes both parts, see Sa‘d al-Dīn al-Taftāzānī, *Tahdhīb al-Mantiq wa l-Kalām*, ed. al-Shaykh ‘Abd al-Qādir al-Kurdī, (Misr: al-Matba‘a al-Sa‘āda, 1330/1916).

¹⁵ al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 3.

¹⁶ al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 3.

¹⁷ Ibid.

¹⁸ al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 3.

¹⁹ al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 3. For the disagreement between Taftāzānī and al-Jurjānī over the notion of *muqaddima*, see Tekin, “The Conception of Science in Postclassical Islamic Thought (647–905/1250–1500),” 105-107.

²⁰ al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 4.

²¹ Ibid., 5.

²² al-Jarkasī, *Risāla fī Muqaddimāt al-‘Ulūm*, 6-7.