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THE STATUS OF THE QUADRIVIUM IN THE CORPUS ON LOGIC OF THE BRETHREN OF PURITY (ʾIḫwān aṣ-Ṣafāʾ)

Abstract: *This article proposes some reflections on the status of the quadrivium in the epistles X–XIV of one of the best known encyclopaedia of the Brethren of Purity Rasāʾil, by reconstructing the implied methodology of how the quadrivium is applied within a theoretic philosophy and therefore how all these aspects concur in order to obtain demonstrations that are in complete cohesion with soundness. Following a hermeneutical methodology, this research explores the ways to get to the universal truth and how exactly one arrives to it. The first part explains what perceived science is and what its defining features are, while the second part illustrates a distribution of the application of the quadrivium in relation with what the Brethren of Purity established as methods of acquiring knowledge. Finally, the last part evaluates some examples that can be traced from a ground of the quadrivial disciplines in order to show how some elements of formal logic are evaluated.*

Keywords: *quadrivium; science; ʾIḫwān aṣ-Ṣafāʾ (Brethren of Purity); logic; knowledge*

Status kvadriva v logickém korpusu Bratrstva čistoty (ʾIḫwān aṣ-Ṣafāʾ)

Abstrakt: *Článek nabízí reflexi statusu kvadrivia v listech X–XIV jedné z nejznámějších encyklopedií Bratrstva čistoty Rasāʾil a rekonstruuje v ní zahrnutou metodologii užívání kvadrivia v rámci teoretické filosofie, tedy jak v něm jsou získávány naprosto korektní důkazy. Pomocí hermeneutické metodologie jsou zkoumány způsoby, jak se přibližovat k obecné pravdě a jak přesně k ní jednotlivci dospívají. První část vysvětluje, co je to empirická věda a jaké jsou její určující rysy, zatímco druhá část dokládá, jak Bratrstvo čistoty nahlíželo na rozličná užití kvadrivia jako na metody vedoucí k poznání. Závěrečná část hodnotí některé příklady, které lze nalézt v samotných základech kvadriviálních disciplín a demonstruje na nich, jak je v nich využita formální logika.*

Klíčová slova: *kvadrivium; věda; ʾIḫwān aṣ-Ṣafāʾ (Bratrstvo čistoty); logika; poznání*

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1. Introduction[1]

The relationship between the Greek sciences and the Arabic corpus of philosophy has a long history and its evaluation constitutes a major discipline within the history of intellectual ideas in the Arab-Islamic world. When this domain of research is evaluated, the term *falsafa* is used, referring to a philosophy of Greek influence written in Classical Arabic in the Arabic-Islamic space. Much of the information in this field involves analysing how the trivium and the quadrivium were passed on to the Arabs, evaluating translations of Greek works into Arabic, taking into consideration the Syriac intermediary, and studying the particular characteristics of whether the Arabs were original in their scientific thinking. It should be stated from the beginning that this research is neither a review of the history of these quadrivial sciences, nor a synthesis of the multiple research investigating this process, and it does not analyse their transmission to the Arab-Islamic cultural space, but can be situated within a plan that reconstructs the rela-

[1] The corpus on logic was translated by the Brethren of Purity, see *Epistles of the Brethern of Purity: On Logic. An Arabic Critical Edition and English Translation of Epistles 10–14,* trans. and ed. Carmela Baffioni (New York: Oxford University Press and Institute of Ismaili Studies, 2010). There is also a translation of Epistle XIV into Latin, but in the title of the edition it is ascribed to al-Kindī: Al-Kindī, Ja'qūb Ben Isḥāq, "Liber introductorius in artem logicae demonstrationis," in *Die Philosophischen Abhandlungen des Ja'qūb Ben Isḥāq Al-Kindī*, ed. Albino Nagy (Münster: Verlag der Aschendorffschen Buchhandlung, 1897), 41–64. The references in the present text in Classical Arabic are given with reference to the edition Frații Purității (*'Iḫwān aṣ-Ṣafā'*), *Epistolele despre logică* X–XIV, trans. Crina Galiță (Iași: Polirom, 2019) which is based on the edition *Rasā'il 'Iḫwān aṣ-Ṣafā' wa Ḫillān al-Wafā'* (ed. Khairaddīn Az-Ziriklī) in *Islamic Philosophy* I, ed. Fuat Sezgin (Frankfurt am Main: Institute for the History of Arabic – Islamic Science at the Johann Wolfgang Goethe University, 1999). In the book I offer an interpretation of the text. This article is based on observations made when translating the text into Romanian and is strictly based on the bibliography referenced at the end. It develops a subject explained in the third chapter on the relation between philosophy, religion and science from my doctoral thesis *Perceiving the meaning of existence in Arabic logic*. In this article I offer transliterations of the original Arabic text. With regards to the translation into English, I have used the same version that is found in Baffioni's translation, but where I found different approaches, I tried to explain my perspective.

The bibliography used in this article was made accessible by means of obtaining a scholarship from the University of Bucharest at the Institut National des Langues et Civilisations Orientales, Paris, August – September 2017. The article is based only on those bibliographical sources that I considered relevant for the actual subject. Its aim is to introduce the subject of logic-quadrivium within the corpus on logic of the Brethren of Purity, based on the text edited by Khairaddīn Az-Ziriklī, and to analyse the content of the text, viewed as a source of logical theory.

tionship between science and the principles of knowledge, as stated in the logical corpus of the Brethren of Purity, and tries to respond to one particular question: how can we envisage knowledge and science in relation to the quadrivium? This article differs from other research in that it focuses on the methodological character of the construction of their logical corpus, by identifying the scope that the Brethren of Purity offer to each of the quadrivial disciplines. This research contributes to the actual state of the studies on the Brethren of Purity by aiming to investigate how these disciplines of the quadrivium appeared within theoretical philosophy in the Arab-Islamic world. The status of a specific science refers to the practical utility of that science and we focus on the sciences of the quadrivium (arithmetic, geometry, music, astronomy), or more precisely, we aim to provide evidence for the practical utility of the instrumentalization of the quadrivium arts within one of the trivium arts – logic in a canonical philosophical text written in Classical Arabic in approximately the 10th century.

In some recent literature, the importance of the study of the logic of the Brethren has become of interest.[2] In this context, one of the main themes regarding this logic is whether it is original or not. Admed Djebbar[3] states, regarding the intellectual stature of these encyclopaedists, that their theories may be based on empirical observations, which show a profoundly particular vision regarding the presented theory, from this point of view being associated in this paradigm of writing with Al-Masʿūdī, Ibn Sīnā and Ibn Ḫaldūn.[4] Moreover, in a recent article on the nature of encyclopaedism,[5] De Callatay argues that the views regarding the lack of originality of the entire corpus of the Brethren are not correct by affirming that this particular style of writing reveals what he calls a "very precise programme and ideological

[2] Relevant in this sense are the studies of Carmela Baffioni, "Il 'Liber introductorius in artem logicae demonstrationis': problemi storici e filologici," *Studi filosofici* 17 (1994): 69–90; Carmela Baffioni, *Frammenti e Testimonianze di Autori Antichi Nelle Epistole Degli Ikhwān aṣ-Ṣafā'* (Roma: Istituto Italiano Per la Storia Antica, 1994); Nader El-Bizri, "Epistolary Prolegomena: On Arithmetic and Geometry," in *The Ikhwān al-Ṣafā'and their Rasā'il. An Introduction*, ed. Nader El-Bizri (New York: Oxford University Press, 2008), 180–213; *Epistles of the Brethren of Purity: On Music. An Arabic Critical Edition and English Translation of Epistle 5*, trans. and ed. Owen Wright (Oxford: Oxford University Press, 2010).

[3] Ahmed Djebbar, *Une histoire de la science arabe, Entretiens avec Jean Rosmorduc* (Paris: Éditions du Seuil, 2001), 293–94.

[4] Ibid., 298.

[5] Godefroid de Callatay, "Encyclopaedism on the Fringe of Islamic Orthodoxy: The *Rasā'il Ikhwān al-Ṣafā'*, the *Rutbat al-ḥakīm* and the *Ghāyat al-ḥakīm* on the Division of Science," *Asiatische Studien* 71, no. 3 (2017): 858.

commitment."[6] Another sign that evokes the original aspect of their thinking is the fact that there is a sort of a unifying principle between the religious and the philosophical dimensions.[7]

In the actual curriculum of the Brethren of Purity logic is very rarely analysed, and I believe that it will help to apply a model of interpretation on this corpus including it in a large curriculum that not only refers to the domain of philosophy, but to the humanities in general. The valuable content of each one of these epistles deserves to be known by a larger public, not only by Arabist specialists. This article tries to reunite all of the actual research that has been done on the exegesis of this corpus on logic and the perspective towards science within it and integrates itself in a methodology that keeps in mind the second stage of the studies, which can be an analysis of the Brethren keeping in mind a thematic interpretation of the corpus. In this regard, the main question that this article aims to answer is whether each of these quadrivial sciences had an impact on the theory of logic as laid out within the Epistles X–XIV of the *Rasā'ilu 'Iḫwāni ṣ-Ṣafā'i.* The encyclopaedic style of the text that incorporates this corpus is perhaps another criterion that somehow ensures a paradigm of evaluating the elements of formal logic, in order to assure a sort of a universal pattern for a correct understanding of all the sections that their encyclopaedia includes.

The first part of the article will focus on explaining how the Brethren of Purity see science in relation to their theory regarding logic, as they divide it in a philosophical logic and a linguistic one, in the classical Arabic philosophy. Secondly, I will formulate a scheme that describes the existing relationship between the two axes of thinking, the quadrivium and the trivium, in order to elaborate a view on the status of the quadrivium in relation to logic. More specifically, I will then underline how this scheme contributes to a description of the faultlessness of knowledge, in the view of the Brethren of Purity. Thirdly, I will analyse the status of the quadrivium in the examples found in the principles of reasoning given by the *'Iḫwān aṣ-Ṣafā'* in the

[6] Ibid., 858.

[7] Ibid., 861. This idea is analysed also in Carmela Baffioni, "The Concept of Science and Its Legitimation in The *Iḫwān al-Ṣafā'*," *Oriente Moderno* 80, no. 3 (2000): 427–41. It is reiterated within the Arabic corpus in *'Iḫwān aṣ-Ṣafā'*, *Epistles,* I.XIII. 5.b.: "'anna l-manṭiqa mīzānu l-falsafati wa-qad qīla 'innahu 'adātu l-faylasūfi wa-ḏālika 'annahu lammā kānati l-falsafatu 'ašrafa ṣanāiʿi l-bašariyyati baʿda n-nubuwati ṣāra minᵊ l-wāǧibi 'an yakūna mīzānu l-falsafati 'aṣṣaha l-mawāzīni wa-'adātu l-faylasūfi 'ašrafa l-'adawāti li-'annahu qīla fī ḥaddi l-falsafati 'innahā t-taššabuhu bi-llāhi bi-ḥasabi ṭ-ṭāqati l-'insāniyyati." In the following notes I will refer to *'Iḫwān aṣ-Ṣafā'* (Brethren of Purity) with the abbreviation IS.

epistles *On Logic*. Therefore, I will describe the nature of each one of the quadrivial disciplines in relation to logic, one of the trivium disciplines. By offering examples from the original Arabic text I will exemplify the connection between each of these quadrivial disciplines for the four types of methods of demonstration used by the Brethren of Purity, namely division, analysis, definition and demonstration.

2. Towards a Theory of Science: The Case of the Corpus on Logic of the Brethren of Purity

In order to understand how the Brethren of Purity formulate their conception of science we need to find an answer to the following question: How is the character of science described within this text? Therefore, it should be underlined that science is regarded as one of the species of spiritual quality[8] and is described as "the form of a thing subordinated to the science in the soul of the one who has mastered the science."[9] It is subordinated to the soul and is perceived by the intellect.[10] A science assures a particular order in existence which has two stages of being, in this world and the after-world, and a way to understand what life in the after-world[11] will consist in. This process is re-analysed in *Epistle I, XI, 1.l* where the opposite of science seems to be ignorance (*ǧahl*). Moreover, there is another condition that each action depends on, and that is applying the principle of integrity.[12]

[8] IS, *Epistles*, I.XI.1.i-j.

[9] Ibid., I.X.5.a. There is a difference between science (*'ilm*) and what is subordinated to it, knowledge (*al-ma'rifa*). The conception of science appears in relation with what is taken in consideration by knowledge (*al-ma'rifa*). What is specific to science is correlated with the first elements of the intellect cf. ibid., I. XIV.9.a. "The first elements of the intellect" (*'awā'ilu l-'uqūli*), according to the perspective of the Brethren of Purity, correspond to what represents the answer to the following questions: "Is it," "What is it?" Cf. ibid., *Epistles*, I. XIV.8.b. Moreover, these answers serve as the basis for building a demonstrative syllogism: "'alā hāḏayni l-'ilmayni yubnā sā'iru l-qiyāsāti l-burhāniyyati 'a'nī hal huwa, wa mā huwa." Ibid., I. XIV.9.a.

[10] "al-'ilmu lā yakūnu 'illā fī n-nafsi, wa-lā yudraku 'illā bi – l-'aqli. wᵃ -l-ǧahlu kaḏālika ḥukmuhu." Ibid., I.XI.1.l.

[11] "'inna l-'ulūma ġaḏā'u n-nafsi." Ibid., I.XI.2.c. This process within the whole corpus of the Brethren of Purity can be consulted in Carmela Baffioni, "The concept of science and its legitimation in the Iḫwān al-Ṣafā'."

[12] IS, *Epistles*, I.X.5.b. Respecting the virtue of being a man of integrity by the one who wants to assimilate the principles of science is a theme that is also present in: Al-Fārābī, "fīmā yanbaġī 'an yuqaddama qabla ta'allumi l-falsafati / falsafati 'Arisṭū," in *Documenta philosophiae Arabum*, ed. Augustus Schmölders (Bonn: E. Weber, 1836), 7.

The Brethren of Purity talk about two ways of having assimilated the sciences, in act (*bi-l-fiʿli*) and in potency (*bi-l-quwwati*), the connection between the latter and the former depending on what can be attained by tenacity (*iǧtihād*), one of the ways of reaching the truth.[13] According to the Brethren of Purity, science and knowledge are acquired after getting over certain steps that come under this way of reaching the truth.[14] Therefore, science is, in the eyes of the Brethren, associated with a possession that is of an interior character, i.e., is present within the soul.[15] This process of knowing a human science is realized in a Neoplatonic descendence trough the intermediary of the theory of emanation and implies the relation conception (*taṣawwur*^{un}) – asentiment (*taṣdīq*^{un}), and an action of perceiving the intelligible realities of things through the active intellect.[16]

The soundness of the philosophical principles assimilated by a person who desires a science implies what the Brethren name "a capacity of detaching oneself from accidents and incomplete outlines."[17] On the other hand, according to the Brethren, these strategies also assure a path of making understanding easier, viewed as a guide for those that are learning. Also, among these types of making learning easier there appears what they name "reasoning by analogy," and they offer a relevant example in this sense in order to simplify the understanding of a science by the one who learns through the association of the ten linguistic expressions that correspond to the *Categories* of Aristotle, with a garden of trees. At the very beginning of this corpus, the first epistle is dedicated to an introduction to logic, namely *On Eisagōgē*, where the Brethren express the fact that they intend to demonstrate the characteristic related to this discipline by considering the fact that the human being can be differentiated from animals.[18] Moreover, they reiterate the claim that the motivation of their philosophical attempt is reflected by the fact that they want to ensure an easier process to the learner

[13] IS, *Epistles*, I.X.5.b.

[14] "yanbaġī 'an lā tartaqiya fī darağati l-ʿulūmi wᵃ-l-maʿārifi 'illā wa-taḫluʿa ʿan nafsika 'aḫlāqan wa-ʿādātin wa-'ārā'a wa-maḍāhiba wa-'aʿmālan mimmā kunta muʿtādan lahā munḏu ṣ-ṣibā min ġayri baṣīratin wa-lā ru'yatin." Ibid., I.XIV.18b.

[15] Ibid., I.XI.1.k. In this context the genus of possession is explained as being divided into two species: interior, in the soul and the body, and exterior, animated and inert.

[16] "'inna l-'ašyā'a kullahā bi-'aġmaʿihā ṣuwarun wa-'aʿyānun ġayriyyātun 'afāḍati l-Bārī - taʿālā - ʿalā l-ʿaqli l-faʿʿāli llāḏī huwa ğawharun basīṭun mudriku ḥaqā'iqa l-'ašyā'i kamā bayyanā fī risālati llātī fassarnā fīhā maʿnā qawli l-ḥukamā'i 'inna l-'insāna ʿālamun ṣaġīrun wa-'inna l-ʿālama 'insānun kabīrun." Ibid., I.X.4.b.

[17] Ibid., I.XIV.18.b.

[18] Ibid., I.X.b.

regarding the understanding of philosophical logic.[19] This process can be developed by applying the following principles:

I. exemplification of the quality of division into ten genus and species. The same principles regarding the genus and the species is reflected by Godefroid de Callatay.
II. Reasoning by analogy (the ten linguistic expressions are correlated to a garden with trees).
III. On the cause and the effect: The problem of cause and effect reflected is in the example of fire and smoke.[20]

This idea of making learning easy for an individual by means of the style of writing is a sort of leitmotif in the present text and recalls the care that the Brethren have for the soundness of the philosophical principles assimilated by one who wants to know what science implies and what the Brethren name as being "the capacity to unbind oneself from accidents and incomplete descriptions."[21] In this sense there are four methods of instruction, namely: definition, demonstration, analysis and division. Regarding the steps of obtaining the knowledge of philosophical logic, the Brethren consider that they depend on time.

Being gifted with the use of syllogisms is a condition for acquiring proficiency and after that, for conceiving sayings beyond contradiction. However, the steps of acquiring knowledge depend on temporality, and that is why, from the perspective of the Brethren, this knowledge demands: "being able to use the senses" (*maǧbūl ʿalā stiʿmāli l-ḥawāssi*), "being gifted with the use of syllogism" (*maṭbūʿ ʿalā stiʿmāli l-qiyāsi*),[22] having acquired a competency,[23] and after that conceiving sayings beyond contradiction, knowledge of philosophical logic being therefore acquired.[24] The following are known to the Brethren: science, a spiritual-corporal quality,[25] the branches of sciences through a measure of the science and of the art,[26] the

[19] Ibid., I.X.1.
[20] Ibid., I.XIV.11.a-b.
[21] Ibid., I.XIV.18.b.
[22] Ibid., I.XIV.5.a.,18.c.
[23] Ibid., I.XII.d.
[24] Ibid., I.XIII.5.a.
[25] Ibid., I.XI.1.i.
[26] Ibid., I.XIII.2.a.

intelligible realities of things,[27] or the quality of perception by the soul of the senses of existing things.[28]

However, the Brethren make a clear distinction between a science and an art. They emphasize a distinctive way of assimilating the theory of science.[29] An art depends on the human capacity to develop connections between what exists in the soul and in matter.[30] The form is subordinated to matter, whether they make a sort of correspondence between what is known, whose place is in the soul and in matter, which corresponds to a stage of the existing thing in the present world, a relation between the character of a spiritual form to a corporeal form. Moreover, what should be considered is the syllogism, taking into consideration the fact that it is an art and therefore we can apply the same principle to its analysis.

With respect to those who apply these sciences, there is a differentiation of classes, even if this equally implies a scale of learning: (i) ordinary humans (*an-nās*)[31] who constitute a category of humans who apply or are beneficiate of a number of the practical utilities of each of these science, in a practical manner, and (ii) the learned, (*al-ʿulamāʾ*) who imply a particular judgement (*ḥukm*) based on a series of systems of thinking, where in a specific time frame, these "learned humans" acquire a particular knowledge in each of these sciences, which allows them to evaluate the actual state of correctness of some problems. Another difference between these two categories of those who benefit from the practical utility of these concepts is the role of the senses (*al-ḥawāss*). The senses perceive corporal quality.[32] The condition of perceiving through the senses is perceiving through more than one single sense, in order to obtain a correct knowledge of the object perceived. On the other hand, a correct perception implies perceiving through all the senses. If the first category bases its knowledge on things that are not absent to the senses, namely things that fall under the incidence of what can be seen (that is to say weighing and measuring), the second category goes beyond the senses, to a second level of interpretation. This differentiation between the classes of people who use these instruments that are applied in order to

[27] Ibid., I.XVI.c.
[28] Ibid., I.X.1.b.
[29] Ibid., I.X.5.a.
[30] "'anna l- 'ilma laysa bi-š-šay'in siwā ṣūrati l-ma 'lūmi fī nafsi l-'ālimi wa-'anna ṣ-ṣan'ata laysat šay'an siwā 'iḫrāği tilka ṣ-ṣūrati llātī fī nafsi ṣ-ṣāni'i l-'ālimi wa- waḍ'ahā fī l-hayūlā." Ibid., I.X.5.a.
[31] Ibid., I.X.1.g.
[32] Ibid., I.XI.

establish the rules of science are: (i) merchants, who apply the principles of geometry, and (ii) those who are in the diwans[33] and apply the principles of arithmetic. That shows a distribution of the sciences by taking into consideration social classes. That is to say that the sciences are distributed among people in a practical way.

3. The Way to a Faultless Knowledge

By establishing a concrete representation of a series of facts, the examples offered by the Brethren of Purity are one of the criteria that secure the way to a faultless knowledge. By creating a relationship between the trivium and the quadrivium, they illustrate their perspective concerning the theory of logic which becomes a sort of a ground for the theory of science. From this representation we note the important role of each one of these sciences to the description of such a text. In this way we perceive, as the Brethren of Purity would say, from the perspective of the intellect the fact that the status of the quadrivium is an instrument for those who learn the science of logic.

	Division	***Analysis***	***Definition***	***Demonstration***
Arithmetic				I, XIII, 1. I, XIII, 2.
Geometry				I, XIV, 9. I, XIV, 10. I, XIII, 5. I, X, 1.
Music		I, XIV, 1.		
Astronomy	I, XI, 1. I, XI, 2.	I, XI, 2. I.XIV.1a	I, XIV	

This type of theory can be formulated as follows, by taking into consideration the methods of knowledge as regarded by the theory of science: we can discover a map of the importance of each of them in relation to a particular logical subject, by using examples in order to present their perspectives regarding a particular subject. In this way, a transfer of perspective regarding each of these quadrivium sciences takes place, a kind of reevaluation of the

[33] Ibid., I.XIII.2.a.

necessity of each one of them. This necessity is accepted within the circle of intelligible reality.[34]

4. On Logic and the Quadrivium in the Brethren of Purity Corpus on Logic[35]

The relation between logic and arithmetic[36] within this corpus concerns first an overview of the principle of anteriority. This principle is explained as order in relation to number. In this way, for exemplifying the anteriority of things, the example given in this respect is "Five is before six."[37] Moreover, the soundness of an argument is secured through a science viewed as a measure, as is the case of the science of number, which is how arithmetic is literally called within the Arabic corpus, where measure is in fact number,[38] and number is viewed as a dissociated quality with its own species.[39] The soundness depends on examples whose nature respects not only the formal part of the demonstration, but also its content. The one who counts can make a mistake, as the logician can devise an unsound syllogism by ignorance or in a conscious way.[40] Another subject that can be outlined in relation to arithmetic is the subject of substance and accident by giving the example of units and number, these units being related to the ten categories.[41]

Regarding the relation logic – geometry,[42] the interconnection between logic, a trivium science and geometry reflects whether a theory of demonstration is developed. The Brethren hold that learning geometrical rules should precede the assimilation of problems related to demonstrations. The most common subject presented in the corpus is the analogy between a logi-

[34] From the epistle *On the sense of the Second Analytics* we know about "the intelligible realities of things" that can be subjected to an act of knowledge by the four methods reiterated within the epistles, namely: division, analysis, definition and demonstration, cf. ibid., I.XIV.c.
[35] Marquet offers evidence for the mathematical character of these sciences in the paper: Yves Marquet, *La philosophie des 'Iḫwān al-Ṣafā* (Paris: S. E. H. A., 1999), 296. His representation also points out this character and organizes, as does the original corpus, the particular epistles dedicated to the quadrivium and after that those dedicated to logic.
[36] El-Bizri, "Epistolary Prolegomena."
[37] "'inna l-ḫamsata 'aqdamu minᵃ s-sittati." IS, *Epistles*, I.XI.2.a.
[38] Ibid., I.XIII.4.
[39] Ibid., I.XI.1.h.
[40] Ibid., I.XIII.1.j.
[41] Ibid., I.XI.d.
[42] By far one of the most important books in this field is Marquet, *La philosophie des 'Iḫwān al-Ṣafā*.

cian and a geometrician. The Brethren hold that analogy is one of the logical techniques that can be understood by a larger group of people due to its simplicity. Another representative analogy is the one between a syllogism and a balance[43] where the balance secures certainty in a domain related to corporeality, whereas syllogisms are regarded as measures establishing the character of certainty in what is related to spirituality. The Brethren compare syllogisms to a balance and the rules that correspond to them to weights.[44] In this way, logic is, for them, an instrument of philosophy,[45] in the same way that syllogisms are instruments leading to the truth.[46] Truth becomes the basis of the soundness in relation to acquiring science. Regarding the expression "demonstration is a balance that distinguishes between the true and the false, and the good from the bad," Yves Marquet suggests that the term "balance" should be understood in the sense of "criteria."[47]

Within this context, the importance of the first elements of the intellect in relation to this aspect of the presence of geometry is also revealed. The relevant example offered in this case is that of the angles of a triangle as an example of essential, substantial attributes that are of a generic nature.[48] Another example within the corpus that reflects the relation between logic and geometry would be the definition offered to the body, following a Euclidian source.[49]

Body $=_{df}$ compound substance characterized by length, breadth and depth.[50]

[43] "lammā kāna fī ṣiḥḥati l-wazni wᵊ-l-kīli yaḥtāğu 'ilā šarā'iṭa min ʿiyāri ṣ-ṣanağāti wa-ṣiḥḥati l-mikyāli wᵊ-l-mīzāni wa-taqwīmi l-kīli wᵊ-l-wazni bihā kaḏālika ḥukmu l-qiyāsāti llātī yuʿrafu bihā l-ḥaqqu minᵊ l-bāṭili wᵊ-ṣ-ṣawābu minᵊ l-ḫaṭā'i wᵊ-l-ḫayru minᵊ š-šarri yaḥtāğu 'ilā šarā'iṭa li-yuṣiḥḥa bihā l-ḥukma." IS, *Epistles*, I.X.1.g.

[44] Ibid., I.XIII.3.a.

[45] Ibid., I.XIII.5.

[46] Ibid., I.XIV.5.a. Regarding truth, a specific distinction should be underlined between what corresponds to a divine truth and what corresponds to a human truth. While the former is beyond any condition that is stated by a human science, the latter is based on mathematical sciences, where logic imposes a series of conditions in order to arrive at it, cf. ibid., I. XII. Truth (*al-ḥaqq*) is interpreted according to the Brethren of Purity as a saying (*al-qawl*), impartial and posterior to a sound syllogism, cf. ibid., I. X.

[47] Marquet, *La philosophie des 'Iḫwān al-Ṣafā*, 191.

[48] IS, *Epistles*, I.XIV.13.a.

[49] On Euclid in the Brethren see Carmela Baffioni, "Euclides in the Rasā'il Ikhwān al-Ṣafā," *Études Orientales* 5–6 (1990): 58–68; Yves Marquet, Les *"Frères de la Pureté" pythagoriciens de l'Islam. La marque du pythagorisme dans la redaction des Épîtres des Iḫwān aṣ- Ṣafā'* (Paris: S. E. H. A., 2006).

[50] IS, *Epistles*, I.XIV.1.e.

A distinctive interpretation in the sense of this relation is offered by the Brethren by evoking all the particularities that associate geometry with logic, through establishing a connection based on the analogy of how they understand the component of each of the *Organon*'s works and how the act of weighing a balance is followed.[51]

As for the relation logic – music,[52] it appears within the explanation of the method of analysis in the last epistle. This example corresponds to the explanation of the particularities of a song[53] which Wright identifies with a practical perspective regarding music, viewed as a theoretical dimension,[54] and is presented as a compound related to the spirit and the soul.

If arithmetic and geometry are the most used within this pattern in order to reflect one of the governing principles of universal truth, in what concerns the relation between logic and astronomy[55] they state that astronomy has the nature of a mathematical science, which constitutes an extension of the field of knowledge[56] to the learner. *Epistle* I.XI,1.b. speaks about the meaning of the term "primary body" which is instantiated as being "a stone, water, fire, air, the stars." These examples are offered in order to explain gender as one of the existing things.[57] Moreover, they are assimilated in relation to the method of division as being a corporal natural simple substance.[58] In another order of ideas, a stone, water and fire are offered as examples representing the relation between logic and astronomy; namely, they reflect some of the particularities of what the Brethren refer to as "the six linguistic expressions," namely the individual, the species, the genus, the specific difference, the proprium and the accident.[59] That is how they exemplify the

[51] IS, *Epistles*, I.XIII.3.a.
[52] On music see Brethren of Purity, *Epistles of the Brethren of Purity, On Music*.
[53] IS, *Epistles*, I.XIV.1.d. In the Latin translation of the text attributed to Al-Kindī the passage is as follows: "Spiritalia vero spirantia sunt ut cantus qui est in numero sonorum ordinatorum. Sonus vero componitur ex tonis proportionalibus et versibus metricis. Versus vero componuntur expedibus. Sed pedes componuntur ex syllabis. Unaquaeque autem syllabarum componitur ex litteris vocalibus et consonantibus, nemo autem cognoscit hoc nisi qui nouit proportiones musicas." Al-Kindī, "Liber introductorius in artem logicae demonstrationis," 44.
[54] Wright, Owen, "Music and Musicology in the *Rasā'il. Ikhwān al-Ṣafā'*," in *The Ikhwān al-Ṣafā'and their Rasā'il*, 225.
[55] Almagesta is a reference to what can be conceived as the primary elements of the intellect and that they are correctly applied. An important study within this context is Godefroid De Callatay, *Ikhwan as-Safa. Les revolutions et les cycles* (Beirut: Al-Bouraq Éditions, 1996).
[56] IS, *Epistles*, I.XIV.6.
[57] Ibid., I.XI.1.b.
[58] Ibid., I.XI.1.f.
[59] Ibid., I.X.

specific difference which is essential and belongs to the substance and secures the existence of this particular primary body.[60] Also, regarding these elements, their particularities are discovered by the method of the senses, where a part of their attributes are humidity, heath and solidity.[61] This type of relation between logic and astronomy reappears in reaching conclusions within the syllogism where their practical utility specifically underlines one of the imperative conditions.[62]

This relation is also exemplified by the nature of one of the two species of an individual, "this stone," in order to explain the character of their unique substance.[63] In what concerns stone and water, they are related to what is presented at the beginning of Aristotle's *Categories*, namely to homonyms. If in Aristotle's work we find this example of homonyms offered for "animal,"[64] the Brethren use in this sense the saying (*qawl*) "the eye of the water." The example that represents a stone is offered for words that have nothing in common, as such is the case of "stone" and "tree."[65] It should also be mentioned that taking into consideration their theory, "stone" would in this situation be a sign that is present in the soul and is expressed by the language of expression.

Transliteration	**Translation***	**Type of statement and its species**
an-nāru ḥārratun	Fire is warm	true statement, affirmation
laysat (i.e., an-nāru) *bi-ḥārratin*	Fire is not warm	false statement, negation
an-nāru bāridatun	Fire is cold	false statement, affirmation
an-nāru laysat bi-bāridatin	Fire is not cold	true statement, negation

* These examples can also be found in the translation of *Epistles of the Brethren of Purity*, 104.

As for fire, as a primary body,[66] its utilization is in relation with the statement and its species, it is a part of a saying (*qawl*) that is either an affirmation (*ʾīǧāb*) or a negation (*salb*), in correspondence with the true (*ṣidq*)

[60] Ibid., I.XI.3.e.
[61] Ibid., I.XIV.10.b.
[62] Ibid., I.XIII.1.k.
[63] Ibid., I.XIV.1.
[64] Aristotle, *Categories*, 1.
[65] IS, *Epistles*, I.X.6.c.
[66] Ibid., I.XII.

and the false (*kaḏb*). Some of these sayings are represented by particular names that relate to specific constituents of each of these quadrivial sciences.

Another example relevant in this particular case is represented by contraries, obverses and conversions, with the same component of the statement. In this case, in the following chart, there is a relation of contrariety between the two categorical propositions that correspond to the formulas *S a P* and *S e P,* taking into consideration Boethius's square of opposition. The example offered by the Brethren in this case is valid and sound.

Type of categorial proposition classified by quality and quantity	**Transliteration**	**Translation**	**Formula**
Universal affirmative	*kullu n-nāri ḥārratun*	Any fire is warm	SaP
Universal negative	*laysa šay'un minᵊ n-nīrāni ḥārratan*	There is nothing in fire that is warm	SeP

The logical operation of obversion can also be formed using a term that refers to one of the primary bodies and its characteristics. The formula *SeP* is valid and sound. The example can be followed in IS, *Epistles*, I, XII, m:

		Transliteration	**Translation**	**Formula**
Type of proposition classified according to quantity and quality	Universal affirmative	*kullu n-nāri ḥārratun*	Any fire is warm	SaP
Immediate inference	Obverse	*laysa šay'un minᵊ n-nīrāni bāridatan*	There is nothing in fire that is cold	SeP

They follow a classification of propositions taking into consideration quality (affirmative and negative) and quantity (universal and particular), where "fire" is a term that within these propositions plays the role of subject, while "warm" is the second term of the proposition, and plays the role of predicate.[67]

[67] IS, *Epistles*, I.XII.q.

In the following chart, the example illustrates a simple conversion that is not valid, because the law of the distribution of terms is not respected. In this way the formula

S a P $^{\text{conversion}}$ P a S is not a valid one.

		Translation	**Transliteration**	**Formula**
Type of proposition classified according to quantity and quality	Universal affirmative	*an-nāru ḥārratun*	Fire is warm	SaP
Immediate inference	Conversion	*al-ḥārratu nārun*	Warm is fire	PaS

What is known in relation to the art of astronomy is explained by the Brethren in light of the analogy with other arts, as is the case of poetry or desinential inflection. These analogies are reflected in the following scheme containing examples with associations made by this group of intellectuals:[68]

Balance and measure	**Art**	**What is known**
Prosody	Poetry	What is correct and what is not correct
Grammar	Desinential inflection	A linguistic mistake is distinguished from correctness of discourse
Astrolabe	Astronomy	Times/Moments
Ruler, compass, set square	Many arts	Uniformity

As for time, it can be interpreted in light of the vector of learning for the one who wants to improve his or her knowledge regarding any kind of science, one of the species of the genus is "the genus of time" exemplified as a group of "day, month, year, moment, duration."[69] This aspect of time reappears in what is described, in an Aristotelian perspective, as being

[68] Ibid., I.XIII.2.a.
[69] Ibid., I.XI.1.c.

a continuous quantity,[70] respectively "line, surface, body, place, time." Furthermore, the theory of the categories in relation to astronomy is revealed by exemplifying names such as: years, days, etc.[71]

Another theme in relation to astronomy is the problem of the cause and the caused thing: on whether it is day or night.[72] In this respect the fact that the permanent movement of the sphere and the order of the component of the universe depend on the process of its movement and the speed of its movement in a certain time is also relevant.[73]

Regarding the principle of anteriority, a related example refers to an anteriority that depends on the rank (*šaraf*) that is related to an order[74] within the universe. In this way, the problem of preexistence is exemplified within the sphere of astronomy. The following passage explains this kind of relation between logic and these sciences:

aš-šamsu ʾaqdamu minᵃ l-qamari. The sun is [situated] before the moon.[75]

5. Conclusion

The elements that are subordinated to the quadrivial sciences become constituents within a demonstration, constituents that can secure the value of truth. In fact, the elements subordinated to the quadrivial sciences are used within a demonstration in order to formulate a theory of logic that is entirely characterized by soundness. In this light, it is possible to describe a scheme that corresponds to a methodology of the utilization of these disciplines taking into consideration how a universal truth is expressed by applying mathematical principles to all the sciences. In fact, what influences this path in establishing an interconnection between all these sciences which subordinates species of knowledge are, in fact, some necessary conditions than can be derived from the corpus on logic of the Brethren of Purity: (i) following primary things existent in the intellect, (ii) respecting the scientific expres-

[70] Ibid., I.XI.1.h.
[71] Ibid.,
[72] Ibid., I.XIV.14.11.a.
[73] Ibid., I.XIV.17.b-c.
[74] "ʾanna taqadduma l-ʾašyāʾi baʿḍuhā ʿalā baʿḍin min ḫamsati ʾawǧahin ʾaḥaduhā bi-z-zamāni wᵃ-l-kawni kamā yuqālu ʾinna Mūsā ʾaqdamu min ʿAysā wᵃ-l-ʾāḫaru bi-ṭ-ṭabʿi kamā yuqālu l-ḥayawānu ʾaqdamu min l-ʾinsāni wᵃ-ṯ-ṯāliṯu bi-š-šarafi kamā yuqālu š-šamsu ʾaqdamu minᵃ l-qamari wᵃ r-rābiʿati bi-l-martabati kamā yuqālu fī l-ʿadadi ʾinna l-ḫamsata ʾaqdamu minᵃ s-sittati wᵃ-l-waǧhu l-ḫāmisu bi-ḏ-ḏāti ka-l-ʿillati wᵃ l-maʿlūli." Ibid., I.XI.2.
[75] Ibid., I.XI.2.

sion of the universal truth, (iii) establishing a structure of thinking having in mind a knowledge represented by elements of formal logic, (iv) establishing connections between all the offered examples in order to give a sort of statistics of how and why they are specifically used, and moreover how this fact contributes to a specific conception of the theory of logic.

This type of methodology makes us believe that when we speak about the importance of geometry, arithmetic, astronomy and music in relation to logic, within the corpus on logic of the Brethren of Purity, we can think about a theory of "applied sciences." The practical utility of such a theoretical perspective referring to the logic-quadrivium relation is a reflection of the nature of the examples that the Brethren are offering by creating a specific system of thinking that differentiates their logical perspective, where the quadrivium constitutes itself as an instrument in configuring a particular theory on logic.

Bibliography:

Al-Fārābī. "*fīmā yanbaġī 'an yuqaddama qabla ta'allumi l-falsafati / falsafati 'Arisṭū*." In *Documenta philosophiae Arabum*. Ex codd. mss. primus edidit, latine vertit. commentatio illustravit, typis Regiis arabicis, ed. Dr. Schmölders, 3–10 Augustus, Bonnae: in officina Francisci Baadeni, Prostat apud Eduardum Weber, 1836.

Al-Kindī, Ja'qūb Ben Isḥāq. "Der Liber introductorius in artem logicae demonstrationis." In *Beiträge zur Geschichte der Philosophie des Mittelalters, Texte und Untersuchungen*, eds. Clemens Baeumker and Georg Freih von Hertling, Band II, Heft V, 41–64, Münster: Druck und Verlag der Aschendorffschen Buchhandlung, 1897.

Az-Ziriklī, Khairaddīn, ed. *Rasā'il 'Iḫwān aṣ-Ṣafā' wa Ḫillān al-Wafā' I*. In *Islamic Philosophy* (4 vol.), ed. Fuat Sezgin. Frankfurt am Main: Institute for the History of Arabic – Islamic Science at the Johann Wolfgang Goethe University, 1999.

Baffioni, Carmela. "Euclides in the Rasā'il Ikhwān al-Ṣafā." *Études Orientales* 5–6 (1990): 58–68.

Baffioni, Carmela. "Il 'Liber introductorius in artem logicae demonstrationis': problemi storici e filologici." *Studi filosofici* 17 (1984): 69–90.

Baffioni, Carmela. "The Concept of Science and Its Legitimation in the Iḫwān al-Ṣafā'." *Oriente Moderno* 80, no. 3 (2000): 427–41. https://doi.org/10.1163/2213 8617-08003003.

Baffioni, Carmela. *Frammenti E Testimonianze di Autori Antichi Nelle Epistole Degli Ikhwān aṣ-Ṣafā'*, Istituto Italiano Per la Storia Antica: Roma, 1994.

Brethren of Purity. *Epistles of the Brethren of Purity, On Music, An Arabic Critical Edition and English Translation of Epistle 5*. Trans. and ed. Owen Wright. Oxford: Oxford University Press, 2010.

Brethren of Purity. *Epistles of the Brethern of Purity: On Logic: An Arabic Critical Edition and English Translation of Epistles 10–14*. Trans. and ed. by Carmela Baffioni. New York: Oxford University Press, 2010.

De Callatay, Godefroid. *Ikhwan as-Safa. Les revolutions et les cycles*. Beirut: Al-Bouraq, 1996.

De Callatay, Godefroid. "Encyclopaedism on the Fringe of Islamic Orthodoxy: The *Rasā'il Ikhwān al-Ṣafā'*, the *Rutbat al-ḥakīm* and the *Ghāyat al-ḥakīm* on the Division of Science." *Asiatische Studien* 71, no. 3 (2017): 857–77. https://doi.org/10.1515/asia-2017-0002.

Djebbar, Ahmed. *Une histoire de la science arabe, Entretiens avec Jean Rosmorduc*. Paris: Éditions du Seuil, 2001.

El-Bizri, Nader. "Epistolary Prolegomena: On Arithmetic and Geometry." In *The Ikhwān al-Ṣafā'and their Rasā'il. An Introduction*, ed. Nader El-Bizri, 180–213. New York: Oxford University Press, 2008.

Fraţii Purităţii (*'Iḫwān aṣ-Ṣafā'*). *Epistolele despre logică*, Trans. Crina Galiță. Iași: Polirom, 2019.

Marquet, Yves. *La philosophie des 'Iḫwān al-Ṣafā*. Paris: S. E. H. A., 1999.

Marquet, Yves. Les *"Frères de la Pureté" pythagoriciens de l'Islam. La marque du pythagorisme dans la redaction des Épîtres des Iḫwān aṣ- Ṣafā'*. Paris: S. E. H. A., 2006.

Wright, Owen. "Music and Musicology in the *Rasā'il. Ikhwān al-Ṣafā'*." In *The Ikhwān al-Ṣafā'and their Rasā'il. An Introduction*, ed. Nader El-Bizri, 214–47. New York: Oxford University Press, 2008.