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Avicenna's *Kitāb al-Burhān*, II.7 and its Latin Translation by Gundissalinus: Content and Text*

Introduction

The relevance of Dominicus Gundissalinus' *De divisione philosophiae* for (i) the development of Western classifications of the sciences in the 12th century, (ii) its significance for the Toledan translation movement, and (iii) its extensive dependence on a broad array of sources, Greek, Latin, Arabic, and Jewish, not only in style and method but also in content, are all well-established facts[1].

Equally uncontroversial is the importance for Gundissalinus' *De divisione philosophiae* of the famous *Summa Avicennae de convenientia et differentia subiectorum*, the Latin translation of chapter II.7 of the *Kitāb al-Burhān* (*Book of Demonstration*) of Avicenna's *Kitāb al-Šifāʾ*, which Gundissalinus inserts in his own original work as a watershed separating the treatment of the theoretical sciences and that of the practical sciences. The very position of this 'treatise within the treatise' is arguably a culmination of the project and offers a conceptual justification for the classification and analysis of the first part of the *De divisione*. Avicenna's text provides the main theoretical underpinnings for Gundissalinus' own model and classification. As the Arabic title (*fī ḫtilāf al-ʿulūm wa-štirākihā bi-qawl mufaṣṣal*)

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[1] On (i) and (iii), see the classic H. Hugonnard-Roche, *La classification des sciences de Gundissalinus et l'influence d'Avicenne*, in J. Jolivet, R. Rashed eds., *Études sur Avicenne*, Les Belles Lettres, Paris 1984 (Sciences et philosophies arabes. Études et reprises), pp. 41-75 ; cf. also A. Fidora, *Domingo Gundisalvo y la teoria de la ciencia arábigo-aristotélica*, EUNSA, Pamplona 2009 (Colección de pensamiento medieval y renacentista), pp. 227-243. On (ii), see C. Burnett, *The Coherence of the Arabic-Latin Translation Program in Toledo in the Twelfth Century*, « Science in Context », 14, 2001, pp. 249-288.

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of the original *Burhān* chapter suggests, the text offers a detailed account of the way in which the sciences differ from one another and of the way in which they share in common elements. The text, which is the only part of *Burhān* ever to be translated into Latin, is significant not only for the specific content of the classification(s) it presents and discusses but also, more generally, because it reflects Avicenna's overarching model of the interrelations between the sciences and their ontological justification at the confluence of metaphysics, logic, and epistemology. The basic building blocks of Avicenna's theory of science are put to use here to develop a complex architecture that ultimately rests on essentialist foundations and depends on his account of *per se* predication.

The purpose of this paper is (i) to present and discuss the structure of this synoptic treatment of the architecture of scientific knowledge, which aims to articulate in detail a number of dependence relations among different sciences, and (ii) to discuss a number of textual points, both in Avicenna's Arabic and in Gundissalinus' Latin, with a relevant role for the understanding of major doctrinal points as well as for the potential benefit of future editors of the two texts. The current editions already show how a close analysis of the relation between them can be mutually beneficial for an improved establishment of both, with interesting results that are oftentimes corroborated by independent witnesses not consulted by the editors (Afifī and Badawī for the two Arabic editions of *Burhān;* and Baur for the edition of Gundissalinus' Latin translation)[2].

[2] The two editions of the Arabic text are lacking in several respects. ʿAfifī's is based on only three manuscripts, but in spite of this is still superior in terms of understanding of the text to Badawī's earlier edition, which is based on a slightly larger set (five instead of three, two of which are also used by ʿAfifī). The manuscripts tradition of the *Burhān* has not been the object of a systematic study so far, but it seems clear that the two current editions are not critical in any sense of the term (there is no attempt to establish a *stemma codicum*, the number of witnesses is exceedingly small and arbitrarily chosen, variants are registered only on occasion and not systematically). That being said, the texts are at least a starting point, and an inevitable point of reference to be in dialogue with. For the Arabic text I use Avicenna, *Aš-Šifāʾ, al-Manṭiq, al-Burhān,* ed. A. ʿAfīfī, al-Maṭbaʿa al-amīriyya, Cairo 1956 [= henceforth *Burhān*]; cf. also Id., *Al-Burhān min Kitāb al-Shifāʾ,* ed. ʿA. Badawī, Maktabat al-nahḍa al-miṣriyya, Cairo 1954. For the Latin text, see Dominicus Gundissalinus, *De Divisione philosophiae*, ed. L. Baur, Aschendorff, Münster 1903 (Beiträge zur Geschichte der Philosophie des Mittelalters IV, 2-3). In 2007, Baur's edition of Gundissalinus's *De divisione philosophiae* was reprinted with facing German translation in A. Fidora, D. Werner, *Dominicus Gundissalinus : De divisione philosophiae : Lateinisch/Deutsch, Über die Einteilung der Philosophie*, Herder, Freiburg im Breisgau 2007. The latter is not a new critical edition, even though it incorporates some occasional corrections that take into account the Arabic text, which at the time of Baur's edition was still unedited. — Notable witnesses of the Arabic text are ms. Oxford, Bodleian Library, Pococke 121 (602H/1206); ms. Istanbul, Süleymaniye Kütüphanesi, Damad Ibrahim Paşa 822 (6th-7th/12th-13th c.); ms. Cairo, Maktabat al-Azhar, Beḫīt 331 falsafa (7th/13th c.); ms. Istanbul, Süleymaniye Kütüphanesi, Damad Ibrahim Paşa 824 (834H/1431); ms. Leiden, Golius 84 (881H/1476); ms. Leiden, Golius 4 (before

The first part of the paper is concerned with the philosophical analysis of *Burhān*, II.7 and provides a map for orientation in the chapter. The second part deals with textual issues and offers a set of preliminary remarks aiming to shed light on the transmission of the text and suggest potential emendations, while occasionally addressing Gundissalinus' style of translation or lexical usage. Unless otherwise noted, the Arabic text printed in the second part of the paper is from ʿAfīfī's edition while the Latin text is from Baur's edition.

I. Structure of *Burhān*, II.7

If one were to look at Avicenna's chapter in isolation, or just read it in the Latin version inlaid by Gundissalinus in his *De divisione philosophiae*, the text would perhaps give the impression of being a self-contained, standalone exercise of classification. This, however, would betray a misconception of its role in the general economy of *Burhān* and the relation of the latter to the *Posterior Analytics.* Even though the chapter is undoubtedly one of the areas of *Burhān* in which Avicenna most significantly alters the relative distribution of content of *An. Post.,* it fits perfectly in the general Aristotelian scheme and in the organization of that work. It is an expansion on a particularly important point that Avicenna deems it necessary to analyze more in depth. If it breaks the continuity of *An. Post.* it only does so insofar as it develops in a systematic way the transition between chapters A6 and A7, exploring in detail the relations between the Aristotelian complex of ideas around the notion of the subject of a science and that of per se predication, the ban on kind crossing and the explanatory and necessary character of scientific knowledge (two conditions that can only be satisfied if certain constraints on the admissible terms are met)[3].

Among Avicenna's most notable accomplishments in *Burhān*, II.7 those that stand out most prominently are: (i) an elaborate account of the various types of relations that may hold between pairs of scientific disciplines; (ii) a

10th/16th c.). For the Latin text of the *Summa* in the *De divisione*, an important witness not used by Baur is ms. Bodleian 679. I am following Jules Janssens (to whom I am grateful for generously sharing with me digital images of the chapter) in using this manuscript to verify the plausibility of some of the hypotheses below. This article, as will become clear in the second section, is very much indebted to J. Janssens, *Le* De divisione philosophiae *de Gundissalinus : quelques remarques préliminaires à une édition critique*, in E. Coda, C. Martini Bonadeo eds., *De l'Antiquité tardive au Moyen Âge. Études de logique aristotélicienne et de philosophie grecque, syriaque, arabe et latine offertes à Henri Hugonnard-Roche,* Vrin, Paris 2014 (Études Musulmanes vol. 44), pp. 559-570.

[3] Avicenna's interpretation of this network of Aristotelian notions is discussed in its philosophical significance in R. Strobino, *Per se, Inseparability, Containment, and Implication : Bridging the Gap between Avicenna's Theory of Demonstration and Logic of the Predicables*, « Oriens », 44, 2016, pp. 181-266.

theoretical justification of those relations, ultimately ontological in character, based on hierarchical relations between subjects or their attributes; and (iii) an identification of different kinds of subordination. In the following I will trace each of them to different sections of chapter.

A map of Burhān, II.7

Depending on the focus of one's analysis, different divisions of the text could be offered. For our purposes, and with a view to highlighting the classificatory aspects of Avicenna's discussion, the chapter naturally divides into two main parts: (I) the first focusing primarily on how sciences differ from one another (*iḫtilāf*, *diversitas*), (II) the second on how sciences may share in various elements (*ištirāk*, *communicatio*)[4].

(I) In the first part, Avicenna presents his fundamental classification of types of relations between different sciences based on the corresponding relations between the underlying subjects[5]. At the root of the division is a distinction between sciences that differ because [*a*] they have two distinct subjects or [*b*] because they treat one and the same subject in different ways. Section [*a*] contains the bulk of the text, devoted as it is to a full articulation of the primary divisions of scientific domains and to an analysis and categorization of the fundamental scientific disciplines and of their interrelations[6].

(II) The second part offers a complementary classification of the criteria of identity and distinctness for the sciences focusing on the ways in which sciences may have elements in common. It addresses the question from a different perspective — that of the canonical three elements of an Aristotelian science —, including not only the subjects, but also scientific principles and questions, i.e., the conclusions of scientific syllogisms (the theorems of a science). This second classification confirms (almost without exception) the taxonomy presented in the first part, and constitutes a digest of the results of the chapter summarizing

[4] The first part is by far the most extensive. It occupies almost ninety percent of the text and includes a digression on the status of metaphysics (first philosophy) with respect to the other sciences, its necessity, and its difference from dialectic and sophistics in subject, principles, and goals.

[5] The ontological underpinnings of Avicenna's ideas on distinctness, overlap, and subordination are treated systematically in Strobino, *Per se, Inseparability, Containment, and Implication* cit.

[6] In this framework, a large subsection [see *abab* in the outline below] addresses the peculiar status of metaphysics with respect to all other sciences. It features as the last point in the discussion of [*a*] and should accordingly be regarded as an in-depth analysis of a particularly significant case rather than as an independent section.

the basic types of relations that exist between the different sciences and the most representative cases that exemplify them.

In the first part, section [*a*], Avicenna presents two basic cases: one [*aa*] in which the subjects of two sciences do not overlap (*min ġayr mudāḫala*, *absque commixtione*), the other [*ab*] in which the subjects overlap (*maʿa mudāḫala*, *cum commixtione*). In the former case, the two sciences are just distinct[7]. The latter case encompasses a number of further sub-divisions that make it the most densely populated in the entire taxonomy. Two subjects may overlap [*aba*] fully, when one is more general than the other[8], or [*abb*] partially, each having something in common with the other as well as something distinct from the other[9].

When the subject of one science is more general than the subject of the other, this may be, according to Avicenna, in virtue of two fundamentally different types of generality (*ʿumūm, communicatio*)[10].

The more general subject stands to the less general subject either in a [*abaa*] genus-like relation or in an [*abab*] implicate-implicant relation of the kind holding between 'one' and 'being' and every other entity.

The first alternative [*abaa*] is then further differentiated into cases depending on whether the relation between the more general subject and the less general

[7] [*aa*] is exemplified by the relation between arithmetic and geometry, their respective subjects being distinct species of quantity, namely discrete as opposed to continuous quantity (number and extended magnitude).

[8] I translate the Avicennan term *mudāḫala* (Lat. *commixtio*) as 'overlap', suggesting that the intersection between two subjects is non-empty. I use the non-Avicennan expressions *full* (as opposed to *partial*) overlap to designate the cases in which the subject of one science does not exceed the subject of the other, which according to Avicenna occurs if the former is more general than the latter (in some sense of generality subject to further qualifications). Full overlap does not admit of residue.

[9] [*abb*] is exemplified by the relation between medicine and ethics. While medicine is concerned with the investigation of the human body and of its parts (which as we will see is in turn subordinated to physics), ethics investigates the rational soul and its practical faculties.

[10] While *commixtio* is consistently used for *mudāḫala* and is the broadest all-encompassing term, *communicatio* is used here for *ʿumūm* in the sense of 'generality' in constructions where Avicenna characterizes two different ways in which what is more general (*al-aʿamm*, or occasionally just *al-ʿāmm*; cf. *communius, magis commune*) stands to the more specific (*al-aḫaṣṣ*, *minus commune*). In the second part of the chapter, *communicare* and derivatives are also used to translate the Arabic *ištaraka*. At first sight, one would think that the original term for *ʿumūm* might have been *communitas* — a translation attested in the *Metaphysics* —, but the consistent use of *communicatio*/*communicat* in the lines that follow suggests that this is the correct reading, even if we have to assume that the term is being used in the unusual sense of 'generality' or 'commonness' to reflect what the Arabic means in the present context (see textual point (3.3) in the second part of the paper).

subject [*abaaa*] is a real genus-species relation[11] or [*abaab*] involves a range of possibilities in which the more general term is related to the less general term in the way a genus is related to an accident of a species. [*abaab*] encompasses one last range of nuances that Avicenna uses to characterize four different types of subordination not involving parthood and distinct from the implicate-implicant subordination singled out above[12]. It is in the case of full overlap between subjects that we encounter the most significant theoretical distinctions in Avicenna's first classificatory effort, particularly the one between 'being part' and 'being under'[13].

The differentiation of case [*abaa*] is due to the need of accounting for two different ways in which a more general subject can be narrowed down to determine the subject of a hierarchically lower science. The most obvious case is when we simply take a differentia and divide the genus (the more general subject) to obtain a species (the less general subject). In this case — and only in this case — the lower science is said to be *part* of the higher science, i.e., when the two subjects stand in a real genus-species relation.

If [*abaaa*] is a straightforward, useful relation to characterize the internal division of a science in its sub-fields, it fails to capture the complexity of a number of other representative pairs, and especially to account for oblique

[11] [*abaaa*] is exemplified by the relation between the study of pyramids (*maḫrūṭāt*, *pyramides*) as part of the study of solids (*muǧassamāt*, *corporea*), and that of solids as part of (a general theory of extended) magnitudes (*maqādīr*, *mensurae*), which presumably coincides, in Avicenna's view, with geometry (*handasa*) itself.

[12] The fifth kind of subordination corresponds to [*abab*]. It is not included by Avicenna in the list of four ways in which a subject is said to fall *under* another with respect to the first sense of generality because the ontological relation it captures is different (i.e., not a genus-like relation).

[13] An issue that lies beyond the scope of this study but is undoubtedly worthy of further investigation is Avicenna's debt towards Fārābī: what matters for our purposes is not so much the celebrated classification of the sciences in the *Iḥṣāʾ al-ʿulūm* (*Enumeration of the sciences*) but rather a tangle of insights from Fārābī's own *Kitāb al-Burhān,* which as I have argued elsewhere, constitutes an unsurprisingly relevant source for Avicenna (Strobino, *Per se, Inseparability, Containment, and Implication* cit., *passim*). In particular, the relevant distinction, which possibly echoes a subtext already to be found in Aristotle in connection with different forms of dependence, is one between the idea of a science being part of another science (*ǧuzʾ*) and that of a science being merely subordinated to another science (*taḥta*). The two types of dependence embody different ontological relations between their respective subjects. The distinction is articulated *in nuce* in Al-Fārābī, Abū Naṣr, *Kitāb al-Burhān wa-Kitāb šarāʾiṭ al-yaqīn,* edited by M. Faḫrī, Dār al-Mašriq, Beirut 1985, IV.1 (*Fī kayfiyyat istiʿmāl al-barāhīn wa-l-ḥudūd fī ṣ-ṣanāʾiʿ an-naẓariyya*), p. 64. In general, various examples used in *Burhān*, II.7 to illustrate different types of subordination (e.g., geometry and the study of pyramids; geometry and astronomy as the study of moving spheres) as well as the discussion of metaphysics and its relation to dialectic and sophistics all seem to be themes of direct Fārābiān derivation.

relations that cut across praedicamental lines[14]. The terrain is rugged and Avicenna's taxonomy aims to reflect this fact.

In this connection, [*abaab*] specifies a range of ways in which one can move from the more general to the less general by qualifying a subject not through a dividing differentia but rather through different kinds of accidents. Avicenna identifies four paradigmatic types exhibiting a progressively more tenuous ontological connection with the more general subject. The latter may be restricted (or 'made less general'; *muḫaṣṣaṣ, proprium; aḫaṣṣ, minus commune*)[15] by adding to it one of the following qualifying properties: (i) a *per se* accident; (ii) a foreign non-*per se* accident which is a disposition in the subject itself and not a mere relation; (iii) a foreign non-*per se* accident which is not a disposition in the subject itself but rather a mere relation; (iv) a foreign non-*per se* accident of a species of a different subject[16].

(i) is exemplified by the relation between physics and medicine: medicine is subordinated to physics because it investigates the subject of the part of physics that deals with the human body, insofar as the latter is qualified by *health* and *sickness*, which are two *per se* accidents of the human body.

(ii) is the case of geometry and astronomy: part of geometry is concerned with spheres (a species of solid), while astronomy deals with moving spheres, i.e., with spheres qualified by a certain property. The property in question is a foreign non-*per se* accident of the subject (in the technical sense of *Burhān*). The subject of astronomy (the study of moving spheres) is less general than the subject of geometry (even of the part of geometry that specifically deals with spheres) and hence the former science is subordinated to the latter. Astronomy is concerned with moving spheres as geometrical objects and with their geometrical relations, i.e., with moving spheres insofar as they are *spheres*, rather than insofar as they are characterized by motion[17].

[14] Avicenna is not committed to a violation of the Aristotelian ban on kind crossing. To the contrary, the complex machinery he sets up is precisely intended to preserve that principle and to specify the limits of its application in order to account for the phenomenon of subordination.

[15] In this context, *ḫ-ṣ-ṣ* and derivatives, unless otherwise noted, do not have the technical meaning of *proprium* as one of the five predicables from the *Isagoge*.

[16] In connection with this distinction, I shall leave aside the question of determining exactly the status of *hayʾa*, which I generically translate as 'disposition' for want of a better term and to reflect as closely as possible the Latin use of *dispositio*. What is clear is that Avicenna is keen to distinguish between (ii) and (iii) and that (iii) represents a kind of connection with the more general subject weaker than (ii).

[17] Avicenna returns on this point after presenting (iv) in order to clarify in what sense it differs from (ii) and also below in discussing [*bb*], namely the case of two sciences having the same subject but being distinct because one science treats the subject in one way, the other science in another way. In that context he explicitly claims that if this were not the case, astronomy would be subordinated to physics and not to geometry, reinforcing the point made here.

(iii) illustrates the kind of subordination holding between optics and geometry. In this case, the foreign non-*per se* accident attached to and qualifying the subject of the more general science (geometry and in particular the part of geometry dealing with lines) is the relation of lines to the eye and vision in general. For this reason optics cannot be a part of geometry, because it is concerned with lines as they relate to vision, but it is subordinated to geometry because it deals with properties and relations that fall within that discipline.

(iv) is the most complex case, where the qualifying accident is an accident of a species of a different subject (i.e., not of the subject of the superordinate science). Avicenna needs this relation in order to explain the ambivalent status of music, which on the one hand deals with 'objects' (notes) that are physical entities (sounds), but is concerned with them only insofar as an extrinsic set of features, i.e., certain numerical ratios, attach to them. Thus, the subject of music, which in and of itself is a species of the subject of physics, is qualified through an extrinsic accident and is investigated under that respect. For this reason, as noted above, music is not genuinely subordinated to physics but rather to another science, i.e., arithmetic, whose subject covers the foreign accident through which the subject of music is qualified. I refer to the discussion in the second section of the paper for a better appreciation of this point, but in presenting (iv), Avicenna explicitly argues that if we were to investigate the subject of music in itself rather than insofar as it is qualified by number, then music would be a part of physics (not even merely subordinated to it because we would be investigating a particular kind of physical entity).

Lest confusion arise as a result of the above association of accidents and subjects of a science, it should be kept in mind that the accidents called into play in (i)-(iv), be they *per se* or foreign, are qualifications determining the subject of the subordinate science. These are distinct from the characteristic *per se* accidents that, by Avicenna's own explicit, unsurprising admission, each science investigates in order to establish their holding of those subjects[18].

A summary of the differences between these four cases may help attenuate the potential impression of ad-hoc-ness of Avicenna's theoretical construction. The difference between (i) and (ii)-(iv) is straightforward: the first case is the only one in which the qualifying accident is a *per se* accident of the subject of the more general science; in the remaining three cases, the accident is foreign

[18] Thus, medicine seeks to establish the *per se* accidents of the human body insofar as it healthy or sick; astronomy the *per se* accidents of moving spheres *qua* spheres; optics the *per se* accidents of visual lines *qua* lines; and music the *per se* accidents of notes, i.e., consonance and dissonance (Ar. *ittifāq/iḫtilāf;* Lat. *convenientia/diversitas*).

non-*per se*, and in (iv) as opposed to (ii)-(iii) it is not a foreign accident directly attaching to the subject of the more general science. The difference between (ii) and (iii) lies in the weaker connection between the accident and the subject: in one case the accident is something that occurs to the subject not in a merely relational sense, while in the other case Avicenna seems to think that the connection is purely relational (the moving spheres are moving objects, while the consideration of lines insofar as they relate to vision is somehow just a matter of investigating them under a certain respect, not in connection with some property that actually inheres in them).

Two further differences are explicitly addressed by Avicenna. First, cases (i)-(iii) differ from case (iv) in that in the former the subject of the more general science is always predicated of the subject of the less general science (because the subject of the less general science is nothing other than the subject of the more general science plus a qualification which directly determines it): thus, trivially, human bodies insofar as they are sick or healthy are (human) bodies; moving spheres are spheres; and visual lines are lines. Not so in the case of arithmetic and music, because notes are not numbers or numerical ratios. Secondly, (ii) and (iv) represent two genuinely distinct cases because in (ii) the relation of subordination obtains with respect to the subject (moving *spheres*) while in (iv) it obtains with respect to the qualifying accident (notes characterized by *numerical* relations)[19].

Resuming the division, case [*aba*] in which the subject of one science is more general than the subject of the other science has two main divisions depending on the kind of generality at stake. After discussing in detail what I have called the genus-like type, Avicenna moves on to the second type, whose treatment had been explicitly deferred at the beginning of the chapter to a later stage of the analysis.

The second type of generality (*ʿumūm*) is the one connecting an implicate (*lāzim*)[20] and that of which the implicate is an implicate, and more specifically corresponds to the relation holding between the notions of 'one' and 'being' and everything else. I shall not cover this case in detail here because the relevant issues are discussed in the second part of the paper. Suffice it to say that

[19] In (ii) the science of moving spheres is subordinated to the science of spheres, not to the science of the accident that qualifies the spheres (motion), while in (iv) music is subordinated to the science that treats the accident (arithmetic), not to the science (physics) of that which is qualified by it (notes as specific types of sounds). On the relation between note, sound, and number see also Avicenna's *Kitāb al-mūsīqā*, where the necessary background is discussed more extensively and the brief references in *Burhān*, II.7 are corroborated by independent evidence.

[20] It will be useful to note that the traditional term used to translate *lāzim* in Latin is *concomitans* or simply *comitans*. I will return to the point below to mention a textual issue already identified by JANSSENS, *Le* De divisione philosophiae *de Gundissalinus* cit., p. 563.

Avicenna introduces this category to serve an important purpose, namely to accommodate the case of metaphysics (or first philosophy) and its relation to all other sciences.

In this context, Avicenna does three things. First, he cursorily lists various features that characterize the status of metaphysics with respect to the other sciences, most notably the fact that the other sciences are all subordinated to metaphysics but not part of it and that no subject is more general than the subject of metaphysics. Secondly, he gives a brief argument for the necessity of a science that is more general than all other sciences, such that the principles of the latter are certified in the former, and argues for the conditional character of the principles of all subordinate sciences[21]. Thirdly, he explains in what ways two disciplines such as dialectic and sophistics, which might potentially claim a similar status because of their wide scope of application, fail to meet the standards of metaphysics. The three disciplines differ with respect to their subject, principles, and goals[22].

The first part of *Burhān*, II.7, after the extensive analysis of [*a*] the ways in which sciences differ when their subjects are distinct, concludes the classification with the other horn of the initial division, devoted to [*b*] the way in which sciences differ when their subject is one and the same (*iḫtilāf al-ʿulūm al-muttafiqa fī l-mawḍūʿ*). Avicenna argues that this may occur in two ways. In the first case [*ba*] one science investigates the subject without qualification and the other under a particular respect. In the second case [*bb*] both treat their common subject under different respects. The division serves the major purpose of enabling Avicenna to account for the difference between two significant pairs: the relation between medicine and physics on the one hand, and that between astronomy and physics on the other. As noted above, the subject of medicine may seem to coincide with the subject of a particular branch of physics dealing with the human body[23]. But according of Avicenna, medicine treats the human body *as* qualified by the *per se* accidents of health and sickness, which is an altogether different endeavor from investigating the properties of the human body as such, i.e., without qualification. The latter is the prerogative of (a part of) physics.

[21] By conditional character Avicenna means that the logical form of each principle in a science other than metaphysics should be that of a conditional statement — 'hypothetical conditional' (*šarṭī muttaṣil*) in his technical terminology) — whose antecedent is proven in metaphysics. Some such principles have typically the form of statements in which the antecedent purports to establish the existence of a subject, e.g., if there are such-and-such physical entities, then *p*, where *p* is a theorem of physics in which a per se accident of the subject is proven to hold of the subject itself.

[22] See A. Bertolacci, *The Reception of Aristotle's* Metaphysics *in Avicenna's* Kitāb al-Šifāʾ, Brill, Leiden 2006, pp. 267 and 233-234.

[23] Medicine and physics were used to illustrate the first type of subordination (i) discussed above.

The other case offers an opportunity to expand on the relation of subordination between astronomy and geometry and to clarify why the former falls under the latter and not under physics. For it may seem natural to assume that astronomy and a certain branch of physics (corresponding to the *De caelo*) have one and the same subject, namely the spherical shape of the universe. Yet, according to Avicenna the two sciences investigate this subject in different respects. Astronomy insofar as it is a spherical object and with respect to quantity (which is why it is subordinated to geometry), physics insofar as it has a peculiar principle of motion[24]. The subject of astronomy is the spherical body of the universe insofar as it has quantity, and astronomy as a science investigates the properties that necessarily follow from it in this respect; the subject of (the relevant part of) physics is the spherical body of the universe insofar as it has a particular kind of motion, and physics as a science investigates the properties that necessarily follow from it in this other respect. The two sciences approach the sphericity of the universe from distinct perspectives. In one case as a result of the impossibility of it having another shape because of the particular kind of motion that characterizes it; in the other case for its purely geometrical properties.

The second part of *Burhān*, II.7, which corresponds to about a tenth of the whole chapter, summarizes the results of the elaborate division carried out in the first part but from a complementary perspective. To conclude his analysis of the possible relations between different sciences, Avicenna introduces a second, independent taxonomy driven by the idea of establishing how different sciences relate to one another with respect the three elements that typically define the perimeter of (Aristotelian) scientific disciplines: (1) principles, (2) subjects, and (3) scientific questions (the theorems of a science in which salient properties, or accidents *per se* of the subject, are demonstratively proven to hold of the subject)[25].

The first criterion encompasses three main cases, excluding the trivial case of common axioms (such as the principle that when equals are subtracted from equals, the remainders are equal)[26]. Two sciences may be related to each other with respect to principles in such a way that the shared[27] principles [1.1] are of

[24] Astronomy deals with the moving spheres insofar as they are spheres and not insofar as they are in motion, i.e., not with respect to the principle of their motion.

[25] In order to avoid confusion, I use Roman numerals to label the elements of the second classification (as opposed to lowercase letters for the elements of the first classification). Notwithstanding the cost of an apparently unnecessary proliferation of tags, this approach should make it easier to see more clearly and immediately the parallels between the two taxonomies.

[26] The principle is in fact common not to all sciences but more appropriately to those that deal with quantity. I return on this point in the second part of the paper, text 18.

[27] The abstract term for sharing in (principles, subjects or questions) in this section is *šarika* (cf. Latin *communicatio*). This notion should be kept distinct from that of *ʿumūm* (also *communicatio*) discussed above.

the same rank[28], [1.2] in one science the principles are prior and in the other posterior, or [1.3] what is a principle in one science is a scientific question (a theorem) in the other science. The last case is subject to a further subdivision. When one and the same statement is a principle in one science and a question in another science, Avicenna distinguishes between [1.3.1] the case in which the two sciences are different because the subject of one is more general than the subject of the other, and [1.3.2] the case in which the two sciences are different without the subject of one being more general than the subject of the other.

When one of the two subjects is more general and the other less general, one and the same claim may be either [1.3.1.1] a scientific question proven in the more general, superordinate science and a principle assumed in the less general, subordinate science or [1.3.1.2] a scientific question proven in the latter and assumed in the former[29]. These two sub-cases account, according to Avicenna, for a distinction between what is a real principle (*mabdaʾ ḥaqīqī, principium verum*) and what is only a principle according to us (*mabdaʾ bi-l-qiyās ilaynā*).

[1.1] and [1.3.2] are interestingly illustrated by the same example, namely the case of arithmetic and geometry. It is easy to see the reason for [1.1], which corresponds to [*aa*] in the first classification. There is no overlap in subject between arithmetic and geometry, and their principles are in a sense at the same level because they deal with different kinds of quantities.

In light of this, however, the case of [1.3.2] seems to become problematic because it covers situations in which certain claims are principles in one science and questions in another in spite of there not being a hierarchical ranking between those sciences. This is compatible with the characteristic trait of [1.1] (the principles being of one and the same rank) but still leaves a problem unsolved, namely how something can be genuinely subject to proof in one science and assumed in another science, without there being a hierarchical arrangement of any sort between the sciences in question.

The example offered by Avicenna to illustrate this horn of the division may be the very reason he feels pressured to introduce it in the first place, namely in order to find room in his taxonomy for the use, in the tenth book of Euclid's *Elements,* of arithmetic theorems (proven in some of the earlier books, presumably *Elements* VII-IX)[30] as principles for geometry theorems[31].

[28] The Arabic expression *ʿalà martaba wāḥida* captures the idea that the principles of two sciences are on a par with each other as opposed to being ranked according to priority and posteriority.

[29] The distinction between more general (*aʿamm*) and more proper/less general (*aḫaṣṣ*) subjects that was extensively used in the first part is paralleled here by a distinction between higher (*aʿlà, altior*) and lower (*asfal, inferior*) sciences.

[30] Avicenna collectively refers to them as the treatises on number (Ar. *fī l-maqālāt al-ʿadadiyya;* Lat. *in libro de numero*).

[31] The problem is that in [*aa*] Avicenna seems to deny that there is any overlap between the subjects of arithmetic and geometry while [1.3.2] concludes with the claim that the use of

[1.2] is exemplified by the case of geometry and optics as well as by that of arithmetic and music. The use of these two examples is unsurprisingly compatible with the first classification, given that they are both sub-cases of subordination without parthood (corresponding to [*abaab* (iii)] and [*abaab* (iv)] above), in spite of the fact that in the first classification Avicenna treats the two pairs separately as a result of a more fine-grained distinction between the types of subjects involved.

The second criterion, namely commonness of questions, is only briefly mentioned in order to specify a necessary condition, namely that there be a shared predicate which is demonstratively proven to hold of the subject of the sciences under consideration. When this is the case, however, a deeper connection must be in place, because two sciences could not be such that one and the same property is predicated of their subjects unless those subjects are identical or overlap in one of the ways outlined above. If the two subjects were entirely distinct, there could be no sharing of predicates of scientific questions in the first place.

This brings Avicenna to the third and most important criterion, namely the sharing of subjects, which concludes the second classification and the chapter as a whole.

It is worth quoting the phrase with which Avicenna introduces the last member of the division: « the primary and most fundamental [kind of] sharing is the sharing of the subject in one of the three aforementioned ways » (Ar. *aš-šarika al-awwaliyya al-aṣliyya* [...] *huwa š-šarika fī l-mawḍū ʿ ʿalà waǧh min al-wuǧūh al-maḏkūra;* Lat. *communicatio igitur prima et radicabilis* [...] *est communicatio in subiecto secundum aliquem modorum qui predicti sunt*).

The various divisions laid out in the first classification are grouped by Avicenna in the second classification under three basic headings. Two sciences may have something in common, as far as their subjects are concerned, either because [3.1] the subject of one science is more general than the subject of the other, because [3.2] the two subjects partially overlap, or because [3.3] one and the same subject is addressed by one science in one respect and by the other science in another respect. Each of these three types contains or coincides with one of the cases presented in the first classification, as is confirmed by the various pairs advocated by Avicenna as illustrations of this second division.

[3.1] corresponds to the largest group in the first list, namely [*aba*], which covered the two ways in which sciences are related when the subject of one is more general than the subject of the other (the genus-like relation and the implicant-implicate relation for the case of 'one' and 'being'). Avicenna interestingly uses two complementary pairs as examples to illustrate the two basic cases of hierarchical

arithmetical theorems as geometrical principles « is not possible if there is no sharing of (i) a subject or (ii) the genus of a subject ». (i) would be in tension with the previous claim, while (ii) would seem to recast the relation in rather different terms, i.e., with respect to a *third* more general science dealing with quantity as such.

dependence discussed in the first part of the chapter, namely parthood and subordination (without parthood). The choice of two distinct pairs — geometry and the study of pyramids on the one hand, physics and medicine on the other (see [*abaaa*] and [*abaab* (i)] above) — as representative examples of the corresponding relations of 'being part' and 'being under' can hardly be coincidental. In fact, both examples fall within the internal subdivision of the first type of *ʿumūm* (the genus-like relation) but, as noted above, the case of subordination without parthood also applies to the second kind of *ʿumūm*, i.e., the relation of all other sciences to metaphysics: the latter is therefore also captured by [3.1].

[3.2] coincides with [*abb*], namely with the case of partial overlap between the subjects of two sciences, and is exemplified, as above, by the relation between medicine and ethics, each of which has something in common with the other and something proper to itself[32].

Thus, [3.1] and [3.2] jointly exhaust [*ab*] the case of overlap between subjects. [*aa*], the case of non-overlap (exemplified in the first classification by the relation of arithmetic and geometry), is not discussed in the second classification (in connection with the subject) because what is at stake here are cases in which something is shared, and trivially nothing is shared with respect to the subject when there is no overlap (Ar. *mudāḫala*; Lat. *communicatio*) between subjects[33]. But [*aa*]-[*ab*] jointly account for all possible ways in which sciences may [*a*] differ with respect to multiple subjects.

What remains to be determined is therefore whether something in the second classification corresponds to [*b*], namely the case of sciences differing with respect to one and the same subject.

This task is accomplished by [3.3] which covers circumstances in which the subject is one and the same but is investigated under different respects by different sciences, as is the case in astronomy and physics. The example corresponds in fact to [*bb*], one of the two sub-cases discussed by Avicenna (the other case, in which one science deals with the subject without qualification and the other with the subject under a particular respect is not mentioned in the second classification, but presumably falls under [3.3] as well).

To summarize the content of the two classifications and, more generally, to provide a map of the chapter, I offer below a schematic reconstruction of its structure[34]. Assuming that α and β are the subjects of two sciences, the following are all possible relations outlined by Avicenna:

[32] See n. 9.

[33] Pending a definitive adjudication of the issue raised in n. 31.

[34] The outline follows for the most part the order of the original text with only a few exceptions (e.g., [*abb*] below, which occurs in the text earlier than the current layout would suggest) due to the need of presenting the division as compellingly as possible. The order can be reconstructed on the basis of the references I provide to both Arabic and Latin text for each individual element in the division and section in the chapter.

[*Part* I. *First classification : difference with respect to subject(s)*][35]

[*a*] Difference with respect to multiple subjects[36]

[*aa*] *α* and β do not overlap[37]
geometry - arithmetic

[*ab*] *α* and β overlap[38]

[*aba*] *α* is more general than β[39]

[*abaa*] first type of *ʿumūm* (genus-like relation)[40]

[*abaaa*] *α* is a genus and β is a species of *α* (parthood, *pars*, *ǧuzʾ*)
(*solid*) *geometry - study of pyramids*[41]

[*abaab*] *α* is a genus and β is a species qualified by an accident γ
(subordination, *sub*, *taḥta*)[42]

The qualifying accident may be

(i) an accident *per se* of β
physics - medicine (body - human body insofar as it is *healthy* or *sick*)[43]
(ii) a foreign non-*per se* accident of β (a disposition of the subject itself, not a purely relational property)
geometry - astronomy (extended magnitude - moving *spheres*)[44]
(iii) a foreign non-*per se* accident of β (not a disposition of the subject itself but a purely relational property)
geometry - optics (extended magnitude - lines insofar as they relate to *vision*)[45]
(iv) a foreign non-*per se* accident of β where the latter is a species of a different subject δ and is investigated only insofar at γ holds of it
arithmetic - music (number - notes as *numerical* ratios)[46]

[35] *Burhān*, II.7, pp. 162.1 - 167.10 ; *De divisione philosophiae*, pp. 124.14 - 132.8.
[36] *Burhān*, II.7, pp. 162.2 - 166.15 ; *De divisione philosophiae*, pp. 124.14 - 131.3.
[37] *Burhān*, II.7, p. 162.2-4 ; *De divisione philosophiae*, p. 124.14-18.
[38] *Burhān*, II.7, pp. 162.4 - 166.15 ; *De divisione philosophiae*, pp. 124.18 - 131.3.
[39] Introduced at *Burhān*, II.7, p. 162.4-5 ; *De divisione philosophiae*, p. 124.20-22 ; properly discussed at *Burhān*, II.7, pp. 162.10 - 166.15 ; *De divisione philosophiae*, pp. 125.4 - 131.3.
[40] *Burhān*, II.7, pp. 162.10 - 165.2 ; *De divisione philosophiae*, pp. 125.4 - 128.25.
[41] *Burhān*, II.7, p. 162.11-13 ; *De divisione philosophiae*, p. 125.8-11.
[42] *Burhān*, II.7, pp. 162.13 - 165.2 ; *De divisione philosophiae*, pp. 125.11 - 128.25.
[43] *Burhān*, II.7, p. 163.14-20 ; *De divisione philosophiae*, pp. 126.20 - 127.4.
[44] *Burhān*, II.7, pp. 163.21 - 164.2 ; *De divisione philosophiae*, pp. 127.5 - 127.12.
[45] *Burhān*, II.7, p. 164.3-7 ; *De divisione philosophiae*, p. 127.13-24.
[46] *Burhān*, II.7, pp. 164.10 - 165.2 ; *De divisione philosophiae*, p. 128.1-25. Notes are a species of the subject of physics (sounds) ; but music investigates them only insofar as they express numerical ratios, and hence music is subordinated to arithmetic, not to physics. The difference between (ii) and (iv) is

[*abab*] second type of ʿ*umūm* : implicate (one and being) (subordination)[47]

Digression on metaphysics (first philosophy)

[Necessity of a science more general than all other sciences ; the principles of the latter are certified in that science ; conditional character of the principles of all subordinate sciences][48]

[Difference between first philosophy, dialectic and sophistics in (i) subject, (ii) principles, and (iii) goals][49]

[*abb*] α and β partially overlap (they have something in common and something distinct)
medicine - *ethics*[50]

[*b*] Difference with respect to one and the same subject[51]

[*ba*] one science investigates the subject absolutely, the other in some respect
physics[52] - *medicine* (body - human body insofar as it is *healthy* or *sick*)

[*bb*] one science treats the subject in way, the other science in another way
astronomy - *physics*[53]

that, in the former case, the subordinate science does not fall under the science that investigates the accident qualifying the more general subject, but rather under the science that investigates that more general subject. In the latter case, by contrast, the subordinate science falls under the science that investigates the qualifying accident. It should be noted that at the beginning of the chapter, when Avicenna draws the distinction between cases where there is a genuine genus-species relation and cases where the more general subject is a genus for an accident of a species, he illustrates the latter with the pair physics-music. This, however, is not in contradiction with what he later says about arithmetic and music. In fact, in order to identify the subject of music (numerical ratios holding between certain sounds), we need to appeal indirectly to the subject of physics, of which sounds are a species. That Avicenna is aware of the peculiar status of this relation is shown by his own insistence on the necessity to keep the two pairs distinct. Yet, the subject of music is related to that of physics in the way an accident of a species is related to the genus.

[47] Introduced at *Burhān*, II.7, p. 162.10-11 ; *De divisione philosophiae*, p. 125.4-8 ; properly discussed at *Burhān*, II.7, pp. 165.3 - 166.15 ; *De divisione philosophiae*, pp. 128.1 - 131.3.

[48] *Burhān*, II.7, p. 165.11-16 ; *De divisione philosophiae*, pp. 129.17 - 130.1.

[49] *Burhān*, II.7, pp. 165.17 - 166.15 ; *De divisione philosophiae*, pp. 130.1 - 131.3.

[50] *Burhān*, II.7, p. 162.6-9 ; *De divisione philosophiae*, pp. 124.22 - 125.3.

[51] *Burhān*, II.7, pp. 166.16 - 167.10 ; *De divisione philosophiae*, pp. 131.4 - 132.7.

[52] I.e., the part of physics that deals with human beings (it is unclear whether Avicenna collectively means the ideal union of texts that deal with human beings, encompassing at least the relevant parts of *De anima* and *De animalibus*, or something more specific).

[53] Avicenna almost certainly is referring in this case to the section of physics corresponding to the *De caelo*. The analysis of this point hinges entirely on the fact that astronomy and (this part of) physics both deal with the shape of the universe. Note that this set of remarks is not incompatible with what Avicenna contends above, namely that astronomy is subordinate to geometry and not

[***Part* II. *Second classification : sciences sharing in principles, subjects, and questions***][54]

[1] principles[55]

[1.1] equal in rank[56]
geometry - arithmetic

[1.2] prior in the more general science, posterior in the less general science
geometry - optics ; *arithmetic - music*

[1.3] something is a principle in one science and a question in the other

[1.3.1] subjects are distinct, one being more general than the other

[1.3.1.1] question proven in the higher science, principle assumed in the lower science
[1.3.1.2] question proven in the lower science, principle assumed in the higher science

[1.3.2] subjects are distinct, neither being more general than the other : questions proven in one science are posited as principles in the other[57]
geometry - arithmetic

[2] questions : sharing the predicate term (a shared subject is a necessary condition)[58]

[3] subjects[59]

[3.1] one subject is more general than the other
physics - medicine ; *geometry - study of pyramids*

[3.2] subjects have something in common and something distinct
medicine - ethics

[3.3] subject is one but investigated in different respects
astronomy - physics

to physics. This point is in fact the natural complement of the previous one. After showing that astronomy is subordinate to geometry because it is concerned with moving *spheres*, Avicenna goes on to explain that astronomy and a certain area of physics are distinct in spite of the fact that they are about the same subject : this is because astronomy only investigates the body of the universe with regard to its purely geometrical properties, while physics investigates it with respect to motion.

[54] *Burhān*, II.7, pp. 167.11 - 168.16 ; *De divisione philosophiae*, pp. 132.8 - 133.24.

[55] *Burhān*, II.7, pp. 167.15 - 168.7 ; *De divisione philosophiae*, p. 133.7-11.

[56] Avicenna gives as an example for this group the principle that equals being subtracted from equals result in equals, which is not a principle of geometry more than it is a principle of arithmetic (or conversely). In this respect the two sciences are on a par.

[57] This type is explicitly illustrated by a reference to the tenth book of the *Elements*.

[58] *Burhān*, II.7, p. 168.8-9 ; *De divisione philosophiae*, p. 133.7-11.

[59] *Burhān*, II.7, p. 168.10-16 ; *De divisione philosophiae*, p. 133.11-24.

This concludes Avicenna's analysis of the different ways in which sciences may or may not have elements in common. The question of the criteria of identity and distinctness for the sciences is unsurprisingly rooted in the *Posterior Analytics*, not just in virtue of a general conceptual framework where an ontological division of the underlying subjects demarcates the epistemological space of inquiry into distinct domains: this much is in fact also addressed, if only briefly, by Aristotle in A28[60]. Avicenna's treatment of this subject, however, brings it to an entirely different level. While being ultimately inspired by similar principles, it provides an original and much more systematic analysis, illustrated exhaustively, case by case, by a variety of examples that supposedly cover all the basic relations between the most fundamental branches of scientific knowledge.

II. Textual remarks

With this map of *Burhān*, II.7 at hand, we can now turn to a number of critical textual issues, whose significance will hopefully be easier to appreciate against the conceptual background developed thus far. As I pointed out above, the chapter is relevant not only for its philosophical content but also interesting from a textual standpoint, and this in two ways: the Arabic text contributes to a better understanding and several potential improvements of the Latin. Conversely, the latter occasionally sheds light on difficult points of the Arabic as available in current printings and seems indirectly to belong to a specific branch in the transmission of *Burhān*.

The textual remarks below include a number of insights that have already appeared in print and which were put forward first by Hugonnard-Roche and, especially, Janssens[61].

Relevant portions of the text are underlined both in Arabic and in Latin to facilitate their identification.

1. *Incipit* (*Burhān* II.7, p. 162.1-2; *De divisione*, p. 124.11-13)

نقول إن اختلاف العلوم الحقيقية هو بسبب موضوعاتها وذلك السبب إما اختلاف الموضوعات و إما اختلاف موضوع

[60] On the notion of subordination in Aristotle, see R. McKirahan, *Aristotle's Subordinate Sciences*, « British Journal for the History of Science », 11, 3, 1978, pp. 197-220.

[61] See Hugonnard-Roche, *La classification des sciences de Gundissalinus* cit. and Janssens, *Le* De divisione philosophiae *de Gundissalinus* cit. The results are presented here not for the sake of pedantry but to group them in a single source.

> « Dicam quod causa diversitatis ceterarum scientiarum est subiecta [*for* substantia *in Baur*] earum. Illa autem causa vel est propter diversitatem subiectorum vel propter diversitatem unius subiecti ».

(1.1) In connection with the *incipit* of the chapter, both Hugonnard-Roche and Janssens already noted that *substantia* in Baur's edition stands in need of correction. *Subiecta* is not only required by the sense of the passage : the variant is attested by one of the manuscript used by Baur (Digby 76, *siglum* D in his apparatus) and also supported by Oxford, Bodleian ms. 675.

Furthermore, it is unambiguously supported by the Arabic *mawḍūʿātihā*[62].

(1.2) Janssens suggests *certarum* as a potentially better reading than *caeterarum* (contingent on further textual evidence from the manuscript tradition of the *De divisione*). The variant is textually easy to justify in virtue of the similarity of the two Latin words and supported by the Arabic *ḥaqīqiyya* with a significant gain in sense. The position of the chapter in the *De divisione* hardly requires, and is possibly even inconsistent with, what *caeterarum* implies ; for what is at stake here is the status of scientific disciplines aiming at certitude, i.e., those discussed in the first part of the *De divisione*, not of a putative group of *other* sciences.

(1.3) Janssens notes that ms. Bodleian 675 reads *dicimus* instead of Baur's *dicam,* a variant that would more closely correspond to the Arabic *naqūlu*[63].

(1.4) One last point concerns the term *unius.* The Arabic *wāḥid* is found in Badawī's text, which registers its omission in ms. Cairo, Al-Azhar, Beḫīt 331, and absent in ʿAfīfī's text, which signals its presence in ms. Istanbul, Damad 824. This fact, which in and of itself may be of little importance, is one of a number of instances showing agreement between the Latin and what looks like a specific branch in the transmission of the Arabic (including at least ms. Istanbul Damad 824 and ms. Leiden Golius 4).

2. 'Scientific' or 'Practical' (علمي\عملي) ? (*Burhān*, II.7, p. 162.8-9 ; *De divisione*, pp. 124.25 - 125.3)

ثم يختص الطب بالنظر في جسد الإنسان وأعضائه ويختص علم الأخلاق بالنظر في النفس الناطقة وقواها العملية

[62] As noted by both Hugonnard-Roche and Janssens, the first required emendation concerns in fact the very title of the chapter in Latin : *Summa Avicennae de convenientia et differentia subiectorum*, instead of the *scientiarum* for the Arabic *ʿulūm* (the emendation is confirmed by ms. Bodleian 679, fol. 16v ; cf. Janssens, *Le* De divisione philosophiae *de Gundissalinus* cit., p. 562).

[63] See Janssens, *Le* De divisione philosophiae *de Gundissalinus* cit., p. 563.

> « Deinde appropriatur medicinae considerare humanum corpus et eius membra, ethicae vero appropriatur considerare animam rationalem et eius vires scientiales ».

(2.1) In discussing the case of medicine and ethics, Avicenna points out that the latter addresses the human body with regard to the rational soul and its practical faculties (*quwātihā ʿamaliyya*). There is little doubt that, at least in principle, the Latin text ought to read *practicas* instead of *scientiales* (Baur, p. 125.3), if it is to be at all a translation of the Arabic *ʿamaliyya.* However, given that *ʿamaliyya* is easily confused with *ʿilmiyya* (cf. Latin *scientiales*), Janssens argues that *scientiales* should be retained, in spite of it being evidently in contradiction with the Arabic (p. 564), warning against the temptation of hyper-correcting. The erroneous reading could easily have crept in the text used by Gundissalinus due to a straightforward scribal error in the transmission of the Arabic or as a result of the translator's own misreading. The point deserves to be explicitly addressed and mentioned by a future critical edition of the Latin text.

3. Kinds of *ʿumūm* (*communicatio*) (*Burhān*, II.7, p. 162.10-11 ; *De divisione*, p. 125.4-7)

وأما القسم الأول من هذين القسمين فإما أن يكون العام فيه عمومه للخاص عموم الجنس أو عموم اللوازم مثل عموم الواجد والموجود

> « Primum autem membrum huius divisionis, scilicet cum communius communicat cum minus communi, aut communicat ut genus cum specie aut communicat ut communicans sicut est communicatio unius et entis ».

The context of this passage is Avicenna's distinction between the two senses of generality (*ʿumūm*) that determine the two main sub-types of case [*aba*] (where the subject of a science is more general than the subject of the other). Either the subject of the superordinate science stands to the subject of the subordinate science in a way that is identical or analogous to the way in which a genus stands to its species (or to an accident of the species), or the subject of the superordinate science stands to the subject of the subordinate science in the way 'one' and 'being' stand to every other thing. The latter is a canonical claim in Avicenna's metaphysics, frequently expressed in terms of a relation between something and its implicates (*lawāzim*), which is not a genus-like relation.

The Latin translation is paraphrastic and does not reflect the idiosyncrasy of the Arabic syntax. The Arabic text literally reads: « The first of these two divisions is [such that] in it either (i) the generality of the [more] general [*viz.* the subject of the superordinate science] to the [more] specific [*viz.* the subject of the subordinate science] is the generality of the genus or (ii) [it is] the generality of the implicates, like one and being ».

(3.1) The editions of the Arabic text do not have anything corresponding to the Latin *cum specie.* Janssens notes that the variant may be explained as an authorial intervention by Gundissalinus aimed at clarifying the text. It is worth noting that the addition may also be inspired by a closely related passage (see text 4) where Avicenna uses the parallel expression *wa-ammā llaḏī ʿumūmuhū fīhi ʿumūm al-ǧins li-n-nawʿ*.

(3.2) *Communicans*, as already noted by Janssens, should in fact be *comitantes* (Janssens) or *concomitantes* ('implicate', 'concomitant'), for the Arabic *lawāzim* (sing. *lāzim*), a crucial technical term in Avicenna's metaphysics and logic, which indicates a relations of inseparability, typically distinct from and weaker than the relation of being a constituent (the latter is the type of relation held by genus and differentia with regard to the species). Thus, 'one' and 'being' are *lawāzim* of all things without being their constituents. The reading is supported by witnesses in the Latin transmission of the text not used by Baur (cf. Janssens, p. 563: ms. Vat. Reg. 1870 reads *ut comitans*, fol. 15v and ms. Bodleian 679, fol. 16v, *ut comicans*).

(3.3) *Communicatio* and cognates are semantically assimilated to *commune/communitas* (for *ʿumūm*) and used here in the sense of 'being general' or 'being common', to distinguish two ways in which something may be more general than something else: one is the way in which the genus is (more) general (or common) with respect to the species, the other is the way in which non-generic notions (like 'one' and 'being', which are not genera but implicates (*lawāzim*)) are (more) general (or common) with respect to their subjects[64].

4. Pyramids/Solids (*Burhān*, II.7, p. 162.11-12; *De divisione*, p. 125.8-11)

وأما الذي عمومه فيه عموم الجنس للنوع فهو كالنظر في المخروطات على أنها من المجسمات والمجسمات على أنها من المقادير

« Id autem in quo est communicatio ut generis ad speciem est sicut speculatio de pyramidibus secundum quod sunt de corporeis et de corporeis secundum quod sunt de mensuris ».

(4.1) Gundissalinus correctly translates the Arabic *maḫrūṭāt* as *pyramidibus*. The vocabulary is consistent with Avicenna's own usage in his treatment of *Elements* XI. The alternative translation ('the science of conics') proposed by A.

[64] See n. 10 above.

Ahmed for parallel occurrences of the term in the *Naǧāt* is intriguing but does not seem to do justice to Gundissalinus' insight. The doctrinal point is best understood if the subject of the subordinate science is in fact a genuine species of the genus 'solid'. One may think of the science of pyramids as the collection of definitions and demonstrative proofs concerning this particular type of solid and as a part of the science of solids (in just the same way in which the science of solids is a part of the science of extended magnitudes or continuous quantities, i.e., of geometry *tout court*).

5. 'Being part' of a science and 'falling under' a science (*Burhān*, II.7, p. 162.15-17 ; *De divisione*, p. 125.14-19)

وهذا القسم نقسمه على قسمين قسم يجعل الأخص من جملة الأعم وفي علمه حتى يكون النظر فيه جزءا من النظر في الأعم وقسم يفرد الأخص من الأعم ولا يجعل النظر فيه جزءا من النظر في الأعم ولكن يجعله علما تحته

« Et hoc membrum dividitur in duo quorum unum ponit minus commune de universitate communioris et in causa eius ita ut speculatio eius sit pars speculationis communioris ; alterum vero assolat minus commune a communiore et speculationem eius non ponit partem speculationis magis communis sed ponit eam scientiam sub eo ».

(5.1) The passage raises another point worthy of consideration for a future editor of the *De divisione*. Hugonnard-Roche already noted that the Latin *in causa eius* does not reflect the Arabic *fī ʿilmihī* and should in fact be replaced by *in scientia eius*. The latter is certainly required by the sense but the question will have to be settled in light of further evidence from the manuscript tradition of the Latin text. A warning against the risk of hyper-correcting analogous the one expressed above (see text 2) applies here, too, because of the similarity in Arabic of *fī ʿilmihī* and *fī ʿillatihī*. I reproduce here the entire passage for its relevance in the economy of the chapter, as this is where the crucial distinction between the notion of 'being part of' as opposed to that of 'falling under' a science is first introduced.

(5.2) Badawī's text reads *yuqassimuhū* for *nuqassimuhū*.

(5.3) The Latin translates *yufridu* as *assolat*, which in classical Latin is attested only in the sense of 'level to the ground' (i.e., destroy). Baur's D reads *absolvit* but an innovative understanding of *assolare* as a calque of the Arabic in the sense of 'isolate', 'single out' would not seem entirely implausible and would constitute a

significant gain in sense with respect to *absolvere*. Be this as it may, the meaning of the Arabic is that the less general is identified, singled out or marked off with respect to the more general in one of several ways. Compare with (7.4) below.

6. The case of parthood (*Burhān*, II.7, p. 163.1-3 ; *De divisione*, pp. 125.20 - 126.1)

والسبب في هذا الانقسام هو أن الأخص إما أن يكون إنما صار أخص بسبب فصول ذاتية ثم طلبت عوارضه الذاتية من جهة ما صار نوعا فلا يختص النظر بشيء منه دون شيء وحال دون حال بل يتناول جميعه مطلقا وذلك مثل المخروطات للهندسة

« Causa autem huius membri haec est quod minus commune non fit nisi propter differentias suae essentialitatis ; et deinde inquiruntur eius accidentia essentialia secundum quod per ea fit species, unde speculatio eius non appropriatur circa unum horum tantum et non aliud necque secundum unam tantum dispositionem et non secundum <aliam sed continet> omnia simul absolute, sicut pyramides ad geometriam ».

This tortuous passage provides a justification for the subdivision of case [*abaa*] (the first type of *ʿumūm,* exhibiting a genus-like relation) into its sub-cases. What matters for our purposes is to note two crucial ways in which the current Latin text significantly betrays the sense of the Arabic.

(6.1) C and D in Baur's apparatus add *minus commune* to *nisi fit*, fully in line with the Arabic.

(6.2) The Latin *propter differentias suae essentialitatis* inaccurately renders the Arabic *bi-sabab fuṣūl ḏātiyya* 'in virtue of some essential differentiae'. While discussing the relation between the more general and the more specific, Avicenna argues that in one case the more general becomes more specific as a result of specifying the genus through its essential (dividing) differentiae. The misreading is easily understandable on account of the similarity in Arabic between *ḏātiyya* and *ḏātiyyatihī*, where *ḏātiyya* is taken as an abstract noun (cf. the Latin *essentialitas*) rather than as an attribute of *fuṣul* (in which case one would have expected *essentiales* instead). Once again, locating at what point of the transmission (Arabic or Latin) the error emerged is not possible on purely philological grounds at this stage, and the decision whether to emend or not will have to lie with the future editor of the text, possibly in light of additional evidence. However, it should be noted that the Latin text, as it stands, is doctrinally implausible.

(6.3) Another difficulty is represented by the presence of *per ea*. The addition, which is not justified by the Arabic, where a counterpart (possibly *bihā*) for the expression is nowhere to be found, may be read in two ways. If the *ea* were to refer to *eius accidentia essentialia* (i.e., the *per se* accidents of the less general subject) Avicenna would be claiming, contrary to his standard views, that the object of scientific inquiry are per se accidents *through which* the subject of the more general, superordinate science becomes a species (the subject of the less general, subordinate science). But the point of the passage is that once the subject of the more general science is specified *through a differentia* and becomes the subject of the less general science (e.g., by adding the suitable differentia to the genus 'solid' to yield the species 'pyramid'), then one seeks the *per se* accidents of the subject insofar as the latter has become a species (and not insofar as it has become a species through them). Thus, if *per ea* reflects Avicenna's text (which should be corroborated by new manuscript evidence), this may only be the case if the referent in Arabic is *fuṣūl ḏātiyya.* The sentence would then read as follows: « then one investigates the accidents *per se* of [the less general subject] insofar as the latter becomes a species in virtue of [those essential differentiae] ». The issue is relevant for an improved edition of both texts.

(6.4) The Arabic reads *fa-lā yaḥtiṣṣu an-naẓar bi-šayʾin minhu dūna šayʾin wa-ḥālin dūna ḥālin bal yatanāwalu ǧamīʿahū muṭlaqan*, i.e., « the investigation of the less general is not exclusively proper to one [accident per se] without another or to one state without another, but rather covers them all without qualification ». The Latin is not perspicuous. We may hypothesize that *yatanāwalu* was missing in the model used by Gundissalinus and that the current text, if correct, is an attempt to rescue the sense. Alternatively, we may assume that the error arose in the transmission of the Latin translation. That the passage suffered is confirmed by two variants in Baur's apparatus (ms. Digby 76: *secundum aliam sed secundum omnia simul* — a reading which is very close to the Arabic and raises the question whether *quod continet* (or another verb, translating *yatanāwalu*) might have fallen out; and ms. Oxford, Corpus Christi 86: *et non aliam sed secundum aliam simul*) as well as by ms. Bodleian 679: *et non aliam sed secundum aliam simul.* The above solution is conjectural.

7. The general case of subordination (*Burhān*, II.7, p. 163.9-11; *De divisione*, p. 126.12-17)

وإما أن يكون الشيء الذي صار به أخص ليس يجعله نوعا بل يفرده صنفا ويعارض فينظر فيه من جهة ما صار به أخص وصنفا ليبحث أي عوارض ذاتية تلزمه وهذا أيضاً يفرد العلم بالأخص عن العلم بالأعم ويجعله علما تحته

> « Aut cum id quod facit rem minus communem non facit eam speciem, sed facit eam aliquam maneriam cum accidente, et tunc consideratur ipsa secundum quod fit minus communis. Materia vero inquisitionis sunt accidentia eius essentialia et comitantia et hoc est etiam quod assolat scientiam minus communem a scientia magis communi et ponit eam scientiam sub ea ».

(7.1) Avicenna argues that the different types of combinations of a general subject and various kinds of accidents determining the subject of a subordinate science typically do not yield genuine natural kinds but something he refers to by means of the term *ṣinf*. The latter occurs twice in the above passage in Arabic but is rendered by Gundissalinus, according to the current edition, once as *maneriam* (for the classical Latin *maneriem*), and once as *materia* (P reads *maneria* in this second case, which might help towards a solution). It is likely that the error may have resulted from a misunderstanding of the Arabic, where the second occurrence of *ṣinf* is paired with *aḫaṣṣ* (*minus communis*) instead of becoming the subject of the next sentence (the Arabic reads « thus it is investigated with respect to what makes it less general and a *ṣinf*, in order to seek the *per se* accidents that necessarily follow from it »).

(7.2) The second occurrence of *ṣinf* is tacitly omitted in Badawī's text, which only reads *min ǧihat mā ṣāra bihī aḫaṣṣa*, without registering variants in the pseudo-apparatus.

(7.3) The Latin *cum accidente* would be a natural translation of *bi-ʿāriḍ,* which is in turn a plausible alternative (not attested by the editions) for *yuʿāriḍ*. This would not solve the problemn, but the textual option seems worthy of consideration.

(7.4) An additional problem is raised by the third *facit,* which is a surprising translation for the first occurrence of *yufridu*. The latter is transalted as *assolat* (only attested in classical Latin in the sense of leveling to the ground) in its second occurrence, presumably to mean 'isolate' or 'single out', which seems a plausible, if idiosyncratic, translation of the Arabic.

Ms. D in Baur's apparatus has *absolvat* (and in case 5 *absolvit*) which may offer an alternative but semantically less satisfactory solution. Compare with (5.3) above.

8. Subordination : case (ii) (*Burhān*, II.7, pp. 163.22 - 164.2 ; *De divisione*, p. 127.8-12)

وقد أخذ الموضوع مع ذلك العارض الغريب شيئا واحدا ونظر في العوارض الذاتية التي تعرض له من جهة اقتران ذلك الغريب به مثل النظر في الأُكر المتحركة تحت النظر في المجسمات أو الهندسة

> « et tunc accipitur illud subiectum cum illo accidente extraneo ut unum et considerantur accidentia essentialia quae accidunt ei ex accidenti illius extraneitatis sicut est speculatio de sphaeris mobilibus quae est sub speculatione corporum vel geometriae ».

The investigation of the moving spheres is subordinated to geometry because its subject is a special kind of geometrical object (spheres) qualified in a certain way (as moving). Astronomy investigates this subject not in the way geometry does, i.e., as such, but rather insofar as a foreign (extrinsic) accident is associated with it, namely motion. Thus, astronomy cannot be *part* of geometry because its subject are not spheres without qualification (the study of spheres, just like the study of pyramids, would indeed be a part of geometry) but rather spheres insofar as they are moving.

(8.1) The Latin text does not reflect properly the clear sense conveyed by the Arabic which reads « insofar as that foreign [accident] is connected to it [*viz.* to the subject of the subordinate science] » (*min ǧihat iqtirāni ḏālika l-ġarībī bihī*). There is no clear counterpart to *ǧiha* and *iqtirān*, and *ġarīb* is rendered by the abstract term *extraneitatis*.

In the rest of the chapter Gundissalinus usually translates *iqtarana* and derivatives with the Latin *adiungere* and derivatives (eleven occurrences in total)[65]. While the absence of *parte* does not entail an accidental omission (*min ǧiha* is often translated by *ex* only — for instance in the *De anima* of the Avicenna latinus), an abbreviated form of the correct term *adiunctionis* may have been mistakenly read by a copyist as *accidentis,* which would be *lectio facilior*. If such an error occurred, it must have been at an early stage in the transmission as there seems to be no significant variant for this passage in the manuscript tradition.

(8.2) The Latin *quae est* before *sub* may simply be seen as a grammatical way to render the more elliptic structure of the Arabic passage and to connect *al-mutaḥarrika* with *taḥta*. The latter are separated by *fa-innahū* in Badawī's edition, which reports the omission as a variant in ms. Cairo, Al-Azhar, Beḫīt 331. ʿAfīfī's text omits the lemma but reports it as variant in ms. Istanbul, Damad 824. The reading is also attested in ms. Leiden, Golius 4. However, the variant would most likely have been rendered in Latin by *enim* and it is reasonable to assume that the translator was looking at a text that did not have it.

[65] At *De divisione*, p. 127.17 *iqtirān* is rendered as *coniunctio,* but for the purposes of our passage, the confusion between *adiunctio* and *accidens* is slightly more likely than that between *coniunctio* and *accidens* (the latter cannot be ruled out altogether due to the standard abbreviation for *con-*).

9. Subordination : cases (i)-(iii) (*Burhān*, II.7, p. 164.8-9 ; *De divisione*, p. 127.21-24)

وهذه الأقسام الثلاثة تشترك في أن الشيء المقرون به العارض الموصوف هو من جملة طبيعة الموضوع للعلم الأعلى من العلمين فيحمل موضوع الأعلى عليه

« Hi autem tres modi conveniunt in hoc quod id quod adiungitur ei scilicet accidens praedictum est de universitate naturae subiecti superioris duarum scientiarum unum et subiectum superioris praedicatur de eo ».

(9.1) The Arabic text reads *aš-šayʾ al-maqrūn bihī al-ʿāriḍ al-mawṣūf*, i.e., « what the described accident is connected to » which unequivocally — and correctly — refers to the subject (that the accident qualifies). The introduction of *scilicet* in the Latin produces an ambiguous effect as it seems to suggest that the roles of the subject and the accident may be inverted, if *accidens predictum* is not just the grammatical subject of *adiungitur*, but stands for the whole expression *id quod adiungitur ei*.

(9.2) The presence of *unum* is also problematic and has no correspondence in the Arabic. It may result from a misreading or from a repetition of the final *-um* of *scientiarum*, or be due to the supposition of a copyist that since two sciences are mentioned, the additional qualfiication 'one' is required or at least appropriate.

10. Subordination : case (iv) (*Burhān*, II.7, p. 164.13-14, 16-17 ; *De divisione*, p. 128.8-9, 13-17)

فتطلب لواحقها من جهة ما اقترن ذلك الغريب بها لا من جهة ذاتها [...] وإنما قلنا لا من جهة ذاتها لأن النظر في النغمة من جهة ذاتها نظر في عوارض موضوع العلم الأعم أو عوارض عوارض أنواعه وذلك جزء من العلم الطبيعي لا علم تحته

« Unde inquiruntur consequentia eorum secundum quod adiungitur eis illud extraneum <non quantum in se> [...] Nec dicimus hoc "<non> quantum in se" <nisi> quoniam consideratio neumatis quantum in se est consideratio accidentium subiecti scientiae communioris vel accidentium accidentibus suarum specierum et haec est pars scientiae naturalis non scientia sub ea ».

The text of this passage presents interesting difficulties and is one of the most significant cases in the whole chapter where the Latin is either in need of emendation or at least worthy of being flagged for the future editor. The context of the discussion is Avicenna's analysis of the relation between music, arithmetic, and physics. Music is subordinated to arithmetic in virtue of the fourth and weakest kind of subordination identified above, whereby the subject

of a subordinate science *A* is a species of the subject of another science *B* qualified by an accident which is studied by science *C*, which is superordinate to A. Avicenna is keen to point out explicitly that the subordinate science *A* investigates its subject 'not as such' but rather insofar as it is qualified by that accident, otherwise *A* would be *part* of *B* rather than being subordinated to *C*. A critical step of the argument is lost in the Latin translation[66].

(10.1) The first occurrence of *lā min ǧihat ḏātihā*, which is crucial to the sense of the whole passage, is missing in the Latin text (I have supplied it between angled brackets). If the omission were due to *homoioteleuton*, the only option would be from *min ǧiha* to *min ǧiha*, which, however, cannot explain the actual omission in the Latin. At best, one may suppose an accidental omission in the Arabic or in the Latin. Another possibility is a conscious omission on behalf of the translator, who might have regarded the occurrence of *lā min ǧihat ḏātihā* right after *al-ġarīb bihā* as redundant because it expresses the same thought in different terms ('foreign', 'not as such'). Whatever the origin of the error, the text has to be amended for the passage to make sense as a whole.

(10.2) The rest of the Arabic text reads *wa-innamā qulnā lā min ǧihat ḏātihā li-anna,* «we said 'not as such' just because» seems to require two further emendations, namely (i) the addition of *non* before *quantum in se* to match the expression in the previous sentence, which is now being quoted rather than used[67] and (ii) of *nisi* before *quoniam*, which completes the construction *nec dicimus ... nisi quoniam* as the correct literal translation of *wa-innamā qulnā ... li-anna*. As a result, the Latin would read *nec dicimus "non quantum in se" nisi quoniam*, which would be a perfectly admissible translation for the Arabic *wa-innamā qulnā lā min ǧihat ḏātihā li-anna* (the use of *non ... nisi* for the Arabic *innamā*

[66] Avicenna goes on to note that case (iv) differs from case (ii) in the following way. In both cases the subject of the subordinate science is the subject of the superordinate science qualified by a foreign accident. Assuming that α is the more general subject qualified by an extrinsic accident γ in order to become the more specific subject β, case (ii) obtains when the relation that matters is the one between α and β, irrespective of γ (γ only matters because it is the reason why the science of β is not a part of the science of α but rather only subordinate to it); case (iv) obtains when the relation that matters is the one between β and γ. Thus, the science of astronomy (whose subject are the moving spheres) falls under (a part of) geometry (dealing with spheres) and not physics (motion), while music (notes, i.e., sounds with respect to numerical ratios) falls under arithmetic (numerical ratios) and not physics (sounds). In (ii) what matters is the relation between subjects in common, in (iv) the relation between the accident that qualifies the subject of the subordinate science and the subject of another science.

[67] It is also possible that confusion between *non* and *hoc* due to their standard abbreviations may have resulted in the transmission of the Latin translation, which could partially explain the omission of *nisi*. The hypothesis should be verified against the manuscript tradition of the Latin text by the future editor.

is canonical for Gundissalinus). The question remains whether the text above reflects Gundissalinus' struggle with a corrupt model or a series of errors in the transmission of his Latin translation.

11. First Philosophy : a modal inaccuracy (لا يجوز as *non oportet*) (*Burhān*, II.7, p. 165.6-9 ; *De divisione*, p. 129.7-13)

ولأنه لا موضوع أعم منهما فلا يجوز أن يكون العلم الناظر فيهما تحت علم آخر ولأن ما ليس مبدأ لوجود بعض الموجودات دون بعض بل هو مبدأ لجميع الموجود المعلول فلا يجوز أن يكون النظر فيه في علم من العلوم الجزئية ولا يجوز أن يكون بنفسه موضوعا لعلم جزئي

« Et quia nullum subiectum est communius eis tunc non oportet ut scientia quae tractat de eis sit sub alia scientia. Et quia id quod non est principium unius entium absque alio, immo est principium omnis quod est causatum, ideo non oportet ut speculatio de eo sit in aliqua scientiarum particularium nec oportet ut per se sit subiectum alicuius scientiae particularis ».

The passage is part of the digression on metaphysics where Avicenna establishes the necessity of a science more general than all other sciences, that the principles of the latter are proven with certainty in the former, and the conditional character of the principles of all subordinate sciences (on which see text 12).

(11.1) The translation fails to capture the correct modal nature of the claim being made by Avicenna, whose point is much stronger than what is conveyed by the Latin: it is impossible (*lā yağūzu*), rather than merely not necessary (*non oportet*), (i) for first philosophy to fall under another science, (ii) for the investigation of the principles of everything caused to be the prerogative of any particular science (mathematics, logic, physics and their subdivisions), and (iii) for the subject of first philosophy to be the subject of any particular science. It is perhaps worth mentioning that the same translation is present in Avicenna latinus, *De anima*, I-III, p. 246.70 (but only on one single occasion)[68].

12. Scientific statements in sciences other than first philosophy are conditionals (*Burhān*, p. 165.12-16 ; *De divisione*, pp. 129.21 - 130.1)

فيجيب أن تكون مبادئ سائر العلوم تصح في هذا العلم فلذلك يكون كأن جميع العلوم تبرهن على قضايا شرطية متصلة مثلا إنه إن كانت الدائرة موجودة

[68] I owe the reference to one of the anonymous referees.

فالمثلث الفلاني كذا أو المثلث الفلاني موجود فإذا صير إلى الفلسفة الأولى يبين وجود المقدم فيبرهن أن المبدأ كالدائرة مثلا موجود فحينئذ يتم برهان أن ما يتلوه موجود فكأن ليس علم من الجزئية لم يبرهن على غير شرطي

« Oportet igitur principia ceterarum scientiarum certificentur in hac scientia. Hoc autem sic erit quasi omnes scientiae probentur argumentationibus hypotheticis coniunctis verbi gratia : si circulus est, talis vel talis triangulus est. Cum autem pervenerimus ad philosophiam primam, tunc manifestabitur esse antecedentis [*for* antecedens *in Baur ; supported by DP*] cum probabitur quod principium scilicet circulus habet esse ; et tunc complebitur probatio consequentis quod habet esse et ita quia nulla scientiarum particularium probetur sine hypothetica ».

The context of this passage is again the discussion of metaphysics at the end of the first part of the chapter. What is at stake here is the status of the principles of all sciences other than metaphysics, which according to Avicenna are ultimately established, i.e., demonstratively proven, in that superordinate science. This dependence determines their logical form as conditionals.

(12.1) The use of the passive *probentur* in conjunction with *argumentationibus hypotheticis coniunctis* does not reflect the Arabic. On Avicenna's model, the scientific statements proven in the other sciences acquire a hypothetical status, i.e., they are construed as claims that have an antecedent (proven in metaphysics) and a consequent. What the particular sciences do is to prove those conditional statements. Thus, the phrase *ʿalà qaḍāyā šarṭiyya muttaṣila* (Lat. *argumentationibus hypotheticis coniunctis*) 'hypothetical conditional propositions' expresses the object of proofs in the particular sciences, not something by means of which the content of the latter is putatively established. The confusion is likely due to a failure to recognize that *ʿalà* introduces the object of *barhana*.

(12.2) The passage *fa-l-muṭallaṯu l-fulānī kaḏā aw al-muṭallaṯu l-fulānī mawǧūd* expresses the distinction between two kinds of scientific statements, depending on whether the proof establishes a predicative claim ('such-and-such a triangle is so') or an existential claim ('such-and-such a triangle exists'), in line with Avicenna's account the two fundamental types of scientific if-questions[69]. The distinction is lost in the Latin, most likely due to an omission by (quasi-)*homoioteleuton*. It is hard to identify the stage at which the error may have emerged, but the sense of

[69] See R. Strobino, *What If That (Is) Why ? Avicenna's Taxonomomy of Scientific Inquiries*, in A. Alwishah, J. Hayes eds., *Aristotle and the Arabic Tradition*, Cambridge University Press, Cambridge 2015, pp. 50-75.

the Latin is at best incomplete as it merely captures the existential component of the disjunctive claim put forward in Arabic. A conjectural solution may be *talis <triangulus est talis (or : huiusmodi)> vel talis triangulus est.*

(12.3) The Arabic *laysa ʿilm min al-ǧuzʾiyya [lam] yatabarhan ʿalà ġayr šarṭī* indicates that no particular science proves anything other than hypothetical (conditional) statements, where (i) *ʿalà* introduces once again the object of *barhana* and (ii) either *lam* (most likely, for syntactic reasons) or *ġayr* is omitted. By contrast, the Latin text seems to suggest that the particular sciences are proven only through conditionals. ʿAfīfī registers as a variant from ms. Istanbul Damad 824 *fa-ka-anna ʿilman min al-ǧuzʾiyya lam yubarhan ʿalà ġayr aš-šarṭī* which omits *laysa* at the beginning of the sentence and conveys a much weaker meaning.

13. Difference between first philosophy, dialectic and sophistics with respect to their subjects (*Burhān*, II.7, p. 166.1-4 ; *De divisione*, p. 130.5-10)

أما في الموضوع فلأن الفلسفة الأولى إنما تنظر في العوارض الذاتية للموجود والواحد ومبادئهما ولا تنظر في العوارض الذاتية لموضوعات علم علم من العلوم الجزئية والجدل والسوفسطائية ينظران في عوارض كل موضوع كان ذاتيا أو غير ذاتي ولا يقتصر ولا واحد منهما على عوارض الواحد والموجود

« In subiecto eo quod philosophia prima non considerat nisi accidentia essentialia <entis et unius et principia eorum et non considerat accidentia essentialia> subiectis uniuscuiusque scientiarum particularium. Topica vero et sophistica speculantur accidentia cuiusque subiecti sive sint essentialia sive non sint essentialia. Unde nulla earum intendit de accidentibus unius vel entis ».

After introducing the necessity of first philosophy as a science more general than all other sciences in which the principles of the latter are justified, Avicenna addresses the question of how this discipline differs from two other putative candidates for the same role, namely dialectic and sophistics. He argues that they differ with respect to subjects, principles, and goals.

(13.1) In connection with the first parameter, the above passage is perfectly consistent with Avicenna's views on what metaphysics as a science investigates, while the Latin translation makes a doctrinally unacceptable point due to a textual error. In the text of Baur's edition nothing corresponds to the crucial clause *li-l-mawǧūd wa-l-wāḥid wa-mabādiʾihimā wa-lā tanẓuru fī.* The passage is also discussed by Janssens, who rightly maintains that the text as it stands in

Latin does not make sense and that the Arabic attested without variant in the two editions should be used as a basis for an indispensable emendation, in spite of this being a straightforward instance of *homoioteleuton* which could have originated at any stage of the transmission of the Arabic text itself. It is hard to believe that Gundissalinus would have failed to notice the inconsistency in his model and to correct it. And if the error originated in the transmission of the Latin translation, the emendation would be even more justified to save the sense of the entire passage. For if the Latin in its current form were correct, Avicenna would be making the utterly un-Avicennan claim that first philosophy only investigates the *per se* accidents of each particular science. But the *per se* accidents of the particular sciences are obviously the object of the particular sciences themselves, not of first philosophy, which investigates by contrast 'being' and 'one' and *does not*, by Avicenna's explicit admission, investigate (*lā tanẓuru fī*) the *per se* accidents of the particular sciences.

(13.2) The Latin *intendit* has no variant in Baur and the reading is confirmed in ms. Bodleian 675. It should be noted, however, that this is likely a misreading of the Arabic *lā yaqtaṣiru* as *lā yaqtaṣidu* (« neither dialectic nor sophistics is *restricted to* [the investigation of] the accidents of 'one' and 'being' »: Avicenna is arguing that these two disciplines have somehow a larger scope of application than metaphysics). The discrepancy should be registered in a future edition of the Latin text, even in the absence of an emendation, which would constitute a gain in sense but is hard to justify on purely philological grounds, without independent evidence from the manuscript tradition of the *De divisione*.

14. Difference between first philosophy, dialectic and sophistics with respect to their principles (*Burhān*, II.7, *p.* 166.7-9 ; *De divisione*, p. 130.15-18)

وقد تفارقهما من جهة المبدأ لأن الفلسفة الأولى إنما تأخذ مبادئها من المقدمات البرهانية اليقينية وأما الجدل فمبدؤه من المقدمات الذائعة المشهورة في الحقيقة وأما السوفسطائية فمبدؤه من المقدمات المشبهة بالذائعة أو اليقينية من غير أن تكون كذلك في الحقيقة

« Differt autem ab eis secundum principium eo quod philosophia prima sumit sua principia ex propositionibus demonstrativis veris ; topicae vero principia sunt propositiones probabiles vel vere vel non acceptae secundum quod sunt vere certae [*Baur* : certe] ».

The discussion of the previous passage continues here with regard to the principles. Metaphysics, dialectic, and sophistics differ in that respect because

the first takes as principles only premises that are certain, while the other two use at most reputable premises (dialectic) or even premises that just resemble reputable or certain premises (sophistics).

(14.1) The Arabic has *al-muqaddamāt aḏ-ḏāʾiʿa al-mašhūra fī l-ḥaqīqati wa-ammā as-sūfisṭāʾiyya fa-mabdaʾuhū min al-muqaddamāt al-mušabbiha bi-ḏ-ḏāʾiʿa aw al-yaqīniyya min ġayr an takūna ka-ḏālika fī l-ḥaqīqati* which is an altogether different (and more perspicuous) text according to which « the principles of dialectic really are widespread reputable premises, while the principles of sophistics are premises that resemble widespread reputable or certain [premises] without really being so ». The Latin translation seems to be based on a different, and less perspicuous Arabic text, which had most likely already suffered from cumulative mistakes in the transmission.

(14.2) The first occurrence of *yaqīniyya* is rendered in the Latin by *veris*.

(14.3) A possible solution is that an omission (quasi-*homoioteleuton*: *vere ... veris*) may have occurred during the transmission of the Latin translation. In this case the passage would have been as follows in the original: *(topicae vero) principia sunt propositiones probabiles vere* [the Latin following the word order of the Arabic; with *probabiles* as a single translation for both Arabic terms *aḏ-ḏāʾiʿa al-mašhūra*] *sed sophisticae principia sunt propositiones similes (propositioninbus) probabilibus vel veris, sed non* [with Baur's C] *secundum quod sunt verae* [reading *verae* according to the classical Latin spelling as a reformulation of *ka-ḏālika*)] *certe*[70].

15. Difference between first philosophy, dialectic and sophistics with respect to their goals (*Burhān*, II.7, p. 166.10-14 ; *De divisione*, pp. 130.19-131.1)

وقد تفارقهما من جهة الغاية لأن الغاية في الفلسفة الأولى إصابة الحق اليقين بحسب مقدور الإنسان وغاية الجدل الارتياض في الإثبات والنفي المشهور تدرجا إلى البرهان ونفعا للمدينة وربما كانت غايتها الغلبة بالعدل وذلك العدل ربما كان بحسب المعاملة وربما كان بحسب النفع و الذي بحسب المعاملة فأن يكون الإلزام واجبا مما يتسلم وإن لم يكن اللازم حقا ولا صوابا وأما الذي بحسب النفع فربما كان بالحق وربما كان بالصواب المحمود

« Differt vero ab eis secundum finem eo quod finis philosophiae primae est acquisitio veritatis certae secundum possibilitatem hominis ; finis vero topicae est exercitium

[70] I owe the suggestion to one of the anonymous referees.

ponendi vel removendi maximas ut gradatim perveniatur ad demonstrationem et utilitatem civitatis. Aliquando vero finis eius est victoria in iure, quod ius potest esse < ... > secundum quod conveniunt ut consecutio sit necessaria secundum quod conceditur quamvis consequentia non sit vera nec recta. Quod autem est ad utilitatem civitatis aliquando verum aliquando rectum laudabile ».

The third way in which metaphysics differs from dialectic and sophistics is with regard to their respective goals.

(15.1) ʿAfīfī's edition omits *ġāya,* possibly as a result of a mere material error. The term is in Badawī's edition and attested by the Latin *finem.*

(15.2) The Arabic in the central part of the passage reads *wa-rubbamā kāna bi-ḥasab al-muʿāmala wa-rubbamā kāna bi-ḥasab al-nafʿ wa-lladī bi-ḥasab al-muʿāmala fa-an yakūna l-ilzām wāǧiban mimmā yatasallamu wa-in lam yakun al-lāzim ḥaqqan wa-lā ṣawāban.* The underlined text is missing from the Latin translation. The *homoioteleuton* may have easily been in the model used by the translator, even though it is worth noting that the passage also shows signs of weakness in the transmission of the Latin text (there is an additional omission by *homoioteleuton* in Baur's ms. Paris, BNF Lat. 14700 of *conveniunt ... secundum quod* while ms. Bodleian 675 misses the entire section from the first *secundum quod* to *laudabile*).

(15.3) The Latin has *civitatis* in addition to the occurrence of *utilitatem* at the end of the passage. The term is absent from the Arabic but this may well be an authorial intervention by Gundissalinus to qualify the term *utilitas* in line with its first occurrence shortly before (the counterpart of the second occurrence of *nafʿ* is absent in Latin as it would have occurred in the missing text).

16. Difference between sciences that agree in subject : case [*ba*] (*Burhān*, II.7, p. 166.16-19 ; *De divisione*, p. 131.4-10)

واعلم أن اختلاف العلوم المتفقة في موضوع واحد يكون على وجهين فإنه إما أن يكون أحد العلمين ينظر في الموضوع على الإطلاق والآخر في الموضوع من جهة ما مثل ما أن الإنسان قد ينظر فيه جزء من العلم الطبيعي على الإطلاق وقد ينظر فيه الطب وهو علم تحت العلم الطبيعي ولكن لا على الإطلاق بل إنما ينظر فيه من جهة أنه يصح ويمرض

« Scias autem quod diversitas scientiarum convenientium in uno subiecto est duobus modis. Aut enim una duarum scientiarum speculatur subiectum

<absolute et alia speculatur subiectum> secundum aliquem modum, verbi gratia una enim pars scientiae naturalis tractat de homine absolute et medicina quae est sub scientia naturali tractat de eo sed non absolute; tractat enim de homine secundum quod infirmatur et sanatur».

The passage is part of Avicenna's discussion of the ways in which two sciences that share the same subject may be distinct. The first way is when one science investigates the subject without qualification and the other in one respect, like the case of medicine and the part of physics that deals with the human body and its vegetative and sensitive faculties.

(16.1) The Latin translation is incomplete due to an omission by *homoioteleuton* of the counterpart of the Arabic *ʿalà l-iṭlāq wa-l-āḫar fī l-mawḍūʿ* after the first occurrence of *fī l-mawḍūʿ* (*subiectum*) most likely linked with the transmission of the Latin translation (*subiectum ... subiectum*). The emendation is required by the sense. In spite of the impossibility of establishing at which stage the error originated, the missing text needs to be supplemented in order to rescue the intelligibility of the Latin. In the absence of any intervention, the current text would fail to account for one of the two cases under consideration, which would be counterintuitive given that the distinction between two cases is introduced in the immediately preceding passage, and illustrated in the subsequent sentence by an example involving two sciences (not just one), one of which investigates the subject without qualification and the other in some respect.

Furthermore, the conjecture is supported by ms. Bodleian 675 which reads *in una* (in agreement with Baur's ms. C) *duarum scientiarum speculatur subiectum absolute et alia speculatur subiectum alio modo.*

17. Difference in sciences that agree in subject: case [*bb*] (*Burhān*, II.7, pp. 166.19 - 167.10; *De divisione*, pp. 131.10 - 132.7)

وإما أن يكون كل واحد من العلمين ينظر فيه من جهة دون الجهة التي ينظر الآخر فيها مثل أن جسم العالم أو جرم الفلك ينظر فيه المنجم والطبيعي جميعا ولكن جسم الكل هو موضوع للعلم الطبيعي بشرط وذلك الشرط هو أن له مبدأ حركة وسكون بالذات وينظر فيه المنجم بشرط وذلك الشرط أن له كما وأنهما وان اشتركا في البحث عن كرية ذلك [فلك for] الجسم فهذا يجعل نظره من جهة ما هو كم وله أحوال تلحق الكم وذلك يجعل نظره من جهة ما هو ذو طبيعة بسيطة هي مبدأ حركته وسكونه على هيئته ولا يجوز أن تكون هيئته

التي يسكن عليها السكون المقابل للفساد والاستحالة هيئة مختلفة في أجزائه فتكون في بعضه زاوية ولا تكون في بعضه زاوية لأن القوة الواحدة في مادة واحدة تفعل صورة متشابهة وأما المهندس فيقول إن الفلك كرى لأن مناظره كذا والخطوط الخارجة إليه توجب كذا فيكون الطبيعي إنما ينظر من جهة القوى التي فيه والمهندس من جهة الكم الذي له فيتفق في بعض المسائل أن يتفقا لأن الموضوع واحد وفي الأكثر يختلفان

«Aut unaquaeque scientiarum tractat de eo uno modo et alia alio modo quemadmodum corpus mundi vel corpus caeli considerant astrologus et naturalis uterque. Sed corpus quod est corpus universi est subiectum scientiae naturalis cum conditione scilicet secundum quod est principium motus ei et quietis essentialiter et est subiectum scientiae astrologicae cum conditione scilicet secundum quod habet quantitatem. Et hae duae scientiae quamvis conveniant in inquisitione specialitatis huius corporis, tamen haec speculatur illud secundum quod habens quantitatem et dispositiones quae sequuntur quantitatem; illa vero speculatur illud secundum quod est habens naturam simplicem quae est principium sui motus et suae quietis secundum dispositionem eius. Non potest autem esse dispositio rei ut perveniat in permanentia opposita corruptioni et alterationi et habent diversitatem in suis partibus ita ut in aliqua parte eius sit angulus. Una enim virtus non facit in una materia nisi actionem et dispositionem consimilem. Geometria autem dicit quod caelum sphaericum est. Aspectus enim eius sunt tales et lineae quae perveniunt ad ipsum faciunt debere esse tale quid. Igitur naturalis considerat caelum secundum vires quae sunt in illo; geometria vero considerat illud secundum quantitatem quae est illi. Contingit ergo quod in aliqua quaestionum conveniant, eo quod subiectum eorum unum est, et in plerisque differtur».

The passage deals with the second way in which two sciences that share one and the same subject may be distinct, which is when they both investigate the subject under different respects. To illustrate the distinction Avicenna advocates the relation between astronomy and physics. While articulating the context of the distinction, he reasserts the subordination of astronomy to geometry (not to physics), in spite of the fact that the object of investigation both for the part of physics that deals with the structure of the universe (corresponding to the *De caelo*) and for astronomy (as a mathematical science) is the *sphericity* of the universe. The two sciences investigate the latter in different ways, one with respect to physical properties, the other with respect to geometrical relations.

I reproduce the text of [*bb*] in its entirety. The numerous variant it contains are best understood in the context of the whole passage.

(17.1) In the Latin translation we encounter *corpus quod est* before *corpus universi*, a variant which does not seem to be attested in Arabic but may also be explained as a stylistic choice on Gundissalinus' part to add emphasis.

(17.2) The Latin *et est subiectum scientiae astrologicae cum conditione* does not correspond to the Arabic of ʿAfīfī's edition (the text reproduced above), which reads *wa-yanẓuru fīhi l-munağğim bi-šarṭ* (« and the astronomer investigates it under a condition »), but rather to the text of Badawī's edition: *wa-mawḍūʿ al-ʿilm al-munağğimī bi-šarṭ* (« and the subject of the astronomical science [is] under a condition »). The (different) Arabic text is printed in both editions without variant. ʿAfīfī's reading is confirmed by ms. Oxford, Bodleian Pococke 121, mss. Leiden Golius 4 and Golius 84, ms. Istanbul Damad 822, and ms. Cairo Beḫīt 331. I have been unable to locate the origin of Badawī's reading which may presumably derive from one of the additional three manuscripts he used for his edition, namely ms. Paris, BNF Ar. 6527 (*siglum Ṣ*), Ar. 6829 (*siglum B*) or ms. Cairo Dār al-kutub 894 (*siglum Q*).

(17.3) The phrase *specialitatis huius corporis* prompts two distinct sets of considerations. First, it raises a flag for the presence of the demonstrative *huius*. The Latin text helps for the identification of an evident mistake on which the two Arabic editions curiously converge. A cursory glance at the manuscript tradition of the Arabic would immediately show that *falak al-ǧism* must be emended. The correct reading is uncontroversially *ḏālika l-ǧism,* the object of both sciences being « [the sphericity] of *that* body », i.e., of the body of the universe. Both Arabic editions of the text print *falak* when manuscripts on which they are based unequivocally have *ḏālika*. What is more, they do so without even signaling *ḏālika* as a variant in their pseudo-apparatus. The error may be easy to explain, in and of itself, due to the similarity of ذ and ف, but it remains unclear how the two editors could possibly have chosen to ignore the presence of *ḏālika* in the witnesses on which the editions are based, leaving aside the fact that it is clearly required by the sense[71].

Secondly, in the same phrase, the Latin *specialitas* does not make sense in the context and needs to be emended. The error cannot have originated in the transmission of the Arabic because the words are different (*kuriyya* versus the putative *nawʿiyya*) and there seems to be no other straightforward philological

[71] For instance, ms. Cairo Al-Azhar Beḫīt 331 which plays a prominent role for the establishment of the text in both editions. But cf. also mss. Leiden Golius 4 and Golius 84 (allegedly used by Badawī), ms. London British Library Or. 7500 (ʿAfīfī), and ms. Bodleian Pococke 121 (with the variant *hāḏā;* the manuscript is not used by either edition).

reason to justify something that would correspond to *specialitas.* Furthermore, the term cannot be an innovation introduced by the translator, as it is hard to imagine Gundissalinus replacing *sphericitas* with *specialitas*, when the whole passage is about the fact that the universe has a spherical shape and this is what the two sciences have in common. The error must therefore have occurred at some point in the transmission of the Latin translation, which is not unfathomable in light of the fact that an abbreviated form for the spelling *sp[h] ericitas* may have been easily misread by a copyist as *specialitas.* This fact, along with the sense of the argument, seems to justify beyond reasonable doubt the necessity of an intervention in favor of *sphericitatis huius corporis* (while at the same time restoring the correct text *kuriyyat ḏālika l-ǧism* in the Arabic).

(17.4) The use of *dispositio* for both *ḥāl* (pl. *aḥwāl*) and *hayʾa* is noteworthy. Gundissalinus' effort to maintain lexical consistency in the case of *hayʾa* (*dispositio* was used earlier for this term in the chapter in the correct sense of 'disposition' or 'state') happens here to betray the sense of the passage and to undermine the strength of Avicenna's point. This becomes clear in connection with the Arabic use of *ʿalà hayʾatihī*, which in this context means 'according to its shape' (contrary to the Latin *secundum dispositionem eius*). Physics investigates the body of the universe in connection with the principle of its (circular) motion and with respect to its sphericity, while astronomy (as a science subordinated to geometry) investigates the body of the universe as a purely geometrical object with respect to its 'quantitative' features.

(17.5) The point of the next sentence hinges, among other things, on a correct understanding of *hayʾa* as 'shape' rather than 'disposition'. Avicenna is discussing the relation between motions and the sphericity of the universe from a physical standpoint. He argues that the shape of the universe cannot have (i) a lack of uniformity in its parts, and (ii) angles in some parts and not in others. The Latin translation does not reflect quite accurately the sense of the Arabic in the expression *et habent diversitatem* for *hayʾa muḫtalifa* (it might come a little closer to the Arabic if we read *habeat* (for *habent*) in tandem with *perveniat* and with *dispositio rei* as subject). Alternatively, one could also have expected the predicate of *non potest esse dispositio rei* to be *habens diversitatem*. The whole sentence seems to have a garbled syntactic construction (even though the first part of the *ut* clause may be an intentional choice to render the relative clause introduced in Arabic by *allatī*). What the Latin fails to convey is that the shape of the body of the universe (*hayʾatuhū*) cannot be, in virtue of its peculiar motions, a shape that admits of differentiation in its parts (*hayʾa muḫtalifa fī aǧzāʾihī*).

(17.6) The Latin also omits a part of the characterization of point (ii). As can be gleaned from the Arabic, Avicenna's contention is that the shape of the universe is not simply such that it cannot have angles in one of its parts. Rather, it is such that it cannot have angles in one part and not in others, which is a stronger requirement for regular uniformity (ultimately related to the kinds of motions and powers acting on it). The phrase *wa-lā takūnu fī baʿḍihī zāwiya* may easily have fallen by *homoioteleuton* in the transmission of the Arabic (in fact it is missing from ms. Istanbul Damad 822), and not intervening in this case may be a prudent choice, even if the discrepancy should certainly be recorded in a future edition of the Latin. Nothing prevents us from imagining that an omission by *homoiteleuton* might have equally easily occurred in the Latin (*angulus ... angulus* [*et in aliqua parte eius non sit angulus*]) but given that the omission is attested in the Arabic tradition, the proposed solution seems to be more plausible.

(17.7) The interesting textual complexities starting with the previous argument continue with the next sentence, which offers another remarkable example of the relation between the Latin translation and one particular branch in the transmission of the Arabic text. After claiming that the shape of the universe must be uniform and cannot have angles in some parts and not in others, Avicenna offers as a justification the fact that one and the same power acting on one and the same matter produces a similar result. The idea is phrased in different terms by different witnesses. ʿAfīfī's text (reproduced above)[72] has *li-anna l-quwwata al-wāḥidata fī māddatin wāḥidatin tafʿalu ṣūratan mutašābihan* which does not correspond to the Latin text *una enim virtus non facit in una materia nisi actionem et dispositionem consimilem*. The latter is isomorphic in structure and vocabulary to Badawī's text *li-anna l-quwwata l-wāḥidata innamā tafʿalu fī māddatin wāḥidatin fiʿlan wa-hayʾatan mutašābihatan*. This variant is registered in note by ʿAfīfī as the text of ms. Istanbul Damad 824 (*siglum S,* which I have been unable to verify) and is independently attested by ms. Leiden Golius Or. 4 albeit in a rather garbled passage that seems to combine the two versions *li-anna l-quwwa l-wāḥida innamā tafʿalu fīmāddatin wāḥidatin fiʿlan wa-hayʾatan mutašābihatan fī māddatin wāḥidatin yafʿalu ṣūratan mutašābihatan*. In this connection, the relation between the Latin translation and the family of manuscripts to which ms. Istanbul Damad 824 and ms. Leiden Golius 4 belong undoubtedly deserves further attention.

(17.8) Two occurrences of *geometria* correspond in Arabic to *al-muhandis* 'the geometer', with loss of symmetry with respect to the parallel constructions *naturalis-aṭ-ṭabīʿī* and *astrologus-al-munağğim*.

[72] In line with ms. Leiden Golius 84, ms. Bodleian Pococke 121 and ms. Istanbul Damad 822.

(17.9) The Latin *igitur naturalis considerat caelum secundum vires quae sunt in illo* neglects *innamā* (*aṭ-ṭabiʿī innamā yanẓuru mina l-quwā*) and adds *caelum*. The Arabic text is printed without variant by the two editions and is attested by independent witnesses such as ms. Bodleian Pococke 121. The introduction of *caelum* may well be Gundissalinus' own innovation, as the Arabic *yanẓuru* here comes unaccompanied (contrary to what happens in the rest of the chapter) by *fī* and its object. The translator may have felt the need to supply the missing object. The absence of a counterpart to *innamā* may simply be due to a material omission in the model used by the translator. By contrast, assuming that the error originated in the transmission of the Latin text would be a more expensive option, as *innamā* is usually rendered by Gundissalinus with a *non ... nisi* construction.

18. ***Sciences that share in principles: the exclusion of a trivial case*** (*Burhān*, II.7, p. 167.12-14; *De divisione*, p. 132.10-14)

والمشتركة في المبادئ فلسنا نعني بها المشتركة في المبادئ العامة لكل علم بل المشتركة في المبادئ التي تعم علوما ما مثل العلوم الرياضية المشتركة في أن الأشياء المساوية لشيء واحد متساوية

« Sed per communicantes in principiis non intelligmus communicantes in principiis communibus omni scientiae sed communicantes in principiis in quibus communicant aliquae scientiae sicut <scientiae mathematicae communicantes> in hoc quod quaecumque sunt aequalia eidem et inter se ».

The list of ways in which two sciences may share in principles excludes the case of common axioms. Avicenna illustrates this with the standard principle that when equals are subtracted from equals, the remainders are equal.

(18.1) The use of this example would be misleading if the text of the Latin translation were correct, as the latter omits an indispensable qualification between *sicut* and *in hoc quod*. The correct sense is found in the Arabic *miṯla l-ʿulūm ar-riyāḍiyya l-muštarika fī anna,* which restricts the principle to the range of the mathematical sciences. The above solution is conjectural.

19. ***Sciences that share in principles: case*** **[1.2]** (*Burhān*, II.7, p. 167.15-18; *De divisione*, p. 132.16-20)

وإما أن يكون المبدأ للواحد منهما أولا وللثاني بعده مثل أن الهندسة وعلم المناظر بل الحساب وعلم الموسيقى يشتركان في هذا المبدأ لكن الهندسة أعم موضوعا

من علم المناظر فلذلك يكون لها هذا المبدأ أولا وبعدها للمناظر وكذلك حال الحساب من الموسيقى

« Aut principium unius eorum erit prius et alterius erit posterius, sicut geometriae et scientiae de aspectibus quae est per numerum et scientiae musicae quia communicant in hoc principio. Geometria vero est communioris subiecti quam scientia de aspectibus. Similiter est dispositio arithmeticae et musicae ».

Avicenna presents here the case of sciences that, while having principles in common, are such that in one the principle is prior and in the other posterior. The case is exemplified by the pairs geometry-optics and arithmetic-music.

(19.1) The relation between the Arabic text of the two editions (which is identical and without variants) and the Latin text is not entirely clear. It is equally possible that something may be missing from the Arabic (perhaps *li-annahumā*) as well as from the Latin, and it remains doubtful whether Gundissalinus is correcting the text or translating from a better model.

(19.2) The Arabic *fa-li-ḏālika yakūnu lahā hāḏā al-mabdaʾ awwalan wa-baʿdahā li-l-manāẓir* is omitted in the translation, most likely due to *homoioteleuton* (*al-manāẓir fa-li-ḏālika/li-l-manāẓir wa-ka-ḏālika*), and may not justify an emendation in the Latin, even if the sense of the passage would gain significantly from it. The current Latin text expresses Avicenna's point in an incomplete way: since the subject of geometry is more general than the subject of optics, a principle may pertain to the former in a primary sense, and to the latter in a secondary sense. Badawī's text has *lahū ... wa-qablahū*.

20. *Sciences that share in subjects: case* [3.2] (*Burhān*, II.7, p. 168.13-15; *De divisione*, p. 133.17-20)

وإما أن يكون لكل واحد من موضوعي علمين شيء خاص وشيء يشارك فيه الآخر كالطب والأخلاق

« Vel unicuique subiectorum duarum scientiarurn est aliquid proprium et aliquid in quo communicat cum altero sicut medicinae et ethicae in sanando sed una sanat corpus et alia animam ».

The last passage under consideration concerns the second way in which two sciences may be distinct in virtue of their subjects, namely when they partially overlap, as in the case of medicine and ethics.

(20.1) The Latin adds the qualification *in sanando sed una sanat corpus et alia animam*, for which no counterpart is to be found in the Arabic editions. The text may be a gloss added by Gundissalinus to explain more in detail the difference between the case of medicine and ethics, along the lines of what Avicenna says at the beginning of the chapter (*Burhān*, II.7, p. 162.8-9, *De divisione*, pp. 124.25 - 125.3). Or, alternatively, it could reflect a genuine stage of the transmission of the Arabic text currently unattested.

Conclusion

The motivation behind this article was to extend distinct lines of inquiry that originated, with different purposes and at different times, with two pioneering articles: one by H. Hugonnard-Roche on the relation between Gundissalinus' *De divisione philosophiae* and Avicenna's *Burhān*, II.7; the other by J. Janssens on the constitution of Latin text and the need for a new critical edition of the *De divisione*.

The first task required a new and more comprehensive analysis of Avicenna's classification of the sciences, which has brought to the surface yet another episode of systematic philosophy in the context of *Burhān* that perfectly fits in the structure of his metaphysics and epistemology. The division of the sciences is based on ontological relations and consistently developed according to Avicenna's expanded model of *per se* predication and the way in which scientific subjects are determined. The relations exemplified by canonical examples that are in some cases already to be found in *An. Post.* are articulated in a systematic framework and justified at every turn by an underlying network of metaphysical relations between subjects and properties.

The second task required a more extensive comparative analysis of the Arabic and Latin texts. What I offer here is a comprehensive take on the chapter in its entirety, highlighting the main junctures and tensions. I do not intend to advance any pretense of exhaustiveness even though this contribution aims to offer a digest of the most relevant points and difficulties, especially with regard to the Latin text. A great many interesting issues concerning syntax and vocabulary, idiosyncratic aspects of the translation, as well as minor discrepancies have often been omitted from the discussion in order to let the most relevant discrepancies stand out more evidently.

It is my hope that the few remarks above will be useful for the establishment of new critical editions of the Latin as well as of the Arabic text. But perhaps more importantly, in spite of the selective focus of this contribution, I hope it offers further convincing evidence that both texts desperately need one.

ABSTRACT

Avicenna's Kitāb al-Burhān*, II.7 and its Latin Translation by Gundissalinus: Content and Text*

The article discusses the relationship between chapter II.7 of Avicenna's (d. 1037) *Kitāb al-Burhān* (*Book of Demonstration*) and its 12th-century Latin translation by Dominicus Gundissalinus (fl. ca 1150), famously incorporated by the latter as an independent section in his own *De divisione philosophiae*. The text deals with the division of the sciences and their mutual relations, and is the only part of Avicenna's *Burhān* — his most extensive treatment of Aristotle's *Posterior Analytics* — ever to be translated into Latin.

I shall examine different ways in which philosophical content and text relate to each other in the Arabic and in the Latin, focusing in particular on emendations, textual transmission, style of translation, and lexical usage.

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