CRISTINA CERAMI

The *De Caelo et Mundo* of Avicenna's *Kitāb al-Šifāʾ*: An Overview of its Structure, its Goal and its Polemical Background*

Introduction

If one can affirm without hesitation that cosmology is one of the most studied areas of Avicenna's philosophy, the part of the *Šifāʾ* corresponding to the *De Caelo* or, following the Arabic tradition, the *De Caelo et Mundo* (*al-Samāʾ wa-l-ʿālam*), remains to this day one of the least explored. Actually, with a few exceptions[1], the great majority of studies dealing with Avicenna's cosmological doctrines focuses on what one might call the 'celestial psychology' and relies primarily on the *Metaphysics* and on the *De Anima* of the *Šifāʾ*, rather than on the *De Caelo et Mundo* (hereafter *DCM*)[2]. Furthermore, the very few articles delving into this part of the *Šifāʾ* take into account the chapters more strictly devoted to the study of the celestial world, rather than the treatise as a whole. As we will see, however, this part of the treatise in itself is not representative of the entire project conveyed by this section of Avicenna's philosophical summa.

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[1] A. Goddu, *Avicenna, Avempace and Averroes – Arabic sources of 'mutual attraction' and their influences on medieval and modern concept of attraction and gravitation*, in A. Zimmermann, I . Crämer-Rügenberg eds., *Orientalische Kultur und europäisches Mittelalter*, Misecellanea Medievalia, 17, 1985, pp. 218-239 ; M. Rashed, *The Problem of the Composition of the Heavens (529-1610) : A New Fragment of Philoponus and its Readers*, in P. Adamson, H. Baltussen, P. Stone eds., *Philosophy, Science and Exegesis in Greek, Arabic and Latin Commentaries*, Bulletin of the Institute of Classical Studies, suppl. vol. 83, 2004, p. 35-56 (for a new French version, see Id., *Le problème de la composition du ciel (529-1610) : Un nouveau fragment de Philopon et ses lecteurs*, in Id., *L'héritage aristotélicien. Textes inédits de l'Antiquité*, Nouvelle edition revue et augmentée, Les Belles Lettres, Paris 2016, pp. 649-689).

[2] For two recent examples of this general trend, see D. Janos, *Moving the orbs : Astronomy, physics, and metaphysics, and the problem of celestial motion according to Ibn Sīnā*, « Arabic Sciences and Philosophy », 21/2, 2011, pp. 165-214 ; D. Twetten, *Aristotelian Cosmology and Causality in Classical Arabic Philosophy*, in D. Janos ed., *Ideas in Motion in Baghdad and Beyond : Philosophical and Theological Exchanges between Christians and Muslims in the Third/Ninth and Fourth/Tenth Centuries*, Brill, Leiden - Boston 2016, pp. 312-434.

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As in the rest of the *Šifāʾ*, the *DCM* is neither a commentary on nor a paraphrase of Aristotle's *De Caelo* (hereafter *DC*)[3]. Although Aristotle remains one of Avicenna's primary interlocutors, the Stagirite's text is deeply transformed in its doctrine as well as in its structure. The aim of the present study is to provide an overview of this transformation by framing the text within a broader philosophical and historical context. Although the debate concerning Avicenna's direct sources is still open, this contextualization will shed light on his general project. For I would like to suggest that the way in which Avicenna arranges his own *DCM* can be understood as an answer to the difficulties concerning the structure and the content of the Aristotelian treatise raised by his Greek and Arabic readers.

In what follows, I will first assess Avicenna's project by reading it against the background of the earlier Greek and Arabic tradition. Against this background, I will sketch the overall plan of the treatise and compare it with Aristotle's text. Then, by a closer study of the first chapters of the original *DCM*, I will argue that this work, without being a standard treatise of cosmology, continues the project of the *Physics* of the *Šifāʾ* (i.e. *al-Samāʿ al-Ṭabīʿī*) and must be seen as a study of the five simple bodies that constitute the universe as a whole[4]. In this same context, I will conclude that in the wake of al-Fārābī's rejection of Philoponus' criticisms against Aristotle, Avicenna's investigation aims ultimately at rebuking a neo-Philoponan trend among his Arabic contemporaries.

Afterwards, in a first appendix, I will examine in more detail the treatise wrongly transmitted as Avicenna's own *DCM* as part of the earliest Latin translation of his *Kitāb al-Šifāʾ*. This comparison will allow us to better appreciate the originality of Avicenna's treatise. Finally, in a second appendix, I will take into account the Latin translation of the authentic *DCM* and highlight some of its peculiarities. A survey of the chapters devoted to the sublunary simple bodies will enable us to confirm some of the hypotheses already put forward by specialists, and to draw some tentative conclusions which will need confirmation by a further study of the Arabic manuscript tradition.

[3] Unless otherwise specified, I rely on the text edited in Ibn-Sīnā, *Al-Šifāʾ, al-Ṭabīʿiyyāt, al-Samāʾ wa-l-ʿālam, al-Kawn wa-l-fasād, al-Afʿāl wa-l-infiʿālāt*, ed. M. Qāsim, Dār al-kitāb al-ʿarabī li-l-ṭibāʿa wa-l-našr, Cairo 1969. All translations provided in the following pages are mine.

[4] I hasten to say that, in defending this hypothesis, I do not want to advocate that the study of the sublunary world in the *DCM* does not concern the heavens and the superlunary world. I merely want to suggest that one cannot properly appreciate Avicenna's cosmology without considering it as a part of a larger and uniform study of the natural body. In this sense, the question pertaining the impact of the study of the sublunary world on Avicenna's celestial kinematics and on his metaphysics exceeds the limits of the present research.

I. Between Aristotle and Avicenna: the historical and philosophical background of the *De Caelo et Mundo* of the *Šifā'*

I.1 *An overview of the Arabic reception of Aristotle's* De Caelo *and of its commentaries*

From the beginning of the Abbasid empire and throughout the centuries, Aristotle's *DC* and the issues it tackles were the object of a wide-ranging debate that went beyond both the Muslim and Christian circles of *falāsifa*[5]. In fact, Aristotle's treatise and its commentaries are among the first Greek scientific and philosophical works to have been translated into Arabic.

Concerning Aristotle's texts, in the *Kitāb al-Fihrist* Ibn al-Nadīm informs us about the translations carried out down to the 10th century[6]. He reports that the *DC* was translated once at the turn of the 8th century, then revised during the 9th century and again partially translated during the 10th century[7]. A more complicated state of affairs is attested by the manuscript tradition, which bears witness to a third translation, probably realized during the 11th century[8].

With regard to the circulation of the Greek commentaries, and more generally

[5] For a study of the *DC*'s Arabic tradition, see G. Endress, *Die arabischen* Übersetzungen *von Aristoteles' Schrift* De Caelo, Diss. Frankfurt am Main 1966; Id., *Die arabischen Übersetzungen von Aristoteles' Schrift* De Caelo, in P. L. Schoonheim ed., *Symposium Graeco-Arabicum I. The transmission of Greek texts in Medieval Islam and the West*, N. Brockmeyer, Bochum 1986, pp. 5-6; Id. *Averroes'* De Caelo. *Ibn Rushd's Cosmology in his Commentaries on Aristotle's* On the Heavens, « Arabic Sciences and Philosophy », 5, 1995, pp. 9-49: pp. 47-48; see also the overview provided by H. Hugonnard-Roche, *Aristote De Stagire:* De Caelo. *Tradition Syriaque et Arabe*, in R. Goulet ed., *Dictionnaire des philosophes antiques.* Supplément I, CNRS Éditions, Paris 2000, pp. 283-294.

[6] Al-Nadīm, *Kitāb al-Fihrist*, mit Anmerkungen herausgegeben von G. Flügel, nach dessen Tode besorgt von J. Roediger und A. Müller, 2 vols., Vogel, Leipzig 1871–2; pp. 250-251. English transl. in Al-Nadīm, *The Fihrist of al-Nadīm. A Tenth-Century Survey of Muslim Culture*, Translated by B. Dodge, 2 vols., Columbia University Press, New York - London 1970, p. 603.

[7] Concerning Aristotle's text, Ibn al-Nadīm assures that it was translated for the first time by Yaḥyā Ibn al-Biṭrīq (d. 815 ca.), that this translation was revised by Ḥunayn ibn Isḥāq (d. 873) and that Abū Bišr Mattā ibn Yūnus (d. 940) also translated a part of the first book. These items of information are confirmed by al-Qifṭī, except for the revision by Ḥunayn ibn Isḥāq which is not mentioned (Al-Qifṭī, *Ta'rīḫ al-ḥukamā'*, ed. J. Lippert, Dieterich'sche Verlagsbuchhandlung, Leipzig 1903, pp. 39-40).

[8] Three anonymous translations are preserved. Two of them are complete, one of which is the revision of the other (at least for a part of it, i.e. I, 1-7), and a third one covers a part of the first book (i.e. *DC* I, 9-II, 9). According to G. Endress, the first translation is the one realized by Ibn al-Biṭrīq. Averroes, who uses it in his *Long Commentary*, refers to it as « one of the translations of al-Kindī ». This same translation was also translated into Latin by Gerard of Cremona (edited by I. Opelt in P. Hossfeld ed., *Alberti Magni Opera Omnia*, t. V, pars. 1, *De Caelo et Mundo*, Aschendorf, Münster 1971). There are still doubts on the authorship of the preserved revised version, which could be attributed either to Ḥunayn ibn Isḥāq or to Abū Bišr Mattā. Concerning the third partial one, there are some arguments in favor of its attribution to Abū al-Faraǧ ibn al-Ṭayyib. First of all, it is transmitted in a unique manuscript (BNF or. 2281) together with a commentary by the same Ibn al-Ṭayyib. Furthermore, on three occasions, Averroes in his *Long Commentary* quotes another translation, which he attributes to Abū al-Faraǧ. Finally, Ibn al-Ṣalāḥ (see n. 10) quotes a translation that he attributes to him. It must also be added that Ibn al-Ṣalāḥ has at his

concerning the Arabic tradition of the *DC*, the biographical sources and the authors directly engaged in the debate give us evidence of intense cultural and philosophical activity. On this point, Ibn al-Nadīm provides us with some rather ambiguous testimonies. He reports that a partial translation of Alexander's commentary on book I was carried out by Abū Bišr Mattā, and that the whole of Themistius' commentary was either translated or revised by Abū Zakariyyā Yaḥyā ibn ʿAdī (d. 974). Concerning Themistius' paraphrase, the mathematician Abū al-Futūḥ Aḥmad ibn Muḥammad ibn al-Sarī ibn al-Ṣalāḥ[9] (d. 1153) provides a different account[10]. He claims that Ḥunayn ibn Isḥāq translated it from the Greek into Syriac, and Abū Bišr Mattā from the Syriac into Arabic, while Yaḥyā ibn ʿAdī revised Mattā's translation[11].

Ibn al-Ṣalāḥ's testimony is also important because it contains information about what material was still accessible on the *DC* in 11th century Baghdad. In his question on the number of regular figures that can fill a space (related to Aristotle's statement in *DC* III, 306b8-38[12], he reports that he had access to a paraphrase of the *DC* by Nicholaus of Damascus, while he had partial knowledge of Alexander's commentary. He also tells us that he perused Themistius' paraphrase and a number of other works by Arabic authors, notably the paraphrases by al-Fārābī[13] and by Abū Sahl ʿĪsā ibn Yaḥyā al-Masīḥī (d. 1010), the correspondence between ʿĪsā ibn Isḥāq Ibn Zurʿa (d. 1008) and Yaḥyā ibn ʿAdī, as well as the commentary by Abū al-Farağ ibn al-Ṭayyib (d. 1043).

After mentioning Themistius' commentary, Ibn al-Nadīm also relates that there was something on 'this work' (*fīhi*) by Ḥunayn ibn Isḥāq, namely a collection of sixteen questions, and that Abū Zayd al-Balḫī (d. *ca.* 934) explained the beginning of 'this work' (*fīhi*) for Abū Ğaʿfar al-Ḫāzin. From a grammatical

disposal a fourth translation that he attributes to ʿĪsā ibn Isḥāq Ibn Zurʿa (d. 1008).

[9] H. Suter, *Die Mathematiker und Astronomen der Araber and ihre Werke*, Teubner, Leipzig 1900, p. 120, n. 287; N. Rescher, *The Development of Arabic Logic*, University of Pittsburgh Press, Pittsburgh 1964, pp. 173-174.

[10] M. Türker ed., *Ibnü'ṣ-Ṣalāḥ' in* De Coelo *ve onun Şerhleri hakkindaki tenkitleri*, « Araştirma », 2, 1964, pp. 1-79; Ead., *Les critiques d' Ibn al-Ṣalāḥ sur le* De Caelo *d'Aristote et sur ses commentaires*, in *La Filosofia della natura nel medioevo*. Atti del 3° Congresso internazionale di filosofia medioevale, Passo della Mendola, Trento, 31 agosto-5 settembre 1964, Vita e Pensiero, Milano 1966, pp. 242-252.

[11] On Themistius' paraphrase, see M. Zonta, *Hebraica Veritas*: Temistio, Parafrasi del *De coelo*. Tradizione e critica del testo, « Aethenaeum », 82, 1994, pp. 403-428; cf. E. Coda, *Reconstructing the Text of Themistius' Paraphrase of the De Caelo. The Hebrew and Latin versions on the three meanings of the term 'Heaven'*, « Studia Graeco-Arabica », 4, 2014, pp. 1-15; Ead., *Alexander of Aphrodisias in Themistius' Paraphrase of the* De Caelo, « Studia Graeco-Arabica », 2, 2012, pp. 355-371.

[12] See n. 10.

[13] The existence of a commentary by al-Fārābī is also confirmed by al-Qifṭī (Al-Qifṭī, *Taʾrīḫ al-ḥukamāʾ*, p. 279) and Ibn abī Uṣaybiʿa (Ibn abī Uṣaybiʿa, *ʿUyūn al-anbāʾ fī ṭabaqāt al-aṭibbāʾ*, ed. A. Müller, 2 vols., Leipzig 1882-1884, repr. Frankfurt am Main 1995, p. 135).

point of view, it is not clear whether 'this work' in the last two quotations means Themistius' paraphrase or Aristotle's text. Assuming that at least the first reference is to Themistius' paraphrase, M. Alonso Alonso[14] suggested that this compilation by Ḥunayn is to be identified with a treatise in sixteen questions translated from the Arabic into Latin and from the Latin into Hebrew, and wrongly transmitted as Avicenna's own *DCM* as part of the earliest Latin translation of his *Kitāb al-Šifā'*[15].

Even if we still do not know the extent of Avicenna's direct access to his antecedents' writings, the *DCM* of the *Šifā'* must be placed in this historical framework and, as we are going to see, in the context of an on-going debate with Avicenna's contemporaries. Still, in order to appreciate his overall project and to highlight the treatise's own stakes, one must take a closer look at the Greek debate pertaining to the goal and the epistemological rank of Aristotle's *DC*. This debate, in fact, constitutes the broader background of the treatise, insofar as the arrangement Avicenna adopted can be seen as a way to answer the difficulties raised by his Greek predecessors.

I.2 *The goal and the structure of Aristotle's* De Caelo *according to the Greek commentary tradition*

There are two connected difficulties concerning the epistemological status of the *DC* that were discussed from the very beginning of the Aristotelian commentary tradition: the first concerns the subject-matter of the treatise, and hence its goal (σκοπός) and its unity[16]; the second one concerns its rank (τάξις) in the series of Aristotle's natural treatises. As is well known, the discussion of these difficulties was an integral part of the hermeneutic study that must precede the interpretation of a treatise according to the usual rules of the Greek commentary tradition[17].

[14] M. Alonso Alonso, *Hunayn traducido al Latin pour Ibn Dawūd y Domingo Gundisalvo*, « Al-Andalus », 16, 1951, pp. 37-47.

[15] I will examine more closely Alonso's argument in a final appendix, where I will also point out the discrepancies between this treatise and Aristotle's *DC*.

[16] The question concerning the goal (σκοπός) of the treatise is definitely the most crucial one. For the σκοπός is, to use P. Hoffmann's terminology, the *focus of unity* (« le foyer d'unité ») of a treatise (P. Hoffmann, *Le σκοπός du traité aristotélicien* Du Ciel *selon Simplicius. Exégèse, dialectique, théologie*, « Studia Graeco-Arabica », 5, 2015, pp. 27-51 : p. 29).

[17] On the preliminary questions to be discussed according to the Late-Antiquity commentary tradition, see L. G. Westerink, *The Alexandrian Commentators and the Introductions to their Commentaries*, in R. Sorabji ed., *Aristotle transformed. The Ancient Commentators and their Influence*, Duckworth, London 1990, pp. 325-348 ; J. Mansfeld, *Prolegomena: Questions to be settled before the Study of an Author, or a Text*, Brill, Leiden - New York - Köln 1994 ; P. Hoffmann, *La fonction des prologues exégétiques dans la pensée pédagogique néoplatonicienne*, in J. Dubois, B. Roussel eds., *Entrer en matière. Les prologues*, Édition du Cerf, Paris 1998, pp. 209-245 ; M. Rashed, *Alexandre d'Aphrodise lecteur du Protreptique*, in J. Hamesse ed., *Les prologues médiévaux. Actes du colloque international Roma, 26-28 mars 1998*, Brepols, Turnhout 2000, pp. 1–37.

In the case of the *DC*, unlike other works of Aristotle, the two questions were the subject of fervent debate[18]. First, the treatise seems to have more than one subject-matter and more than one goal: an inquiry on the sky and the stars, a study of the Earth, an investigation of the unitary and finite nature of the world, and a long examination of the generation of sublunary elements followed by a monograph on heavy and light; hence it seems to lack a real principle of unity. Second, part of its inquiry (i.e. the study of the elements) seems to overlap with the investigation of the second book of the *De Generatione et Corruptione* (hereafter *GC*), which is devoted to the generation and corruption of the four sublunary bodies and to related phenomena. In this sense, the difficulty consists in understanding the peculiar role of the second half of the *DC* with regard to what follows in the order of Aristotle's natural *corpus*.

In the Greek commentary tradition, the most disputed question was by far the first one. In the prologue of his commentary on the *DC*, Simplicius reports the status of the debate prompted by his predecessors[19]. The debate revolved both around the unity of the *DC* and the pertinence of its title, for since the title mirrors the content of the treatise, one has to explain how the title περὶ οὐρανοῦ can fit a treatise pertaining to such a variety of topics that exceeded the study of the celestial world[20].

To solve this difficulty, Alexander of Aphrodisias, according to Simplicius, maintained that the term οὐρανός can have three meanings: (1) the sphere of the fixed stars; (2) the whole supra-lunary world; (3) the cosmos in its entirety. He also makes clear that the relevant meaning in the case of the title περὶ οὐρανοῦ is the third one, since the goal of the treatise is the study of the whole world. Οὐρανός, thus, must be understood as a synonym of κόσμος[21].

[18] On the Greek debate, see P. Moraux, *Aristote. Du Ciel*, Les Belles Lettres, Paris 1965, pp. vii-viii; Id., « Kommentar zu *De caelo* », *Der Aristotelismus bei den Griechen, von Andronikos bis Alexander von Aphrodisias*, vol. III, *Alexander von Aphrodisias*, De Gruyter, Berlin - New York 2001, pp. 181-241 : pp. 188-189 ; Hoffmann, *Le σκοπός du traité aristotélicien* Du Ciel cit., pp. 27-51.

[19] On Simplicius' prologue and its 'dialectical' nature, see Hoffmann, *Le σκοπός du traité aristotélicien* Du Ciel cit.

[20] On the question concerning the title of a treatise, see P. Hoffmann, *La problématique du titre des traités d'Aristote selon les commentateurs grecs. Quelques exemples*, in J.-C. Fredouille, M.-O. Goulet-Cazé, P. Hoffmann, P. Petitmengin eds., *Titres et articulations du texte dans les oeuvres antiques*. Actes du Colloque International de Chantilly, 13-15 décembre 1994, Brepols, Paris 1997, pp. 75-103 ; on the title περὶ οὐρανοῦ in particular, see pp. 82, 86-88.

[21] Simpl., *In De Cael.*, ed. I. L. Heiberg, G. Reimeri, Berlin 1894 (CAG VII), pp. 1, 24 - 2, 4 : « Alexander says that the subject of Aristotle's treatise *On the Heavens* is the world. He says that "Heaven" is used in three senses by Aristotle in this work, to mean both the sphere of the fixed stars and the whole of the divine revolving body, which in this books he also calls the "furthest heaven" (with the adjective), and additionally "the world", as Plato called it when he said "the whole heaven, or the world, or whatever else it might care to be called » (transl. R. J. Hankinson, in R. J. Hankinson,

The same discussion is related at the beginning of Themistius' paraphrase[22], which reports that according to the 'Ancients' the word οὐρανός can have three meanings, and that the scope of Aristotle's treatise is the whole world[23]. According to this reading, the *DC* is a unitary treatise, since it has one single goal, i.e. the universe as a whole (κόσμος) with its constitutive parts, even if the inquiry implies the study of topics that are proper to one portion of it and not to another, as well as an investigation of the nature of the whole world as such.

This reading, however, is challenged by the Neoplatonic readers of Aristotle, notably Iamblichus and Syrianus, who insist on the pre-eminence of the cosmological part of the treatise. According to Simplicius' testimony, Iamblichus admits that the different inquiries of the treatise do not have the same status, for the study of the celestial world is the real and primary goal of the treatise, while the inquiry into the other topics is merely secondary and dependent upon the study of the primary one[24]. Syrianus takes this reading to its extreme consequences, by arguing that the same principle governs the different meanings of οὐρανός and the various topics of the treatise: the proper meaning of οὐρανός is the celestial world, which also designates the real and unique goal of the treatise[25].

As this debate continues, Simplicius suggests a reading that endorses both elements of the interpretation of Alexander and Iamblichus. He admits that some discussions pertain to the whole universe and to the sublunary world, but he makes clear that all the properties considered in the treatise, i.e. the finite and unique nature of the whole as well as the characteristic properties of the four sublunary bodies, are studied insofar as they are *caused* by the celestial world, which constitutes the primary goal of the treatise. Thus, unlike the *Timaeus*, which really is a treatise on the whole world, the *DC* is a treatise on its parts and, more precisely, on the most excellent one, i.e. the supralunary body, which is the remote *cause* of what happens in the sublunary world, as well as of the

Simplicius. On Aristotle On the Heavens 1.1-4, Duckworth, London 2002, p. 19). In his commentary on the *Meteorology*, Alexander presents the same threefold division of the meanings of οὐρανός (cf. ALEX., *In Meteor.*, ed. M. HAYDUCK, G. Reimeri, Berlin 1899 [CAG III, 2], p. 41, 20-22) and in the prologue of the same commentary, he describes the content of the *DC* in the same terms as those used in Simplicius' commentary (ALEX., *In Meteor.*, pp. 1, 12 - 2, 5).

[22] The original Greek and the Arabic translation are now lost. On the status of the Arabic-Hebrew and of the Hebrew-Latin translation, see CODA, *Reconstructing the Text of Themistius' Paraphrase* cit. See also EAD., *Alexander of Aphrodisias in Themistius' Paraphrase* cit.

[23] The three meanings are enumerated by Aristotle himself in *DC* I, 9, 278b9-24, but a comparison between Themistius' and Simplicius' texts shows that the common source is Alexander of Aphrodisias.

[24] SIMPL., *In De Cael.*, pp. 1, 24 - 2, 4.

[25] SIMPL., *In De Cael.*, p. 2, 7.

unique and finite nature of the whole world[26]. Accordingly, one can conclude that on Simplicius' interpretation, the hierarchical structure of the topics of the *DC* mirrors the hierarchical order of the universe[27].

These three different solutions to the question concerning the title and the goal of the *DC* give us some hints toward the answer to the question of the rank of the treatise and its relationship to the *GC.* As regards Alexander, we can reconstruct his stance from his commentary on the *Meteor.* Commenting on the first lines of the treatise, Alexander claims that the *DC* deals at the same time with « the ordered stars according to their upper movement » (περί τε τῶν κατὰ τὴν ἄνω φορὰν διακεκοσμημένων) and with the elements, or more precisely the « corporeal elements » (περὶ τῶν στοιχεῖων τῶν σωματικῶν)[28]. He makes clear that while the first expression designates the study of the movement of the last sphere (τὴν ἐξωτάτω τε καὶ κύκλῳ περιφοράν), the second one refers to an inquiry into the elements, which aims at establishing their number and their quality (πόσα τε καὶ ποῖα). Accordingly, he concludes that Aristotle's goal in the *DC* is to show that there are five elements and to elucidate « what they are » (τὸ γὰρ ποῖα δηλωτικὸν ἄν εἴη τοῦ τίνα), i.e. the four sublunary elements and the fifth one that moves in a circle (τὰ τέσσαρα μετὰ τοῦ κυκλοφορικοῦ σώματος πέμπτου).

Following Alexander, we can point out that the enquiry into the simple bodies is split into a two-stage investigation: the first stage, carried out in *DC* I, establishes the existence and the number of the simple bodies; the second one, accomplished in the second part of the treatise, explains what they are. According to Alexander's reading, thus, the second part of the *DC* is integrated within a more general inquiry concerning the « elements of the universe » (στοιχεῖα τοῦ κόσμου)[29]. This enquiry, as Alexander also spells out, ends in the second book of *GC*, which « completes » (τελειώσας) the *DC*'s study of the elements, inasmuch as it studies their reciprocal transformation (εἰς ἄλληλα μεταβολῆς)[30].

[26] Simpl., *In De Cael.*, p. 5, 32-34 : « And it is not necessary on account of this to imagine the world to be the subject, but rather the simple bodies of which the most primary is the heaven which gives a share of its goods to the whole world » (transl. Hankinson, in Hankinson, *Simplicius* cit., p. 23).

[27] On the 'hierarchical' nature of Simplicius' reading, see P. Hoffmann, *Science théologique et foi selon le Commentaire de Simplicius au* De Caelo *d'Aristote*, 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, pp. 277-363.

[28] Alexander makes it clear that the term στοιχεῖα without further specification designates matter and form, which are the topic of the general study of the first book of the *Physics*. This fits with Alexander's reading of the first lines of *Phys*., I, 1, and the goal of the *Physics* reported by Averroes in his *Long Commentary* on *Phys*., I, 1. For more details, see C. Cerami, *Génération et Substance. Aristote et Averroès entre physique et métaphysique*, W. De Gruyter, Boston - Berlin 2015, p. 295 et ss.

[29] Alex. *In Meteor*., pp. 1, 12 - 2, 6.

[30] *Ibid*. p. 2, 6-10.

For the Neoplatonic readers, we can infer that despite their differences, one single answer fits all their interpretations. According to their reading, *GC* II can be seen as the study of the simple sublunary bodies and their properties *as such*. In fact, according to the readings of Iamblichus and Syrianus, the sublunary bodies are not within the real scope of the *DC*, but they are considered in its inquiry only insofar as they show us what the fifth body is not. According to Simplicius, as we have already seen, if Aristotle studies the four sublunary elements in the *DC*, it is not *as such*, but in so far as they are *caused* by the supralunary world. In both cases, then, the study of the sublunary elements in the *GC* is not a mere repetition of the one in the *DC*.

Now that the philosophical and historical stage of the reception of Aristotle's *DC* has been set, let us see in more detail how Avicenna organizes his own *DCM*, and how his approach enables a solution of both the structural tensions underlying Aristotle's *DC* and the doubts about its content raised by its Greek and Arabic readers.

II. The *De Caelo et Mundo* of Avicenna's *Šifāʾ*: a study of bodies with respect to their powers

The *DCM* is the second part of the section of the *Šifāʾ* devoted to the philosophy of nature (*al-Ṭabīʿiyyāt*). The treatise is developed in 10 chapters. It contains three chapters on the nature of the five simple bodies, integrated within a larger research on the body considered with respect to its power (chap. 1-3), four chapters on the dispositions and movements of the celestial bodies as such (chap. 4-7), two chapters on the opinions of the predecessors on what has been previously examined (chap. 8-9), and one final chapter on the uniqueness of the world, in which the predecessors' opinions on this topic are also refuted (chap. 10).

Table 1: Outline of Avicenna's *De Caelo et Mundo* compared to Aristotle's *De Caelo*

Avicenna's *DCM*	**Aristotle's *DC***
Chapter 1: On the power and acts of simple and composite bodies.	I, 2
Chapter 2: On simple powers and simple movements, and on the proof that the spherical nature is outside the elemental natures.	I, 2-4 + IV, 1, 3-4
Chapter 3: On the indications concerning the essences of the simple bodies, on their order, their features and the figures that belong to them by nature, as well as on their differences with respect to the sphere.	IV, 6 + I, 2-4
Chapter 4: On the dispositions of the body that moves in a circle, on the nature of its movement, and on what belongs to it properly.	II, 3
Chapter 5: On the disposition of the stars and the spots of the moon.	II, 10-12
Chapter 6: On the proper movements of the stars.	II, 7-8
Chapter 7: On what is inside the celestial body and on what men say about the disposition of the earth and the other elements.	II, 14
Chapter 8: Refutation of the silly opinions on the justification of the fact that the earth is at rest.	II, 13
Chapter 9: On the controversy between men concerning heavy and light.	III, 2-8, IV, 2
Chapter 10: On the fact that the world is one and not many, as some claimed.	I, 8-9

What is immediately striking when one looks at the table of contents of the *DCM* of the *Šifāʾ* is its structure. With regard to both arrangement and content, the *DCM* does not correspond to a treatise of cosmology, at least if we mean by that a study of the so-called 'supralunary' world, to use Aristotelian terminology. Actually, the very beginning of the treatise does not announce a study of the celestial world, but a study of the simple bodies considered from the point of view of their powers. Moreover, nearly half the treatise is devoted to the study of the four simple sublunary bodies and to the doctrines about their nature that were held by earlier thinkers.

To this *prima facie* appraisal, one might object that in choosing this arrangement Avicenna is merely following Aristotle's treatise — or at least the text as it was transmitted after the 1st century B.C.[31] — which develops into two quite separate sections, the first one (*DC* I-II) devoted roughly speaking to cosmological issues, the second one (*DC* III-IV) devoted to the four sublunary bodies and to their characteristic properties: lightness and heaviness. However, even a cursory glance at the table of contents of Aristotle's *DC* shows that there are several significant differences between the two treatises, which cannot be overlooked.

We must remark first of all that, although the *DCM* as a whole shares the same twofold structure of the Aristotelian *DC*, Avicenna's treatise involves three major modifications with respect to the arrangement of the two sections: 1) unlike Aristotle, Avicenna does not postpone the study of the sublunary simple bodies until after the investigation of the celestial one, but combines the two inquiries, so that all the issues concerning sublunary simple bodies that are discussed by Aristotle in *DC* III-IV, are addressed by Avicenna at the beginning of the treatise; 2) the analysis and refutation of the predecessors' doctrines, scattered in the Aristotelian *DC* throughout books III and IV, are gathered together and placed after what one may call the positive discussion of Avicenna's treatise; 3) the proof of the uniqueness of the world, which Aristotle establishes in I, 8-9, at least according to the current division of his *DC*, is provided by Avicenna in the last chapter of his own treatise. Moreover, concerning the very beginning of the treatise, it also must be noticed that Avicenna's *DCM* does not open with an acknowledgment of the perfection of the body supported by arguments akin to Pythagorean doctrines, as is the case in the Aristotelian treatise (*DC* I, 1). Instead, it starts abruptly with a threefold division of bodies considered with respect to their powers.

The arrangement chosen by Avicenna can be accounted for if one considers the entire treatise as pursuing a twofold strategy, striving on the one hand to meet the epistemological standards of a unitary inquiry and on the other hand to inscribe the *DCM* within the continuity of the *Physics* of the *Šifā'*. This hypothesis is confirmed by a more detailed study of the first chapters. The way in which Avicenna announces the goal of his research and presents its subject-matter highlights the philosophical agenda of the entire treatise. In fact, the study of the four sublunary simple bodies is not incidentally appended to the study of the celestial body, but it is part of one single inquiry aiming at revealing the proper nature of the five simple constituents of the whole world. One can therefore

[31] The paternity of the *DC*, in its actual state, has been challenged by several modern scholars who dispute the originality of the link between books I-II and books III-IV. On the contemporary debate over the unity of the treatise, and for a new solution of the difficulties concerning the epistemological status of the *DC*, see Cerami, *Génération et Substance* cit., pp. 44-50.

plausibly argue that Avicenna shares Alexander's general solution: the *DCM* is a study of the whole world and of its simple constituents[32].

Before delving into the content of Avicenna's study, two preliminary objections must be taken into account in order to understand correctly our general assumption. First of all, one can object that the study of the simple bodies, by setting up a comparison between the four sublunary bodies and the celestial body, aims at proving that the celestial body has a peculiar nature. The celestial body should then be defined as the real subject-matter of the treatise, since Avicenna first considers its eternal nature and, afterwards, its proper characteristics (movements, shape, etc.). Second, one might allege that the inquiry into the whole world as such is limited to one final chapter devoted to the proof of its uniqueness and, furthermore, that this verification is framed in the context of the refutation of the predecessors' mistaken opinions on this topic. In this sense, it might be maintained that this investigation does not suffice to make the *DCM* a treatise on the whole world.

To the first objection, we can reply that the fact that the study of the simple bodies reveals the peculiar nature of the celestial body does not constitute a sufficient argument to infer that the primary, if not unique goal of the entire section is to establish the nature of this body. For this inquiry is essentially integrated within a more general investigation, i.e. the study of bodies considered with respect to their power, which Avicenna announces at the very beginning of his treatise.

Concerning the second objection, a quick look at the arguments used at the end of the treatise to prove the uniqueness of the world helps us to understand the nature of the final chapter and qualify our general assumption. All the arguments used to conclude that there cannot be a plurality of worlds rely on the properties of the five simple bodies set forth in the previous chapters. Indeed, the uniqueness of the world is verified by appealing either to the proper nature of the four simple sublunary bodies, or to that of the fifth celestial body[33]. In this sense, we can safely assume that the discussion concerning the uniqueness of the world is included in the *DCM* as a part of the general inquiry into its simple constituents[34], for the uniqueness of the world is considered here

[32] It is difficult to say whether Avicenna had direct access to Alexander's commentary on the *DC*. Since Ibn al-Ṣalāḥ attests that in his time Alexander's commentary on the first book was still accessible, it is not implausible that it was also available to Avicenna. However, at the present stage of research, this hypothesis cannot be corroborated and remains a matter of speculation.

[33] Avicenna, *DCM*, pp. 71-76.

[34] It is noteworthy that Avicenna closes the ninth chapter by affirming that after having finished the inquiry into the constituents of the world, it is now time to ask whether the corporeal world is one or many. *Ibid.* p. 69, 10-12.

to be a consequence of the nature of its five constituents. We can thus conclude that this study does not jeopardise the unitary character of the *DCM*. On the contrary, it contributes to clarifying its overall project: the *DCM* can be defined as an inquiry into the world *insofar as* it provides an investigation of the simple bodies that constitute it as a whole.

A closer examination of the chapters devoted to the simple bodies confirms and elucidates this general assessment, but also sheds light on the way in which Avicenna's *DCM* provides a solution to the second difficulty underlying the Aristotelian treatise, i.e. the question concerning the relationship between the study of the four sublunary bodies in the *DC* and the study of these elements in the *GC*. In fact, an analysis of the these chapters of the *DCM* will show that the way in which Avicenna takes the simple bodies into consideration, i.e. with respect to their powers, also provides a solution to this difficulty. For the study provided in these chapters constitutes in itself an argument in support of the complementary nature of the two inquiries provided in *DC* III-IV and in *GC* II, and against their supposed redundancy.

II. 1 *The notion of power* (quwwa) *at the core of the* DCM

Avicenna opens his *DCM* abruptly by delimiting the subject of the inquiry. This demarcation is obtained by a division of the notion of body considered with respect to its power. Avicenna states that bodies can be understood with respect to their powers (*al-aǧsām min ǧihati quwāhā*) according to a threefold division: either I) the body is one, non composite and endowed with one single power; or II) the body is one, non composite and endowed with two powers; or III) the body is the product of the composition of many mixed bodies, all characterized by different powers, which IIIa) either interact so that one single common complexional power (*quwwa wāḥida mizāǧiyya muštaraka*) occurs, IIIb) or do not interact[35].

These opening remarks tells us a great deal about how Avicenna conceives his work. The restriction 'with respect to their powers' provides the key notion of the entire discussion. By adding it, Avicenna integrates the inquiry of the *DCM* within a wider philosophical context, which is the study of the natural body, and hence adapts the opening declaration of Aristotle's *DC*.

In announcing the study to come, Aristotle states at the beginning of *DC* I, 2 that before taking into consideration the question of the limited or infinite nature of the whole, he plans to study the latter's parts according to species

[35] Avicenna, *DCM*, p. 1, 7-11.

(τῶν κατ' εἶδος αὐτοῦ μορίων)[36]. This statement can be interpreted in a weaker or in a stronger sense, depending on the meaning one attributes to the term εἶδος: as designating a class or the substantial form[37]. By interpreting this term as designating a class, one can assume that Aristotle is simply announcing his intention to study the different kinds of bodies. This, for example, is Simplicius' interpretation[38]. According to the stronger interpretation, on the contrary, and by taking the notion of εἶδος in a clear-cut ontological sense[39], Avicenna reorients Aristotle's text and announces a thoroughly reconceived project: the aim of the present investigation is not just to study the bodies according to their species, but to study them with respect to their power[40].

It must also be emphasized that by proceeding in this way, Avicenna does not simply reinterpret Aristotle's *DC*, but also integrates his own *DCM* within a unified inquiry whose first step was accomplished in the *Physics* of the *Šifāʾ*[41]. As I wish to argue, in fact, the notion of power constitutes the link between the two investigations. Let us briefly consider the elements authorizing the establishment of such a link.

At the beginning of the *Physics*[42], Avicenna makes clear that the starting point of the enquiry is the definition of 'the natural body'[43] and that this body, insofar

[36] Aristotle, *DC* I, 2, 268b11-268b14 « The question as to the nature of the whole, whether it is infinite in size or limited in its total mass, is a matter for subsequent inquiry. Let us now speak of those parts of the whole according to their species, taking this as our starting-point ».

[37] This is possible at least in principle, since in Greek the term εἶδος can have both meanings.

[38] Cf. Simpl. *In DC*, p. 11, 26.

[39] The term εἶδος in Greek could ambiguously designate a class of individuals and their respective ontological principle, i.e. the form. In the Arabic-Latin translation of Aristotle's *DC* that is transmitted with Averroes' *Long Commentary*, the term εἶδος is translated by *formarum* which undoubtedly translates the Arabic *ṣūra*, unequivocally designating the form and not the species.

[40] The identification of the form with the power of the body is an essential part of Avicenna's physics. The history of this doctrine and the way in which this identification renewed the Aristotelian notion of form is still a desideratum. This doctrine goes back to Alexander, but it is charged in Avicenna with a stronger Neoplatonic nuance.

[41] Concerning the order of the two treatises, in the letter to al-Kiyā (ʿA. Badawī ed., *Arisṭū ʿinda al-ʿArab*, Maktabat al-Nahḍa al-Miṣriyya, Le Caire 1947, p. 119-122), Avicenna clearly asserts the necessity of studying the *Physics* before the *DC*. We will come back to this text later.

[42] On the structure of the *Physics* of the *Šifāʾ*, and on how Avicenna achieves a reorganization of Aristotle's *Physics*, see A. Hasnawi, *Aspects de la synthèse avicennienne*, in M. A. Sinaceur ed., *Penser avec Aristote*, Erès, Toulouse 1991, pp. 227-244 ; Id., *La physique du* Šifāʾ *: aperçus sur sa structure et son contenu*, in J. Janssens, D. De Smet eds., *Avicenna and His Heritage*. Proceedings of the International Colloquium « Avicenna and his Heritage », Leuven - Louvain-la-Neuve, 8-11 Septembre 1999, Leuven University Press, Leuven 2002, pp. 67–80.

[43] Ibn-Sīnā, *Al-Šifāʾ, al-Ṭabīʿiyyāt, al-Samāʾ al-Ṭabīʿī*, ed. S. Zāyid, Al-Hayʾa al-Miṣriyya al-ʿāmma li-l-kitāb, Cairo 1983 (hereafter Avicenna, *Phys.*), I. 2, p. 13, 4-6 : « We say, then, that the natural body is a substance in which one can posit one dimension, and another crossing it perpendicularly, and a third dimension crossing both of them perpendicularly, where its being of this sort is the form by which it becomes a body » (transl. J. McGinnis modified).

as it is subject to change, is the subject-matter of the treatise. He announces, then, that the goal of the enquiry is to investigate the necessary accidents belonging to this body as such, the concomitants that attach to it insofar as it is, whether they be forms, accidents, or derivatives of the two, as well as its principles, reasons and causes[44]. Afterwards, he makes clear that the body is called 'natural' in relation to the power (*quwwa*) called 'nature'[45]. He then defines the nature as the internal principle of motion and action, and distinguishes four ways in which nature and power can be identified[46]. He concludes by stating that the power/nature examined at present is the internal power « which brings about motion and change, and from which the action proceeds in a single manner without volition »[47].

After defining nature, Avicenna establishes its relationship with matter, form and motion. He explains that in the case of simple bodies, the nature is the same thing as the form and, hence, as the power[48]. Immediately afterwards, however, Avicenna adds that this power can be considered from several points of view, depending on whether it is the principle of action and motion or the principle of the subsistence of matter. He thus claims that when it is related to the motions and actions that proceed from it, it is called nature ; whereas when it is considered to be the principle accounting for the subsistence of the species the body belongs to, and if the effects and motions that proceed from it are not taken into account, it is then called form[49].

Avicenna considers the case of water, and claims that its form is imperceptible, while its effects (*al-āṯār*) are perceptible. Following the same division put forward in the definition of nature (defined as the internal principle of motion *and* action), he distinguishes, among the effects of the form, those relative to its passive/active influence, namely coolness and wetness, from those relative to its proximate/proper place, namely motion and rest, which he also equates with the weight and the inclination of the body :

> « So the form of water, for instance, is a power that makes the water's matter to subsist as a species [— namely, water]. The former [namely, the form] is

[44] Avicenna, *Phys.*, I. 1, p. 3, 9-4, 7.

[45] On the identification of the nature with the power of the body, see A. Lammer, *Defining Nature. From Aristotle to Philoponus to Avicenna*, in A. Alwishah, J. Hayes eds., *Aristotle and the Arabic Tradition*, Cambridge University Press, Cambridge 2015, pp. 121-142.

[46] Avicenna, *Phys.*, I. 5, p. 39, 4-9

[47] Avicenna, *Phys.*, I. 5, p. 39, 2-4.

[48] *Ibid.*, I. 6, p. 45, 7-8 : « In some cases, the nature of the thing is just its form, whereas in others it is not. In the case of the simples [that is, the elements], the nature is the very form itself, for water's nature is [for example] the very essence by which it is water ».

[49] *Ibid.*, p. 45, 9-11.

> imperceptible, but the effects that proceed from it are perceptible — namely, on the basis of the perceptible coolness and weight (which is the actual inclination and does not belong to the body while it is in its natural location). So the nature's act in, for example, the substance of water is either relative to its passive influence and so is coolness; or it is relative to its active influence, which shapes [something else], and so is wetness; or it is relative to its proximate place and so is setting in motion; or is relative to its proper place and so is bringing about rest. Now, this coolness and wetness are necessary accidents of this nature, given that there is no impediment »[50] (trans. J. McGinnis modified).

The form of the simple body, identified with its nature, is thus the internal principle of a certain number of 'effects'; it is an internal principle of action and passion as well as of movement and rest. Weight and inclination are also considered to be effects of the form, but Avicenna warns that they actually belong to the body only when the latter is in its 'proximate' place and not in its 'proper' place, namely, its natural location[51].

The notion of power, therefore, is at the very core of the physical inquiry. In the *Physics* of the *Šifāʾ*, Avicenna identifies the power of the natural body with its internal principle of movement, its nature and its form. What remains to be done, however, is to clarify the kind of principle this power is by studying *in particular* the different kinds of natural bodies, simple and composite.

If we return to the first lines of the *DCM*, it becomes clear that this is exactly what Avicenna announces. These lines, and the whole division of the body with respect to its power reveal that Avicenna is here embarking on an enquiry that takes its place in continuity with the *Physics*. This enquiry begins with the *DCM*, but goes beyond it. In the same lines, in fact, after positing his first threefold division, Avicenna narrows the subject-matter of the present study, and makes it clear that he is going to set aside the third branch of the division, in order to concentrate on the second one (II), that is, the simple body endowed with two powers[52]. From the outset, then, simple bodies considered with respect to their power — and not the celestial body alone — are announced as the subject-matter of the *DCM*. It is to them that the entire enquiry is devoted. What is excluded is the study of complex bodies.

The thorough analysis of each branch of this division is not easy to follow, and the very relevance of Avicenna's overall analysis is difficult to understand.

[50] *Ibid*., pp. 34, 14 - 35, 4.

[51] On the notion of inclination, see A. Hasnaoui, *La dynamique d'ibn Sīnā. La notion d''inclination': mayl*, in J. Jolivet, R. Rashed eds., *Études sur Avicenne*, Les Belles Lettres, Paris 1984, pp. 103-123; Id., *La théorie avicennienne de l'impetus. Ibn Sīnā entre Jean Philopon et Jean Buridan*, in M. Arfa Mensia ed., *Views on the Philosophy of Ibn Sīnā and Mullā Ṣadrā al-Šīrāzī*, (Carthage, 22nd -24th Oct. 2013), al-Maǧmaʿ al-Tūnisī li-l-ʿUlūm wa-l-ādāb wa-l-Funūn, Tunis 2014, pp. 25-42.

[52] Avicenna, *DCM*, p. 1, 13.

As a matter of fact, its ultimate goal becomes clear when one considers the wider context of the first three chapters. A closer survey of Avicenna's entire investigation, as I wish to show, points out that its ultimate aim is to show that each simple body has one multidimensional but unitary power. By progressively rejecting all the different branches that imply that the power of a simple body results from the simultaneous occurrence of many ontologically heterogeneous principles, Avicenna wants to show that any simple body — whether it is a part of the sublunary world or of the supralunary world — is endowed with a power that, though displaying a multi-layered nature, remains a unitary principle. His strategy consists in establishing, in the first chapter, a paradigm for the four sublunary bodies and in extending it, as far as possible, to the celestial body. In what follows, I will provide a more detailed assessment of this assumption and suggest that, in relying on al-Fārābī's counterarguments against Philoponus' criticisms, Avicenna's ultimate goal is to challenge an Arab neo-Philoponan trend[53].

II. 2 *The unitary nature of the active/passive power*

According to the plan we have just sketched, the first goal of Avicenna's analysis is thus to understand if and how the posited division (i.e. II) captures the nature of the simple bodies possessing a twofold power, namely the four sublunary bodies[54]. Avicenna assures that when we suppose that a simple body has two powers, we once again have a threefold division according to the relationship the two supposed powers entertain with each other and with the form: IIa) the two powers differ from the form of the body, for either they follow the form (*tābiʿāni lahā*) or they occur from the outside (*ʿāriḍāni min ḫāriǧ*); IIb) one of the two powers is the form, while the other is a consequent (*lāzim*) or an accident (*ʿāriḍ*); IIc) neither of the two powers is an accident, but from the interaction of both one single form occurs, so that it is by virtue of this form that the body belongs to a certain species[55].

[53] A. Hasnaoui was the first scholar to highlight the role of Avicenna's anti-Philoponan stance in the *DCM*. Referring to the second chapter of the *DCM*, in an unpublished paper presented in 2013 (in the context of the international conference *Physika: Aristotle's Physics In the Greek, Arabic, Hebrew and Latin Traditions* that I organized in Paris with A. Falcon), he suggests that Avicenna elaborates his theory of the inclination against Philoponus, without ever mentioning him by name. In the wake of this general hypothesis, I would rather suggest that Avicenna is not directly opposing Philoponus, but a neo-Philoponan Arabic author. In this sense, I share M. Rashed's hypothesis that Avicenna in his *DCM* tackles neo-Philoponan arguments (see Rashed, *The Problem of the Composition* cit.) and I attempt, in what follows, to sketch the profile of their author.

[54] On the link Avicenna establishes between form and sensible qualities, see Al-Ḥasan ibn Mūsā al-Nawbakhtī, *Commentary on Aristotle* De generatione et corruptione, Edition, translation and commentary by M. Rashed, W. De Gruyter, Boston - Berlin 2015, pp. 237-272; 291-306.

[55] Avicenna, *DCM*, p. 2, 2-7.

Avicenna goes on to analyse the third subsection: IIc) «neither of the two powers is an accident, but from the interaction of both one single form occurs, so that it is by virtue of this form that the body belongs to a certain species». The study of this supplementary division shows that Avicenna's investigation aims first at clarifying the role of the powers in the ontological constitution of the simple bodies. For — as he makes it clear — the question at issue is to understand whether the presence of two powers can guarantee, in one way or another, the existence of a unitary form of a simple body and, therefore, its inclusion in one species[56].

He divides this branch as well into three: IIc,i) each one of the two powers is capable of making the matter a subsisting substance in act; IIc,ii) only one of the two powers is capable of doing so; c, iii) only the combination of the two powers (*maǧmūʿuhumā*) can do so. Let us set aside for the time being the first two subdivisions (IIc,i-ii), since Avicenna rules them out quickly to focus on the third one[57]. He points out that if we suppose that the two powers together make the matter a subsisting substance, we can identify them with the form. Still, we have to explain how the two powers can constitute one single principle. One can suppose either that (IIc,iii,α) each power is part of the form as a distinguishable (*mutamayyiz*) and separable (*munfaṣil*) part of a composite, i.e. as matter and form are parts of the composite; or (IIc, iii, β) that this it is not the case, but that each power is an indistinguishable and inseparable part of the form, as are genus and differentia[58].

Avicenna goes on to analyse these two possibilities (IIc,iii,α-β). In this case too, it is not an easy task to follow his assessment. From what follows, however, it appears that his aim is not so much to reject these two options absolutely, as to provide the conceptual tools for understanding the multi-layered nature of the power of simple bodies, notwithstanding its ontological capacity to substantify matter.

Concerning the second option (IIc, iii, β), Avicenna does not explicitly reject its validity. He points out that if the powers are constitutive parts of the form as genus and differentia, then what proceeds from each one of them will not be a proper (*ḫāṣṣ*) and specific (*nawʿiyy*) act (*fiʿl*), but a generic act from one of the two powers, which is specified by the other one. This — Avicenna affirms — is not to be denied *absolute loquendo*, since it helps to understand the notion of movement conceived in an absolute way (*ḥaraka muṭlaqa*)[59].

[56] *Ibid.*, pp. 2, 9 - 3, 13.

[57] He points out that the first option (c, i) is not viable, since each power would be at the same time a form and an accident, which is absurd. If we consider each power as a form, but we assume that there are two powers, we are forced to admit that they are reciprocally the form of one another. As for the second option (c, ii), Avicenna merely states that it brings us back to the previous subdivision, i.e. b): one of the two powers is the form, while the other is a consequent (*lāzim*) or an accident (*ʿāriḍ*).

[58] Avicenna, *DCM*, pp. 2, 16 - 3, 3.

[59] *Ibid.*, p. 3, 2-3.

Avicenna next considers the possibility that the two powers are constitutive parts of the form as matter and form (IIc, iii, α); then he states that this possibility is also not viable, since it has been supposed that the two powers were capable of substantifying matter *together*. If the two powers were parts as matter and form, one of the two (i.e. the one that is not part as a form) would be a consequent of the other, since the latter would be essentially prior. This ontological inequality, Avicenna explains, is not to be completely discarded, for it is true that among the dispositions (*hay'āt*) of the body, that whose subsistence depends on the existence of the other is posterior to it. What must be denied is that in this case the two powers can be considered as being on the same ontological level; for this option amounts to option IIb[60].

Against the background of this analysis, Avicenna concludes that it is not possible for two forms, one of which is prior to the other, to be equally capable of making matter a subsisting substance. He points out, however, that this does not invalidate the possibility that there is an ontological *décalage* among the dispositions of a natural simple body. On the contrary, according to him, three points of the analysis of these different options (IIc, iii, α-β) must be retained: i) we must first admit that in the power of a simple body, something is more closely linked to matter and something to form; ii) secondly, that some of the simple body's dispositions can be ontological posterior to others; iii) finally, that in a unitary power we can single out a generic and a specific aspect without compromising its ontological simplicity. These three assumptions provide the tools for a more precise understanding of the link between the power, the form and the movement of the simple bodies and for ascertaining the multi-layered but unitary nature of their power.

The whole division and its ultimate goal become clear when Avicenna illustrates his statements with some examples. We thus understand that among the three aforementioned indications, the first one aims at clarifying the power with respect to the active and passive capacities stemming from it, while the other two elucidate the nature of the power with respect to its capacity to move the body. The entire discussion aims at defining the nature of these two powers in the sublunary simple bodies. Avicenna's ultimate goal is to show that the two constitute a kind of ontological unity, and that each one of them belongs exclusively to one single body.

Avicenna first considers the active and passive capacities. He claims that they stem from one single and unitary principle, but he makes clear that the first one proceeds from the power — which Avicenna explicitly identifies with the nature — insofar as it is form, while the second one proceeds from it insofar

[60] *Ibid.*, p. 3, 4-7.

as it is matter. We have thus one single nature with a twofold capacity, i.e. with an active and a passive aspect. In the case of water, for example, the sensible coolness (*al-burd al-maḥsūs*) is the active capacity (*quwwa fiʿliyya*), which proceeds from the nature as from the form, while the humidity (*al-ruṭūba*) is the passive capacity (*quwwa infiʿāliyya*), which proceeds from the nature as from the matter:

> « The impossibility of this division [i.e. IIciii)] has thus become evident. For it is impossible that two forms, among which one is not prior to the other, together make the matter subsist. On the contrary, it is possible that from one unique simple nature, insofar as it is form, there proceeds an active power (as from the nature of water proceeds the sensible coolness) and that another passive power comes from it, with respect to its matter, as moisture in the case of water »[61].

Here, the matter/form distinction is employed to account for the unitary nature of the active/passive power. In *Phys.*, I.6, as we have already seen, Avicenna suggest that nature, defined as the internal power that brings about action, acts so as to produce a passive and an active influence, while, understood as the principle that makes matter a subsisting substance, it is called form. At the end of the same chapter, Avicenna states that in simple bodies, nature clearly cannot be matter, for the latter is the same in all such bodies[62]. By using the matter/form distinction in the *DCM*, he goes in exactly the same direction. The passive power cannot stem from the simple body's matter, but its effect can be more akin to this matter than to the form. This does not mean that the active influence is form, but that it is closer to the form than to the matter.

In assessing this first part of the division, Avicenna can conclude that there is only one unitary principle and a double-sided effective power, which means a unitary power with a multifarious capacity, i.e. an active and a passive one. What he has to clarify now is the nature of the other power, i.e. the motive capacity, its link to the form, and if and how can we account for its unitary nature. At the end of *Phys.*, I.6, as we have also seen, Avicenna points out that motion is more distant from the nature of simple bodies and that, being « foreign to the substance », « it arises in the case of deficiency »[63]. Accordingly, he assures that the body's weight, that is, its inclination, does not belong to the simple sublunary body while it is at rest in its natural location, and that 'nature's act' in this body is not the movement in its 'proximate place', but rest in its 'proper place'. In this ontological framework, therefore, it is not misleading to conclude that the

[61] *Ibid.*, p. 3, 14-17.
[62] Avicenna, *Phys.*, I.6, p. 49, 1-2.
[63] *Phys.*, I.6, p. 49, 6-7: « As for motion, it is the farthest removed from being the nature of things, for, as will become clear, it arises in the case of deficiency and is foreign to the substance ».

active/passive power is more closely related to the form of the simple body, while the motive power is in a sense more remote from it. We will see that this is also what Avicenna confirms in the final lines of *DCM* 1, as in the following chapter.

II. 3 *The unitary nature of the inclinatory power and its one-to-one relationship with the simple body*

Once the unitary nature of the active/passive power and its link to the form has been assessed, Avicenna goes on to clarify the nature of the motive capacity. He first claims that the motive capacity cannot stem from the form alone, although it cannot be chronologically posterior to the form, either. He then asserts that this capacity, as the active/passive power, is a unitary power in which we can recognize some kind of complexity. Unlike the active/passive capacity, however, the complexity of the motive power cannot be accounted for by appealing to the distinction between matter and form, but by calling upon the distinction between genus and differentia. The clarification of this twofold assumption is the core of the last part of the first chapter and of the next one. Avicenna follows a two-stage strategy: he first considers the motive capacity in the case of the sublunary simple bodies and puts forward a paradigm to account for its ontological unity; then he extends, insofar as is possible, the same paradigm to the simple supralunary body. In both cases, as we will see, Avicenna elaborates his doctrine while facing the doubts of an anonymous opponent.

Concerning the ontological relation between the motive capacity and the form of the simple sublunary bodies, the gist of Avicenna's doctrine is based on the idea that their power to move toward their own natural place, either downward or upward, is ontologically posterior to the power that emanates directly from the essence of the body. Avicenna's claim relies on the assumption that one single principle cannot be the cause of one thing and of its contrary: if the body's power to move towards its natural place, which Avicenna calls here 'inclinatory power' (*al-quwwa al-mumīla*), were to be identified with the form itself or emanated from it alone, then the form would be the cause of two contrary states, i.e. movement toward the natural place, and rest in it once the body has reached it.

In order to avoid this conclusion and to settle the relationship between the inclinatory power and the form, Avicenna considers an alternative: the inclinatory power is either chronologically posterior to the essential power and hence to the form, or is it simultaneous with it. His strategy will be to dismiss the first option and to sharpen up the second one:

> « And it is possible that [from the unique simple nature] there emanates an inclinatory power in virtue of the body's place and a heating power in virtue of

> the body's quality, the one being prior to the other. Therefore, the heating power precedes the inclinatory one, as what receives heat by accident leans upward. Otherwise the two are simultaneous, but the one is caused by the form by itself, as heat in the case of fire and coolness in the case of water, while the other one is caused by the form together with a supervening accident, as the inclination (*al-mayl*), when the body is accidentally separated from its natural place. Or they are simultaneous, while the cause is the form alone; but this is not possible. And you have already learnt before this place the difference between the form and these states. And you know from there that in the body, while staying in its natural place, there is no cause of its movement, as much as it is cause of its movement. For it is not the form alone that is cause, but its form and something. Actually, one single thing cannot be the cause of the movement toward the natural place and cause of the rest [in it]. And the doubt (*al-šakk*) some people (*baʿḍuhum*) raise is solved for you »[64].

Avicenna initially considers the first option, according to which the inclinatory power is chronologically posterior to the essential power and hence to the form. He does not reject it explicitly, but states that in this case the inclination toward the natural place is *stricto sensu* an accident that supervenes upon the body. In the case of elemental fire, for example, its upward inclination would be something that supervenes upon its form and is chronologically posterior to its active power, i.e. the power to heat. According to this option, therefore, fire comes to be, and then acquires its upward inclination as an accident.

He continues by considering the second possibility, according to which the inclinatory power is *chronologically* simultaneous to the essential power and, therefore, to the form. This — Avicenna argues — is true, but a specification must be added. The active power and the inclinatory power cannot be also *ontologically* simultaneous or, in other words, on the same ontological level; for the first one emanates from the unique nature of the body, while the second one cannot be caused by the form alone. Otherwise, as we have seen, the form would be the cause at the same time of movement toward the natural place and of rest in it. The cause of the body's inclination toward its natural place — Avicenna asserts — is its form *plus* an accident, namely, the fact that it is separated from its own natural place.

Thus, confirming the ontological framework of *Phys.*, I.6, Avicenna concludes that the inclinatory power is neither a form, nor an accident, but emanates from the formal principle when an accident is joined to it. By stating this, Avicenna can argue that only one act characterizes a simple body as such; this act is not to move towards its proper place, but to rest in it. This is what Avicenna

[64] Avicenna, *DCM*, pp. 3, 17 - 4, 10.

means when he states that a form cannot be the cause of two opposite acts, i.e., movement toward the proper place and rest in that place. The form, as such, is the principle of the latter act and of the former only when the simple body is not in its proper place. As a consequence, the simple sublunary body is what it has to be when it is in its proper place, but it is already endowed with the corresponding power even when it is not in it. Fire, for example, already possesses the capacity to be in the upward region, even when it is on earth, since its capacity to be above does not follow from its form alone, but from its form and its location. Properly speaking, the natural movement of the simple sublunary body does not constitute its essential act, but the path leading to its ontological realization.

In accordance with these considerations, in chapter 2, Avicenna explains that simple sublunary bodies, when they are in their natural location, are neither heavy nor light. For a simple body is light or heavy when it has an inclination (*al-mayl*) to move upwards or downwards. When it is in its natural location, however, it does not possess any inclination in act[65]. Accordingly, light and heavy cannot be the form of the simple body. Although they are not merely accidents of simple bodies, Avicenna makes clear that they occur accidentally when the matter becomes hot or cold[66].

At the end of the above-quoted passage, Avicenna states that this explanation enables us to eliminate the doubts 'someone' raises on this issue. He does not name the person he is referring to, nor does he outline the terms of the doubts. In an insightful presentation, A. Hasnaoui pointed out that, in the second chapter of the *DCM*, Avicenna formulates his doctrine of inclination as an answer to the objections raised by John Philoponus, without ever naming him[67]. If this is the case for this passage too, Avicenna might be alluding to the objection Philoponus raises against the demonstration of the eternity of motion established by Aristotle in *Phys*., VIII, 1.

According to the main assumption at the basis of Aristotle's argument, any movement whatsoever that we can suppose to be the first one is preceded by another movement and the mobile possessing the corresponding potency to move[68]. Against this argument, in the sixth book of the *Contra Aristotelem,* Philoponus argues that elemental motion challenges this assumption of *Phys*.,

[65] *Ibid*., p. 9, 7-8.

[66] *Ibid*., p. 15, 1-4.

[67] In this presentation (see n. 53), A. Hasnaoui provided some results of his ongoing research on the Arabic reception of Philoponus and the essential role that the latter played in Islamic philosophical tradition. The importance of this research cannot be over-emphasized. On this issue, see his groundbreaking paper *Alexandre d'Aphrodise vs Jean Philopon. Notes sur quelques traités d'Alexandre "perdus" en grec, conservés en arabe*, « Arabic Sciences and Philosophy », 4, 1994, pp. 53-109.

[68] See fragment 109 (ed. WILDBERG), pp. 125-126 ; cf. SIMPLICIUS, *In Phys*., pp. 1133, 16 - 1134, 29.

VIII, 1, since in its case the mobile and the corresponding potency to move do not pre-exist. In the case of fire, for example, the mobile that has the potency to move upward is fire itself, which did not exist before its own generation. As for its potency to move upward, it does not pre-exist either; since fire comes to be and immediately acquires the potency to move upward. In the case of elemental movement, thus, it is false that the mobile and the corresponding potency temporally pre-exist this motion. Elemental movement, therefore, constitutes an exception to Aristotle's assumption and a counterexample to his demonstration of the eternity of movement.

By switching from the notion of potency to that of power, and by assuming that the act of fire is not to *move* upwards, but to *be* upwards, Avicenna might try to avoid the aforementioned difficulty. In fact, if movement toward the natural place is ontologically posterior to the form, it can be considered as a sort of first actuality of the simple body, whose second actuality is rest in its natural place[69]. Insofar as it is a first actuality, natural movement presupposes the pre-existence of a corresponding potency, which is not present in the fire but in what fire comes to be from. Avicenna, in other words, would be rebutting Philoponus' objection as Simplicius and al-Fārābī had done before him[70], namely by admitting that the capacity to move towards its natural place is a sort of second potentiality for the simple body, preceded by a first potentiality belonging to what the simple body comes to be from[71].

It is undeniable that Philoponus' criticism of elemental motion shapes the larger polemical setting of Avicenna's doctrine. His attack against Aristotle's doctrine of natural movement clearly constitutes the background of Avicenna's

[69] On the doctrine of the double actuality in Alexander of Aphrodisias, Philoponus and Avicenna, see Hasnawi, *Alexandre d'Aphrodise vs. Jean Philopon* cit., and Id., *La définition du mouvement dans la* Physique *du Šifāʾ d'Avicenne*, « Arabic Sciences and Philosophy », 11, 2001, pp. 103-123.

[70] This hypothesis is confirmed by Averroes' *Long Commentary* of *Phys*., I, 1. There, Averroes states that Avicenna interpreted *Phys*., I, 1 as al-Fārābī did. On the debate concerning the meaning of *Phys*., I, 1, see R. Glasner, *Averroes' Physics: a Turning Point in Medieval Natural Philosophy*, Oxford University Press, Oxford 2010; C. Cerami, *L'éternel par soi. Averroès contre al-Fārābī sur les enjeux épistémologiques de* Phys. *VIII 1*, dans P. Bakker ed., *Averroes' Natural Philosophy and its Reception in the Latin West*, Leuven University Press, Leuven 2015, pp. 1-36.

[71] This does not necessarily prove that Simplicius' commentary on *Phys*., VIII was accessible to the Arabic readers of Aristotle (in favour of this hypothesis, see I. Bodnar, M. Chase, M. Share, *Simplicius, On Aristotle's* Physics *8.1-5*, Cornell University Press, Ithaca 2012; M. Chase, *Philoponus' Cosmology in the Arabic Tradition*, « Recherches de Théologie et Philosophie médiévales », 79/2, 2012, pp. 271-306). As a matter of fact, Avicenna could have used al-Fārābī's treatise on *Changing beings*, which itself could rely on Alexander's commentary on *Phys*. VIII and its theory of *ephesis* (in favor of this hypothesis, see Cerami, *L'éternel par soi* cit. On Alexander notion of *ephesis*, see M. Rashed, *Alexandre d'Aphrodise: Commentaire perdu à la* Physique *d'Aristote (Livres IV-VIII). Les scholies byzantines. Edition, traduction et commentaire*, De Gruyter, Berlin - New York 2011, pp. 140-150.

doctrine that natural movement does not stem directly from the form, and is in this sense farther removed from the ontological core of the simple body. Still, subsequent developments concerning the nature of the inclinatory power seem to suggest that there is also a more specific polemical background, established in a properly Arabic context. This becomes clear from the last lines of the first chapter and from the next one, in which Avicenna ascertains the unitary nature of the motive capacity and extends the same account to the celestial body. It is in these lines that Avicenna's Arabic background comes to light.

In order to ascertain the motive capacity's unitary nature and to elucidate its connection with the body it belongs to, Avicenna first establishes a causal link between the agent cause, the power and the act of a simple body. He declares that when the matter, the agent cause and the power are one, only one act can follow. Two acts with opposite ends cannot belong to a single and simple body. This — Avicenna asserts — is indisputable:

> « And there must be no doubt concerning the impossibility of the realization of actions whose ends[72] are opposite, when matter is one, power is one and the agent cause is one. For, you know that from a single power one single act proceeds and that a single natural act[73] cannot but proceed from a single power »[74].

The natural act of a simple body necessarily stems from a single unitary power, and, inversely, the motive power of a simple body cannot be at the origin of two opposite acts, as in the case of the upward and downward motions of a simple body. Fire, in virtue of its inclinatory power, cannot move upward *and* downward. Its only natural act is to move upwards, when it is outside its natural place.

Avicenna then specifies that this assumption does not mean that we cannot distinguish a generic and a specific aspect of this act and the corresponding power. On the contrary, the acts, like the powers of simple bodies, differ from one another with respect to their species and share a form of generic unity:

> « Thus, if this natural act is one in genus, like the downwards movement of water and earth, these two movements are one in genus, but not in species, since they communicate and they differ by virtue of something essential to them. They share something, since they move from the region of air following the direction opposite to the sphere. They differ, since the end of each one of these two movements is not the same in species as the end of the other. And the power is one in genus, but not in species. For the power that is one in species reaches

[72] Following the Teheran lithography, which transmits *al-muḫtalifat al-ġāyāt*.
[73] Following again the Teheran lithography, which transmits *al-fi'l*.
[74] Avicenna, *DCM*, p. 4, 10-13.

> an end that is one in species. And[75] when the natural act is one in species, an end that is one in species is reached. Furthermore, when the natural act is one in species, its principle is one in species. And if its principle is one in genus, the simple body that shares with it the species of this movement does not share the specific cause, but the generic cause, as well as the generic power, and it would differ by virtue of the addition of a differentia to its power. For this differentia either specifies the power's act or does it not. If it specifies it, there is no sharing of the act's species; if it does not specify it, this addition would not be one of the power's differentiae, insofar as it is a power, implying a predication in the power, but something accidental not a [real] differentia »[76].

As in the previous lines, Avicenna maintains that there is a causal link between the principle, the power, and the act of a simple body. On this basis, he confirms that we can infer the unitary nature of the principle and the bodily power from the unitary nature of the act. He adds, however, that this unity can be either specific or generic. Thus, from the fact that two acts belong to the same genus, we can infer that the corresponding powers and principles share the same genus, but not that they are also absolutely identical, i.e. the same according to species as well. Two movements that apparently have the same end, as for example the movement of water and of earth toward the centre of the cosmos, are only generically the same. For their ends are not exactly, i.e. specifically, the same: water ends its course on the surface of the earth, while earth does not stop until it arrives at the centre of the cosmos.

Two assumptions therefore support Avicenna's conception: 1) the unitary nature of the principle and of the power of a simple body can be inferred from the unitary nature of its natural movement; 2) natural movements have species and genus; the species of the natural movement is determined by its end-point, while its genus is defined by its path. By making these assumptions, Avicenna can conclude that one and only one unitary power corresponds to each simple body; for each natural movement is essentially determined by the natural location of each simple body, just as we can infer the existence of a corresponding unitary power from the unitary character of each natural movement.

This is the conclusion Avicenna finally draws. The entire argument and its two assumptions reveal Avicenna's ultimate purpose, as well as the source of his development. In fact, the idea that the natural movements of the simple bodies have a genus and a species, like the idea that the proper location of the simple sublunary bodies defines the species of their natural movement, constitute the primary tools which al-Fārābī uses to dismiss Philoponus' refutation of

[75] Following the Teheran lithography, which transmits *wa.*
[76] Avicenna, *DCM*, *p*p. 4, 13 - 5, 7.

the special nature of the celestial body. In this case too, let us briefly recall the Aristotelian argument at issue, as well as Philoponus' criticisms, and then go on to consider al-Fārābī's reaction to Philoponus.

Aristotle demonstrates the incorruptibility of the fifth element in *DC* I, 2-4. The main argument supporting this tenet is based on the assumption of a one-to-one correspondence between the simple movements and the five simple bodies. Aristotle argues that there are only three simple movements : rectilinear (downward and upward) and circular[77]. He maintains that to each simple movement must correspond just one simple body, and infers that only a fifth simple body could be characterized by circular movement, since the four sublunary bodies move by nature either downward or upward. He concludes that this fifth body is incorruptible, since the circular movement has no contraries and cannot have a beginning or an end.

As for the doctrine of the eternity of movement, Philoponus' strategy for dismissing Aristotle's argument consists in pointing out an exception to one of its assumptions. This assumption is precisely the one-to-one correspondence between simple bodies and simple natural movements. Philoponus retorts that this correspondence is refuted by the very fact that two simple bodies can share the same movement. Air and fire, for example, move by nature upward, as earth and water move by nature downward. The one-to-one correspondence is thus rebutted, and so is Aristotle's entire demonstration[78].

Al-Fārābī reacts against Philoponus' attack in his *Against John the Grammarian* (*al-radd ʿalā Yaḥyā al-naḥwī*)[79]. He dismisses Philoponus' objection by arguing that the movement of air and fire is not, strictly speaking, the same kind of movement. In fact, although the two bodies are directed towards the upper region of the cosmos, their movements differ in species, insofar as they are oriented towards two different places of this region. The two movements, in this sense, differ from one another because of the diversity of their end-points :

> « What [Philoponus] has said about air and fire, and earth and water — that their movement is one in species — is false. The case is not as he states. For the place of water is different from the place of earth, and, similarly, the place of air is different from the place of fire. Movement is one in species only when the end

[77] The existence of these two simple movements is inferred from the existence of two simple lines : the straight line and the circular line.

[78] Simplicius, *In DC*, p. 26 and ff.

[79] For the Arabic text, see M. Mahdi, *The Arabic Text of Alfarabi's Against John the Grammarian*, in S. A. Hanna ed., *Medieval and Middle Eastern Studies in Honor of Aziz Suryal Atiya*, Brill, Leiden 1972, pp. 268-284. For a study of this text and an English translation, see Id., *Alfarabi against Philoponus*, « Journal of Near Eastern Studies », 26, 1967, pp. 233-260.

> pertaining to place is an end that is one in species and when the place pertaining to both [elements] is one in species. If, however, the place of water and of earth is not one in species, then their movements are not one in species. Similarly, the place of air and of fire are different in species, therefore their movements are different in species »[80].

In the following lines, al-Fārābī states even more explicitly that the end-point of a natural movement, identified with a specific region of the cosmos, constitutes a part of the definition of natural movement:

> « [T]he essence of movement is [constituted] by the thing that takes place through the movement and by the goal at which what moves arrives by its movement. The same is true of the argument concerning fire and air. For the two places to which they move differ in species; one may be deceived about them only because when they move away from the place of earth they traverse a certain distance together »[81].

Al-Fārābī's riposte to Philoponus is thus based on the idea that the direction of natural movement can only determine its genus, but not its species. It is the limit of a natural movement, i.e. the natural place of each element, that determines its species. The upward movements of fire and air are generically one, but not specifically the same, since they are specified by their respective end-points. The one-to-one correspondence between simple natural movements and simple bodies is thus secured, and so is Aristotle's entire demonstration of the special nature of the fifth body[82].

This very same idea, as we have seen, is behind Avicenna's doctrine stating that the natural movement of each simple body, as its inclinatory power, displays a generic and a specific aspect. From this, and beyond what al-Fārābī advocates,

[80] Mahdi, *Alfarabi against Philoponus* cit., p. 259; Arabic text in Id., *The Arabic text of Alfarabi's* cit., p. 283.

[81] Mahdi, *Alfarabi against Philoponus* cit., p. 260; Arabic text in Id., *The Arabic text of Alfarabi's* cit., p. 284.

[82] It would be mistaken to assume that al-Fārābī's refutation of Philoponus' counterarguments is *ipso facto* a demonstration of the eternity of the world and that, according to him, Aristotle's aim in the *DC* is to establish the eternity of the world. As a good Aristotelian, al-Fārābī is very well aware that Aristotle does not demonstrate the eternity of the world in the *DC*, but the special nature of the fifth body (i.e. the fact that it moves by nature in a circle, and therefore that it does not possess heaviness or lightness, and that it is ungenerated, indestructible, and exempt from increase and alteration). Still, al-Fārābī's refutation of Philoponus is not simply a dialectical exercise, but one step in a larger argument. The very complicated issues of how the eternity of the world can be demonstrated according to Arabic thinkers, and if and how they were able to reconcile the theory of aether with that of the divine creation of the heavens do not pertain to the present study. For an overview of the first issue, see C. Cerami, *The Eternity of the World*, in R. Taylor, L. Lopez Farjat eds., *The*

Avicenna concludes that the *powers* of the simple bodies are generically one, but specifically different. In chapter 1, he does not explicitly adopt this device against Philoponus and his followers. This, however, is more clearly carried out in the following chapter. In chap. 2, in fact, Avicenna pursues the study of simple primary powers. He confirms the need to distinguish between a generic and specific aspect of natural movements and of simple powers, and extends this same scheme to circular movement [83].

Applying the framework established in chap. 1 to circular celestial movements, Avicenna claims that, in the case of these motions too, we can distinguish a generic and a specific aspect. Circular motions with different orientations and different locations must be regarded as generically the same, but specifically different:

> « The bodies that have in their natures a circular inclination are either many or one. For they constitute a genus opposite by nature to [that of] bodies moving by nature in a rectilinear way, just as you have realized from the previous explanations. However, if [these bodies] require in addition a different natural place and a different directions in motion, it is appropriate that they differ in species »[84].

Avicenna states plainly that there is one genus for circular celestial motions, according to which they all differ from rectilinear motions, and several species, determined by the movements' different inclinations. The same scheme is thus operative in sublunary and in supralunary natural movements. Circular motions (and the corresponding powers) share the same genus, but differ from each other (like their corresponding powers) in their species.

As in chap. 1, Avicenna affirms here that the distinction of one genus and several species of circular motions enables the objection of an anonymous opponent to be rejected. The opponent's criticism is not addressed directly against the Aristotelian doctrine, but against those who infer the diversity of the nature of the four simple bodies from the diversity of their movements. It consists in accusing them of not also having inferred the different nature of the celestial bodies from the different celestial movements. According to the opponent, in other words, it is not consistent to assume that there are four

Routledge Companion in Arabic Philosophy, Routledge, New York 2016, pp. 141-155, where the relevant literature is quoted. Concerning the second issue, see M. Chase, *Creation in Islam from the Qur'ān to al-Fārābī*, *ibid*., pp. 248-260, with bibliography. On al-Fārābī's position in particular, see D. Janos, *Method, Structure, and Development in al-Fārābī's Cosmology*, Brill, Leiden - Boston 2012.

[83] Cf. Avicenna, *Physics*, III. 13-14. Avicenna has already pointed out that three genera of natural motions are to be posited: the genus of what moves *from* the middle, the genus of what moves *towards* the middle and the genus of what moves *around* the middle. Here, however, he maintains that there are several species in each of these genera.

[84] Avicenna, *DCM*, p. 12, 4-7.

sublunary simple bodies which, like their simple movements, are generically the same and specifically different, but not to assume the same for the fifth body. In fact, since there are several celestial movements, why not admit that there are also several celestial natures, instead of a single fifth one?

> « Thus, [bodies] moving toward the middle (*al-wasaṭ*) constitute one genus, while those moving from the middle constitute another genus differing from the first one. However, if they are in addition different in nature, so that one requires some natural place above or below the other, and one moves farther away while another approaches, and one maintains its own inclination while the other loses it, and this belongs to them by nature, then these [bodies] differ in species by nature. This therefore eliminates the [supposed] inconsistency of the one who claims: "why did you all postulate (*awǧabtum*) a difference in the natures of the bodies in virtue of a difference in their movements, and then make (*ǧaʿaltum*) the spheres one single fifth nature"? The fact is that we do not make it (*lam naǧʿalhā*) one in species »[85].

The adversary's attack is not fully developed, but its main tenet becomes clear in the light of Avicenna's analysis. According to the opponent, it is nonsensical to assume the genus/species distinction for the sublunary natural movements but not for the supralunary ones and, hence, it is also inconsistent to infer on the basis of this argument the existence of one special celestial nature. For according to the one-to-one correspondence between movement and nature and the motion's genus/species distinction, one should assume that there are just as many celestial natures as circular movements, and not just one single fifth nature.

What is at issue, then, is the one-to-one correspondence between simple movements and simple bodies, and the existence of a fifth 'special' nature. The ultimate target of the criticism, however, is not Aristotle, but al-Fārābī. It is not Aristotle's original argument that is under attack, but al-Fārābī's answer to Philoponus, stating that the sublunary simple movements are the same according to their genus, but different according to their species. It is this thesis that the opponent accuses of inconsistency, and against it that he concludes that it is absurd to infer from it the existence of one single fifth nature. This is clear from Avicenna's answer; since he tells us that it is in order to dismiss this objection that he extends the genus/species distinction to the celestial movements, and claims that there are several species of celestial movements, but one single genus for them all. The one-to-one correspondence is therefore secured, and hence the existence of a special kind of simple body. By adapting al-Fārābī's scheme to the celestial movements, in fact, Avicenna can conclude that there is still *one* single fifth nature, even if it is one *in genus*, while different *in species*.

[85] *Ibid.*, p. 12, 11-16.

According to this reconstruction, therefore, we can conclude that, even if the objection is clearly a result of Philoponus' criticism against Aristotle, it was necessarily raised after the composition of al-Fārābī's treatise. In fact, the genus/species distinction is not attacked in any of Philoponus' criticisms, simply because this is al-Fārābī's new argument. In this sense, it is not incongruous to speak of a neo-Philoponan critic.

Before trying to provide a more specific profile of this neo-Philoponan opponent, and in order to underline the significance of Avicenna's development, some remarks are needed. First of all, by claiming that «*we* do not make [the celestial spheres] one in species», Avicenna places himself in a single lineage that goes back to Aristotle through al-Fārābī. This is true not merely because he makes al-Fārābī's thesis his own, but more importantly because he implements it and uses it, as did al-Fārābī, against an opponent of Aristotle's doctrine. Secondly, as in the case of the sublunary natural movements, Avicenna goes beyond what al-Fārābī explicitly states. In fact, he infers from the existence of several circular movements, which are specifically different but generically the same, the existence of several natures and several powers, which are specifically different but generically the same. This is the ultimate conclusion of the regressive argument Avicenna puts forward: celestial bodies and their corresponding powers belong to some single fifth nature, but only according to their genus, since according to their species, each one of them constitutes one single nature and possesses one single power. Thus, as in the case of the sublunary simple bodies, Avicenna can conclude that one unitary specific power belongs to one single celestial body, but he can also conclude that this celestial nature is a fifth nature, i.e. generically different from the sublunary one.

In the wake of Aristotle's *DC*, therefore, the second chapter of the *DCM* finally proves that the nature of the celestial body is different from the natures of the sublunary ones. However, Avicenna's strategy consists in considering, as far as possible, the five simple bodies from one single perspective, i.e. with respect to their simple power. The entire chapter, if not the *DCM* as a whole, thus shows that Avicenna's project lies halfway between the intention of setting up a unitary framework for all simple bodies and a strong anti-Philoponan concern.

Another passage of Avicenna's work confirms this hypothesis and provides supplementary evidences about his opponent. Here too, Avicenna strives to maintain Aristotle's cosmological underpinnings, while taking into account the new potentially threatening theories. In this case too, what is at stake is the existence of natural movements that remain in a one-to-one correspondence to simple bodies and, hence, the existence of a fifth simple nature.

After having admitted in the first chapter the genus/species distinction in the motive powers, Avicenna admits, as does Aristotle, that natural movements,

in a cosmological perspective, are defined by a fixed coordinate system[86]. Simple bodies moving naturally in a rectilinear way move towards or away from the centre of the universe (*al-wasaṭ*), while bodies moving naturally in a circular way revolve around this same centre. In the same context, however, Avicenna also endorses Ptolemy's models of epicycles and eccentrics, and specifies that not all celestial movements have the centre of the universe as their centre[87]. In order to maintain these *a priori* opposed astronomical theses, Avicenna follows the same strategy brought to light earlier: as far as possible, he extends the framework used to account for natural rectilinear motions to celestial movements.

First, Avicenna claims that we can admit that two simple bodies, water and earth for example, move towards the centre of the universe, even if only one of them reaches it:

> « Let it be known[88] that what moves from the middle need not inevitably move from the very middle (*min ʿayn al-wasaṭ*) only. For if it moves from another place, while moving by its movement farther away from the middle, it nevertheless moves away from[89] the middle[90]. Likewise, what moves toward the middle is not that which by its movement inevitably terminates at the very middle, for even if by its movement it [only] approaches[91] the middle [without reaching it], it is something that moves toward the middle. Indeed, not everything that moves towards something, reaches [it][92] »[93].

Water actually moves towards the centre of the universe, even if the latter is not its end-point, but is instead the end-point of the movement of earth. According to al-Fārābī's scheme, in fact, the movements of water and earth are specifically different, although, as rectilinear natural movements, they all share the same genus.

Avicenna then explains that in an analogous way, we can admit that a celestial body revolves around the centre of the universe, even if the latter is not the centre of its circular path:

[86] *Ibid.* p. 2, 5-7.

[87] I wish to thank A. Hasnaoui and J. McGinnis for having shared their respective translation of the following passage. Any possible mistake is mine.

[88] Following the Teheran lithography, which transmits *fa-l-yuʿlam*.

[89] Following the Teheran lithography, the manuscript Bibl. Nac. 5008 and the Latin translation, which transmit *ʿan al-wasaṭ*.

[90] If fire, for example, which moves by nature away from the centre of the universe, starts its upward movement in the region of air and not on earth, it nevertheless moves 'away from the middle'.

[91] Following the Teheran lithography, the manuscript Bibl. Nac. 5008 and the Latin translation, which transmit *in kāna*.

[92] Water, for example, 'moves toward the middle', even if its natural place, namely, the place where its movement stops, is not the very centre of the universe.

[93] Avicenna, *DCM*, p. 6, 8-14.

> « As for what moves around the middle, the middle need not inevitably be its centre (*markaz*)[94]. For even if [the middle] is not the centre [of its circular movement], but is inside it, then this [body] is something that moves around the middle, since it moves in a way about it (*ḥawlahū*) ; with the exception of one [body] in particular among those that move around the middle, namely[95], the one which delimits the whole, since [in this case] the middle is its centre[96]. As for what is other than that one [body], the centre of the circular body moving around the middle may not be the middle of the movement of the body moving toward the middle and from the middle[97]. [This centre] is thus not that with respect to which is determined the middle which makes the natural directions for rectilinear movements »[98].

By distinguishing the geometrical notion of centre (*markaz*) from the physical notion of centre of the universe, i.e. 'middle' (*wasaṭ*), Avicenna can claim that a planet revolving around the centre of an epicycle does not have the centre of the universe as the centre of its movement, but that it still moves about it (*ḥawlahū*). Since the epicycle's centre moves along a deferent, which contains the centre of the universe, the planet itself can be said to move around the centre of the universe, for following the path of the deferent, the planet sometimes comes closer to and sometimes moves farther away from this centre. In this sense, we can say that it moves about it. The only body that necessarily has the centre of the universe as its proper centre, Avicenna concludes, is the last sphere.

Avicenna adds that this consideration must not lead to the conclusion that the planet moving along the epicycle moves towards or away from the centre of the universe as the simple sublunary bodies do. For, Avicenna claims, the planet does not tend *essentially* towards that proximity or remoteness :

> « If what moves moves about (*ḥawla*) this middle, while the latter is not its centre, it happens to [this body] to be sometimes closer to it, sometimes farther away from it. This, however, is not because [the body] moves toward the middle or away from the middle, since it does not essentially tend by its movement toward this proximity and remoteness. Rather, it simply moves and is on its orbit, yet one part of its orbit happens to be nearer to the abovementioned middle and one part is farther, just as the parts [of] its orbit are near to or far from a potentially

[94] I.e., the centre of its circular movement.

[95] Following the Teheran lithography, which transmits *wahāḏa*.

[96] The last sphere has necessarily the centre of the universe as the centre of its circular movement.

[97] I.e., the centre of all celestial concentric spheres, as well as of the four sublunary bodies, which move toward and from the centre of the universe in the above-mentioned way.

[98] Avicenna, *DCM*, pp. 6, 13 - 7, 3.

> almost infinite number of [other] things, while it does not move towards them by primary intention. On the contrary, the primary intention with respect to its movement is the preservation of its orbit, [which] then entails this [other phenomenon]. And if that happened by primary intention, [the body] would stop once it reached what was intended and never depart from it, but it would move toward it from the nearest distance, namely, the straight line, not along a deviation. However, this proximity and this remoteness are not accidental to the whole of what moves around the middle [...] »[99].

Avicenna manages to reconcile the Aristotelian and Ptolemaic astronomy by appealing to the distinction between primary and secondary intention. The planet's getting closer to the centre of the universe does not constitute its primary goal ; it is not the result of a primary intention. If this were the case, when it arrived at the closest distance from that centre, the planet would reach it following the shortest path, namely the straight line, and never depart from it. Still, Avicenna concludes, this getting closer is not purely accidental either, at least as far as the whole movement is concerned.

Although Avicenna's explanation is based more on an analogy then on an identity, his strategy is the same as in the previous argument : the same scheme applies to natural rectilinear movement as to natural circular motion. The centre of the universe is always the point of reference for both kinds of motion, i.e. rectilinear and circular natural motions, either in a primary or in a secondary sense. In the case of earth's downwards motion, as in the case of the last sphere's circular movement, the centre of the universe is the primary point of reference ; while in the case of water's downward movement, as in the case of the planet's circular movement along the deferent, the centre of the universe is only secondarily the point of reference.

In the case of this argument too, Avicenna makes clear that the doctrine at issue is attacked by some people who seem to object that circular celestial movements are real movements toward and away from the centre of the universe :

> « If that is the case and there is neither something distinct that moves[100] nor a movement that is by itself toward some direction which the body would move to[101] by primary intention, how would there be a real movement toward the middle or from the middle, to the point that some of those near to the Christian community

[99] Avicenna, *DCM*, p. 7, 3-12.

[100] Following the Teheran lithography, the manuscript Bibl. Nac. 5008 and the Latin translation which seems to transmit *mutamayyizun.*

[101] Following the Teheran lithography.

(*baʿḍu al-mutaqarribīna ilā al-ʿāmmati min al-naṣārā*)[102] could reckon it as foolish, while being conscious »[103].

The opponent's doubt is considerably abridged, but here too its main tenet is clear from the context of Avicenna's presentation. By questioning the universality of the homocentric system, the Ptolemaic discoveries contribute new arguments against Aristotle's cosmology. If the centre of the universe is no longer the absolute point of reference of the circular celestial movements, the very existence of a natural downwards/upwards movement, like that of a natural circular motion around the centre and, hence, the existence of a fifth special nature, are also unreasonable. Integrated within the new scientific context, this criticism thus constitutes another piece of evidence substantiating the existence of a neo-Philoponan opponent. The objection, in fact, only applies if we admit the Ptolemaic astronomical model.

At the end of the passage, Avicenna provides supplementary information about the anonymous opponent. In reaction to this latter's criticism, Avicenna seems to reply that the opponent himself acknowledges that his objection is not decisive, while scoffing at Aristotle's doctrine. In so doing, Avicenna accuses his opponent of adopting a polemical posture; for the latter knows how to escape his own objection and decides, notwithstanding, to attack Aristotle's doctrine. It is not easy to understand what, according to Avicenna, the opponent is aware of. It is not unlikely that Avicenna is alluding to the solution he has just offered, according to which the model of deferents and epicycles still ensured a real form of homocentric cosmology. Be that as it may, Avicenna's riposte provides further unambiguous data concerning the identity of his opponent. By claiming that the opponent is part of a group of people « near to the Christian community », Avicenna provides two essential pieces of information. First of all, we can exclude that Avicenna is alluding to Philoponus, since this latter was not just 'near' the Christian community, but a full member of it. Likewise, we can infer that Avicenna's opponent belongs to the Arabic cultural *milieu* and that he was probably one of his contemporaries.

Another objection, which Avicenna quotes literally in chap. 5, lends weight to this hypothesis[104]. Avicenna tackles it while studying the disposition of the stars. This time the anonymous' criticism is addressed directly against the 'Peripatetics'. It consists in a clearer reformulation of Philoponus' argument to

[102] Or less plausibly « some Christians near to the crowd ».

[103] Avicenna, *DCM*, p. 7, 15-17. Or alternatively « but this is something well known », reading *wa-huwa yušʿiru*. I wish to thank Michael Chase for this suggestion.

[104] *Ibid.*, pp. 38, 17 - 41, 7.

the effect that the visible nature of the celestial bodies necessarily implies their tangible nature[105]. The author rephrases Philoponus' argument, by deploying the formal analogy supporting it: « sight is to touch what the object of sight is to the object of touch ». Setting aside the detail of Avicenna's reply, what is worth noting for us is that in this case, as in the previous criticism, Avicenna reproaches his opponent for his two-faced posture:

> « What we say in response to this spurious fallacy, which its author has doubtless decided to take over arbitrarily, is as follows [...] » (transl. M. Rashed)[106].

Avicenna implies that his opponent acknowledges that Philoponus' objection is groundless, but that he deliberately consents to it. These are sufficient elements to assign this objection if not to the same author, then at least, to the same philosophical tendency.

Bringing together all the evidence gathered so far, and even if the identification of Avicenna's opponent demands further research, we can provisionally conclude that the latter was an Arabic thinker active not before the first half of the 10th century. Indeed, the first objection examined shows that the opponent presupposed the solution provided in al-Fārābī's treatise *Against John the Grammarian*, while the second one suggests that he was either a Muslim or a Christian member of the Arabic cultural community. Furthermore, the quite severe tone of Avicenna's answers suggests that he was one of his contemporaries.

Taken together, these data allow us to rule out some names and to point to some others as possible candidates. Among the Arab critics of Aristotle's doctrine, we know from al-Qifṭī[107] that Abū Hāšim al-Ǧubbāʾi composed a work against Aristotle's *DC*. Although it is possible that Abū Hāšim was acquainted with al-Fārābī's response to Philoponus and that Avicenna had still access to his work, it is highly implausible that Avicenna should describe him as someone near to the Christian community. Among Avicenna's well-known polemical targets, Abū Bakr al-Rāzī could also be a possible candidate. Avicenna attacks him by name several times, notably in the context of the discussion of Aristotle's doctrine of the eternity of the world. The above examined objections, though, suppose a keener interest in Aristotle's *DC* that does not fit well with al-Rāzī's intellectual posture.

If we consider Avicenna's contemporaries who directly tackled the *DC* with an anti-Aristotelian attitude, two other names emerge as more plausible: Abū

[105] On this argument, see Rashed, *The Problem of the Composition* cit., p. 41 and ff.
[106] Avicenna, *DCM*, p. 39, 7-8.
[107] Ibn al-Qifṭī, *Taʾrīḫ al-ḥukamāʾ*, p. 40.

Rayḥān Muḥammad ibn Aḥmad al-Bīrūnī and Abū al-Faraǧ ʿAbd Allāh ibn al-Ṭayyib. Let us consider the elements supporting the identification of Avicenna's opponent with either the former or the latter.

The famous correspondence between Avicenna and al-Bīrūnī attests to a fervent debate between the two thinkers on issues pertaining to Aristotle's *DC*[108]. We are aware of two sets of questions that al-Bīrūnī addressed to Avicenna (ten grouped in a first set, eight in a second one). We do not possess the original version of al-Bīrūnī's questions, but Avicenna's summary, as well as Abū Saʿīd Aḥmad ibn ʿAlī al-Maʿṣūmī's summary of al-Bīrūnī's replies, can provide a reliable picture of his standpoint.

In the introductory lines of his first answers, Avicenna informs us that al-Bīrūnī asked him to elucidate some of Aristotle's statements in the *al-Samāʾ wa-l-ʿālam*, which al-Bīrūnī himself found 'problematic'[109]. Far from asking for a merely exegetical explanation, al-Bīrūnī provides doubts on Aristotle's doctrine by appealing to more or less fundamental objections. In several of them, he harshly criticizes Aristotle, but also upholds some of his tenets and confesses his admiration for his insight. In Avicenna's reformulation, none of al-Bīrūnī's criticisms perfectly matches the objections faced in the *DCM*. Nevertheless, Avicenna's answers as well as al-Bīrūnī's responses summarized by al-Maʿṣūmī, contain some elements that bring these objections close to those of the *DCM*. A detailed examination of this outstanding text is beyond the limits of the present paper. I will limit myself to pinpointing these elements of resemblance and consider to what extent they shed light on the *DCM*'s polemical background.

Among the eighteen questions addressed to Avicenna, four are particularly interesting for our purpose: the first two of the first set, pertaining to the absence of heaviness and lightness in the celestial body and to its eternity respectively, the fifth one of the first set, pertaining to the uniqueness of the world, and the second one of the second series, concerning the natural character of the movements of the simple sublunary bodies.

In the first question, al-Bīrūnī asks Avicenna why Aristotle asserted (*awǧaba*) that the heavenly bodies have neither lightness nor heaviness, and why he denied that heavenly bodies move toward and away from the centre[110]. In

[108] Al-Biruni and Ibn Sina, *Al-Asʾilah wa'l-Ajwibah (Questions and Answers)*. Including the further answers of al-Biîrûnî and al-Maʿsûmî's defense of Ibn Sînâ, eds. S. H. Nasr, M. Mohaghegh, High Council of Culture and Art, Tehran 1352Sh/1974 (hereafter Avicenna-Biruni, *Questions and Answers*). English translation in R. Berjak, M. Iqbal, *Ibn Sīnā-al-Bīrūnī Correspondence*, « Islam & Science », 1/1, 2003, pp. 91-98, 1/2, pp. 253-260 ; *ibid.,* 2/1, 2004, pp. 57-62, 2/2, pp. 181-187 ; *ibid.,* 3/1, 2005, pp. 57-62, 3/2, pp.166–170 ; *ibid*., 4/2, 2006, pp. 165-172 ; *ibid*., 5/1, 2007, pp. 53-60.

[109] Avicenna-Biruni, *Questions and Answers*, p. 1, 8-10.

[110] *Ibid.,* p. 2, 5-6.

spelling out his question, al-Bīrūnī first objects that the absence of movement toward and away from the centre in the celestial bodies is not due to the fact that they are neither light nor heavy, as Aristotle's statements seem to imply. He then provides his own explanation: the celestial body does not move *away from* the centre of the universe because there is no place outside the cosmos, and it does not move *toward* this same centre, because its parts are interconnected. In this sense, contrary to what Aristotle states, nothing prevents us from admitting that the celestial body is the 'lightest' body[111].

Avicenna solves al-Bīrūnī's first difficulty by appealing to the doctrine previously examined in the *DCM*, according to which a body is light only when it is not in its natural place. He first states that if the celestial body were light, it would not be in its natural place; for a body is defined as light in act when it moves *towards* its natural place and not when it is *in* it. He then argues that the celestial body is not in its natural place anywhere else than where it is, and concludes, therefore, that the celestial body is not light in act[112]. Clearly enough, then, the claim that inclination does not belong actually to the simple body in its final state, presented in the *DCM* as solving 'someone's' doubts, is here explicitly used to respond to al-Bīrūnī's question. This fact does not disprove that Avicenna's doctrine targets eventually Philoponus' criticisms, but it highlights the existence of a supplementary level of discussion within this same polemical background.

In the second question, alluding to *DC* I, 10 and II, 1, al-Bīrūnī asks Avicenna why Aristotle considered his predecessors' testimonies concerning the immutability of the heavens to be a strong argument for its perpetuity. The question aims ultimately at challenging the eternity of the universe. Al-Bīrūnī contests that ancient testimonies are not reliable on this point, and implies that claiming the contrary is nothing but sophistry[113].

In answering this question, Avicenna first makes clear that the appeal to the ancient testimonies is part of Aristotle's dialectical strategy, and that it does not constitute his real argument in favour of the eternity of the cosmos. He then blames al-Bīrūnī for raising an objection similar to those raised by Philoponus, ignoring the fact that the latter actually agrees with Aristotle on this point, as his commentaries testify[114]. He concludes his answer by harshly condemning al-Bīrūnī's violent stance against Aristotle[115].

[111] *Ibid.,* pp. 2, 6 - 3, 7.
[112] *Ibid*., pp. 3, 8 - 5, 9.
[113] Avicenna-Biruni, *Questions and Answers*, pp. 12, 7 - 13, 1.
[114] It is worth noting that Avicenna here mentions Philoponus' commentary on Aristotle's *GC.* On Avicenna's idea that Philoponus does not really wish to criticize Aristotle, cf. al-Maʿṣūmī reply to al-Bīrūnī's objection *ibid.,* pp. 69, 12 - 70, 5.
[115] *Ibid.,* p. 13, 7-10.

The overall tone of Avicenna's answer, thus, attests a certain agreement between the criticisms by al-Bīrūnī and Philoponus. Al-Bīrūnī's reply goes in the same direction, insofar as it attests both his acquaintance with Philoponus' texts, in all probability the *Contra Proclum* and the *Contra Aristotelem*, and his commitment to a critical stance against Aristotle. Al-Bīrūnī replies, in fact, that it is not Philoponus who should be accused of taking a two-faced stance, as Avicenna implies, but Aristotle. He then recommends that Avicenna make a closer study of Philoponus' personal treatises, notably the *Contra Proclum* and the *Contra Aristotle*, and not just his commentaries on Aristotle's books[116].

The fifth question provides supplementary elements concerning al-Bīrūnī's rejection of Aristotle's theory of elemental natural movement. What it at issue is the idea that there is only one world, whether made up of the same simple bodies as our present world or of different natures. Al-Bīrūnī warns that this assumption, as well as Aristotle's claim that any supposed different world must be constituted by simple bodies of the same kind, put God's absolute power into question. This is clear from his reply to Avicenna's answer, where al-Bīrūnī states that if Avicenna is not willing to admit that God can create two separate worlds with distinct centres and peripheries, he is not willing to assume that the movements from the centre and toward the periphery are distinct movements belonging to only one genus (*ǧins*). He ends his reply by granting that his opinion can be assimilated on this point to the Basrians' opinion, which, as he attests, Avicenna defined as a Sophism[117].

The second question of the second set attests the same critical assessment of Aristotle's theory of natural movements and proves that al-Bīrūnī's doubts echo difficulties embedded in a larger polemical context. Al-Bīrūnī asks Avicenna whether the doctrine of 'the person' asserting that all simple sublunary elements move downward is more reliable than the doctrine defended by Aristotle that fire and air move upwards while water and earth move downward[118].

Avicenna answers that the case of fire invalidates this person's assumption. As such, fire cannot be said to moving *toward* the centre, because it never reaches it. In fact, only a body that reaches a certain end moves, strictly speaking, toward it[119].

Against Avicenna's opinion, al-Bīrūnī espouses the first doctrine. He relates that, once he had received Avicenna's answer, he questioned the author of doctrine as to how to reply. The latter, according to al-Bīrūnī, confirmed against Aristotle's model that all bodies move toward the centre, and explained that the reason why

[116] *Ibid.*, pp. 51, 13 - 52, 10.
[117] *Ibid.*, pp. 57, 17 - 58, 8.
[118] *Ibid.*, pp. 38, 12 - 39, 2.
[119] *Ibid.*, pp. 39, 3 - 40, 5.

some elements, such as fire, do not reach the centre, although they move toward it, is that they are hindered by others that occupy the inner region[120].

All four of al-Bīrūnī's questions thus attest the existence of a heated debate concerning Aristotle's doctrine of elemental natural movement. They also show that Avicenna uses the doctrines provided in the *DCM* to oppose an anti-Aristotelian Arabic tendency that he assimilates to Philoponus' criticism. Furthermore, although Avicenna shows great respect for al-Bīrūnī, he does not hesitate to blame him for questioning Aristotle's doctrine and for raising objections comparable to those of Philoponus. Finally, the earlier date of the correspondence with al-Bīrūnī[121] fits with the possibility that Avicenna was already aware of these criticisms while composing the *DCM*.

All these elements make it rather likely that al-Bīrūnī was one of Avicenna's interlocutors in the *DCM*. However, the fierceness of Avicenna's replies, as well as the indication of the opponent's proximity to the Christian community leave the possibility open that Abū al-Faraǧ ibn al-Ṭayyib was also a target in the *DCM*. Several sources dating to the last years of Avicenna's life document the contempt he displayed for Ibn al-Ṭayyib and, more generally, for the Christian philosophical community of Baghdad. Two texts in particular provide information that can support this hypothesis : a letter that Avicenna addressed to Abū Jaʿfar Muḥammad Ibn Ḥusayn al-Kiyā[122] and a letter from one of Avicenna's disciples in Rayy addressed to an anonymous *šayḫ* in Iraq[123].

In the first text, in reply to al-Kiyā, Avicenna agrees with him that Aristotle's doctrines, notably about intellect and soul, puzzled their readers and that this hesitation and obtuseness are particularly evident among the « simple-minded Christians » of Bagdad. He then considers Philoponus' stance and makes reference to the latter's « book on the refutation of Aristotle[124] ». He judges it to be only

[120] *Ibid.* pp. 77, 12 - 80, 2.

[121] D. Gutas, *Avicenna and the Aristotelian Tradition*, Introduction to Reading Avicenna's Philosophical Works. Second, Revised and Enlarged Edition, Including an Inventory of Avicenna's Authentic Works, Brill, 2014, pp. 97-98 ; 289-290.

[122] The letter, in the version transmitted in the Cairo MS Dār al-Kutub, Ḥikma 6 M, is published in Badawi, *Arisṭū ʿinda al-ʿArab* cit., pp. 119-122. For a French translation, see S. Pines, *La "philosophie orientale" d'Avicenne*, « Archives d'Histoire doctrinale et littéraire du Moyen Âge », 19, 1952, pp. 5-37, pp. 6-9 ; for an English translation, see Gutas, *Avicenna and the Aristotelian Tradition* cit., pp. 60-64.

[123] This letter is included in the collection preserved in the Oxford MS, Bodleian Hunt. 534, at ff. 13v ult.-15v2. For an English translation, see Gutas, *Avicenna and the Aristotelian Tradition* cit., pp. 66-72. On this letter, see also Pines, *La "philosophie orientale" d'Avicenne* cit., pp. 35-37 and D. Reisman, *The Making of the Avicennan Tradition : The Transmission, Contents, and Structures of Ibn Sīnā's* al-Mubāḥaṯāt *(The Discussions)*, Brill, Leiden 2002, pp. 195-203.

[124] Literally « of this man ». Pines and Gutas suppose that Avicenna is alluding to the *Contra Aristotelem*. Avicenna's access to this work is also suggested by his correspondence with al-Bīrūnī (see *infra* n. 116).

apparently cogent, but states that facing the difficulties (*šukūk*) it tackles and solving them is a necessary step in science, which he achieved in an appropriate manner in his *Šifā'*. Referring again to the Christian philosophers of Bagdad, Avicenna claims that the above-mentioned « superficial scholars (*rasmiyyūn*) »[125] can neither understand such complex difficulties nor solve them, just as Philoponus himself was incapable of doing. He then adds that the only way to discard them, as he himself did, is to first consider the fundamental principles provided in the *Physics*, and then those provided in the *DC*[126]. Avicenna ends the letter by recalling that he included an analysis of the Baghdadis' « weaknesses, deficiency and ignorance » in his treatise *The Fair Judgment* (*Kitāb al-Inṣāf*), lost during the sack of Isfahan.

The same hostility against the circle of Baghdad is attested in a letter, probably by Ibn Zayla[127], relating an episode of the last years of Avicenna's life. Pushed by his students to rewrite his lost treatise *The Fair Judgment*, Avicenna asked a friend to procure him the recent books of the two Baghdadi masters still alive, no doubt including Ibn al-Ṭayyib[128]. The author relates that only the books by Ibn al-Ṭayyib could be located, among which was his commentary on the *DC*[129]. He also reports that Avicenna's reaction, once he had examined them, was extremely severe. Avicenna despised Ibn al-Ṭayyib's commentaries, as he did those by Ibn al-Samḥ and Ibn al-Ḫammār, for the scantiness of their content as for the unsuitability of their method. Among all the invectives Avicenna heaps on Ibn al-Ṭayyib, the criticisms concerning his method are particularly interesting for us. Avicenna accuses him of adhering too closely to the transmission of certain books without analysing the details of the problems, as well as for dismissing logic completely. This drew Ibn al-Ṭayyib away from the right path. This is true, as Avicenna makes clear, not only of the books he recently came upon, but also of all those he previously examined. In all of them, Ibn al-Ṭayyib formulates dubious argumentation that fails to convince, produces inconsistent procedures, and uses rhetorical and sophistic methods in demonstrative sciences.

In both texts, then, Ibn al-Ṭayyib is criticized for dealing with Philoponus' difficulties without solving them, as well as for following a sophistic method in

[125] On the different meanings of this term, see Pines, *La "philosophie orientale" d'Avicenne* cit., p. 26, n. 3.

[126] This passage thus confirms, as we suggested in examining the first chapter of the *DCM*, that Avicenna establishes an essential link between the *Physics* and the *DCM* of the *Šifā'*.

[127] On this attribution, see Reisman, *The Making of the Avicennan Tradition* cit., pp. 191-192.

[128] On the identification of the two masters, see Gutas, *Avicenna and the Aristotelian Tradition* cit., p. 62 n. 9.

[129] This commentary could be identified with the one accompanying the Arabic translation attributed to him. See *infra* n. 8.

his commentary on the *DC*. These elements can buttress the hypothesis that he is to be identified with the anonymous opponent of the *DCM*. However, the later date of the events related in the letters makes it less plausible that Avicenna is alluding in the *DCM* to objections found in Ibn al-Ṭayyib's commentary on the *DC*.

The review of the previous sources does not exhaust the question concerning the *DCM*'s polemical background[130], but enough has been said to prove that Avicenna aims at refuting a Philoponan trend among his contemporaries. This is not to imply that Philoponus himself is not among Avicenna's targets, since the correspondence with al-Bīrūnī and the letter to Kiyā confirm that Avicenna was acquainted with at least the *Contra Aristotelem*. But it is indisputable that there is also another closer polemical setting against which Avicenna's *DCM* was constructed. It can be argued, in conclusion, that the entire study devoted to the inclinatory power, and Avicenna's effort to demonstrate its unitary nature, as well as its one-to-one correspondence with the simple body, must be understood in this Arabic polemical context. Aristotle's *DC* and the doctrine it conveys do not constitute a threshold that cannot be exceeded, but the theoretical background that is to be confirmed.

Conclusion

Despite the peculiar attention Avicenna's cosmology has received in more or less recent years, the *DCM* of the *Šifāʾ* is still a terra incognita in Avicennian studies. No modern translation of this treatise has ever been made, and the articles devoted to it can be counted on the fingers of one hand. Scholarship dealing with Avicenna's cosmological doctrines, notably his 'celestial psychology', focuses on other texts, inside and outside the *Šifāʾ*. Considering the very nature of the *DCM*, this state of affairs is not a mere coincidence. Any reader eager to find new insights on Avicenna's 'celestial noetics' would be disappointed, simply because such a study falls outside the *DCM*'s primary scope. By claiming this, I do not mean that the *DCM* does not concern essentially the heavens and the superlunary world, and that what Avicenna argues in it has no impact on his celestial physics and even his metaphysics. What I wish to argue is that Avicenna's project, in the *DCM*, is to study the superlunary world as a part of the whole world.

Accordingly, I have suggested that in order to understand the specific project of the *DCM*, one has to realize that Avicenna arranges it so as to solve the

[130] On the one hand, a detailed study of Ibn al-Ṭayyib's still unedited commentary on the *DC* is needed; on the other hand, other possibilities must be considered more carefully, notably the hypothesis that the correspondence between Ibn Zurʿa and Yaḥyā ibn ʿAdī, mentioned by Ibn al-Ṣalāḥ, might also have provided material for Avicenna's polemical background.

perplexities concerning the structure and the content of Aristotle's *DC*, raised by its Greek and Arabic readers. This is not to say that Avicenna did not have his own philosophical agenda, since he clearly wishes to inscribe this enquiry within the general project of his *Physics* of the *Šifā'*; but that he develops his doctrine, while remaining faithful to this twofold commitment.

Concerning the question of structure, I have suggested that the *DCM* avoids the reproach addressed to Aristotle's *DC* of lacking an inner unity, since it more clearly constitutes a unitary enquiry into the five simple bodies. This is revealed by the fact that Avicenna, unlike Aristotle, deals with sublunary simple bodies from the outset, and provides a study that is, as far as possible, common to them and to the celestial body. The unity of this common study relies on the way the simple bodies are considered, namely, with respect to their power. By following this approach, as I have also suggested, the *DCM* carries on the programme of the *Physics* of the *Šifā'* to study the body insofar as an internal power « which brings about motion and change » belongs to it. In this larger context, the specific aim of the *DCM* is to understand the ontological status of the powers of the simple bodies with respect to their motion and their form. For this reason, the *DCM* focuses primarily on what Avicenna calls the inclinatory power, which must be identified according to him with the lightness and heaviness of the simple bodies.

I wish to argue in conclusion that focusing on this notion, Avicenna also emphasizes the *DCM*'s specificity with respect to the *GC* and, henceforth, avoids the second difficulty raised against the Aristotelian treatise, namely, the supposed redundancy of *DC* III-IV and *GC* II. This is confirmed by the way Avicenna considers the body in the *GC* of the *Šifā'*, where he claims that the simple bodies can be understood in a threefold way: 1) as such; 2) as parts of the whole; 3) as elements of a composite body[131]. He explains that water, for example, understood as a part of the whole world, is characterized as heavy and moving downwards, while understood as an element it is characterized as possessing an active/passive power (that is, as cold and moist). He concludes that it is with respect to this power that the simple bodies are considered in the *GC*, because it is as such that they can interact with each other. This remark, therefore, confirms the suggested reading of the *DCM* and highlights its complementarity with the *GC*: the *DCM*, as an inquiry into the simple parts of the whole, considers simple bodies with respect to their inclinatory power, while the *GC*, being a enquiry of the mutual interaction of the simple bodies, considers them with respect to their active/passive power.

The doctrine of the inclinatory power is thus at the very core of Avicenna's solution of the structural difficulties addressed to Aristotle's *DC*. The present

[131] Chap. 9.

contribution shows that this notion also constitutes the key to the *DCM*'s most original contribution and that, in this case too, the criticisms addressed to Aristotle's text provide the framework within which Avicenna constructs his own doctrine. Three main theses show that Avicenna aims at the same time at innovating, while defending Aristotle's doctrine against his Greek and Arabic critics. As a final conclusion, I would like to pinpoint some of the new insights these three theses provide for the understanding both of Avicenna's own doctrine and of his preceding and subsequent tradition.

First, by claiming that the inclinatory power is not a direct consequence of the form of the simple bodies — since it stems from it *and* from an accident —, Avicenna deliberately withdraws the capacity to move from the simple bodies' ontological core. This doctrine can be traced back ultimately to Alexander of Aphrodisias' exegetical strategy, but operates in Avicenna as an ontological tool to highlight the separate nature of the substantial form. The metaphysical implications of this doctrine are crucial for both Avicenna's ousiology and his theory of emanation.

Second, by extending al-Fārābī's genus/species distinction to the celestial movements, Avicenna sets up the ontological framework that enables him to conclude that each celestial body has its own species. Strangely enough, scholarship has overlooked the relevance of this strategy with regard to both Avicenna's doctrine and the subsequent tradition. The *DCM* shows that the doctrine that heavenly bodies have one genus and several species, so harshly criticized by Averroes for its supposed metaphysical consequences[132], is strongly rooted in Avicenna's physics and, hence, in the Farabian heritage. This consideration contributes new insights for the appraisal of both Avicenna's interpretation of the boundaries between physics and metaphysics, and of Averroes' criticism.

Third, by applying the distinction between primary and secondary intention to celestial movements, Avicenna manages to reconcile Ptolemy's new cosmological theories with the Aristotelian homocentric system. It is not farfetched to conclude that this strategy is a perfect exemplification of Avicenna's stance in the *DCM*: always with and beyond Aristotle.

The present contribution shows that, in all these cases, Avicenna elaborates his doctrine while responding to the difficulties raised by some near opponents. Although Philoponus's criticism provides the *DCM*'s larger polemical background, the thorough analysis of these criticisms suggests that Avicenna's direct target is among his contemporaries. For different reasons, al-Bīrūnī and Ibn al-Ṭayyib and his circle are plausible candidates. Sticking to their doctrinal and philosophical stance,

[132] On Averroes' criticism against Avicenna's doctrine, see C. Cerami, *A Map of Averroes' Criticism against Avicenna: Aristotle's Natural Philosophy I*, in A. Bertolacci, D. N. Hasse eds., *The Arabic, Hebrew and Latin Reception of Avicenna's Natural Philosophy*, W. de Gruyter, forthcoming.

they raise doubts against the fundamental assumption of Aristotle's cosmology: the one-to-one correspondence between simple bodies and natural movements. The precise identification of Avicenna's sources requires further research; still, it is undeniable that it is to secure this doctrine and, hence, the existence of a special fifth nature, that Avicenna strives to ascertain the unitary nature of the inclinatory power and its exclusive connection with the body it belongs to.

Appendix I: Pseudo-Avicenna's *De Caelo et Mundo*

By writing the *DCM*, Avicenna thus intends to provide a treatise on the entire world and on its parts. This intention explains the arrangement as well as the scope of this part of the *Kitāb al-Šifā'*, which is not strictly speaking a treatise on cosmology. A general comparison with the homonymous treatise in sixteen questions wrongly transmitted as part of the earliest Latin translation as Avicenna's own *DCM* shows the originality of Avicenna's project and sheds some light on the Latin heritage of his treatise.

As I have previously recalled, Alonso suggested that this treatise is to be identified with the work by Ḥunayn ibn Isḥāq mentioned in the *Kitāb al-Fihrist* after Themistius' paraphrase. Alonso examined all the parallel passages between pseudo-Avicenna's *DCM* and Themistius' paraphrase and concluded that the Arabo-Latin treatise is nothing but a compilation of parts of Themistius' work by Ḥunayn ibn Isḥāq. Alonso's conclusion has been challenged more recently by R. Glasner[133] and O. Gutman[134]. By emphasizing that a great deal material of the treatise does not derived from Themistius, Glasner concludes that the treatise as a whole cannot be considered a mere reformulation of Themistius' paraphrase[135]. She also produces convincing arguments against the attribution to Ḥunayn ibn Isḥāq. In particular, she points out that the theory of light attested in pseudo-Avicenna's *DCM* is not coherent with what we have by Ḥunayn ibn Isḥāq on this issue[136]. In a preliminary study and in the preface to the critical edition of the treatise, O. Gutman confirms Glasner's conclusions and claims that the treatise is much more than a mere collation of extracts of Themstius's paraphrase. He is more cautious, however,

[133] R. Glasner, *The Hebrew Version of De Celo et Mundo Attributed to Ibn Sīnā*, « Arabic Sciences and Philosophy », 6, 1996, pp. 89-112 ; cf. H. Kahana-Smilansky, *Solomon Ben Moses Melguiri and the Transmission of Knowledge from Latin into Hebrew*, in R. Fontaine, R. Glasner, R. Leicht, G. Veltri eds., *Studies in the History of Culture and Science*. A tribute to Gad Freudenthal, Brill, Leiden 2011, pp. 283-302 : p. 293.

[134] O. Gutman, *On the Fringes of the* Corpus Aristotelicum *: the Pseudo-Avicenna* Liber Celi et Mundi, « Early Science and Medicine », 2/2, 1997, pp. 109-128 ; Id., *Pseudo-Avicenna. Liber* Celi et Mundi, A Critical Edition with Introduction, Brill, Leiden - Boston 2003 (hereafter Pseudo-Avicenna, *DCM*).

[135] On the Latin-Hebrew version, which is more of a paraphrase of the Latin text than a mere translation, see Glasner, *The Hebrew Version* cit., pp. 96-101.

[136] On the authenticity of Ḥunayn's *Fī anna l-ḍaw' laysa bi-ǧism*, see R. Arnzen, *Aristoteles'* De

about disavowing Ḥunayn's paternity, and claims that it is plausible to think that Ḥunayn wrote a treatise on the *DC* in sixteen questions that became the basis of what is now pseudo-Avicenna's *DCM*[137], which in its actual form could have been written by another Arabic author.

In her article, Glasner also adds arguments against the attribution to Avicenna. She points out that pseudo-Avicenna's *DCM* diverges from Avicenna's views on at least two issues: 1) the idea that the four elementary qualities are produced as a function of the distance from the celestial bodies; 2) on the nature of the heat proceeding from the heavens and the corpuscular nature of light[138]. Concerning the first issue, she claims that Avicenna has a less 'derivative' theory of the four primary qualities. As for the second point, she emphasizes that Avicenna explicitly criticizes any theory that the sun's rays have a material nature.

The authorship of pseudo-Avicenna's *DCM*, thus, remains to be ascertained and an in-depth study of the content of the treatise is still a desideratum. Such an investigation goes beyond the purpose of the present article. I will limit myself to providing an overview of the structure of the treatise, with the aim of highlighting the differences between it and Avicenna's *DCM*. This approach will emphasize the originality of the plan of Avicenna's *DCM* and provide some hints toward explaining the reasons of the fortune of pseudo-Avicenna's *DCM* in the Latin world[139].

Anima. *Eine verlorene spätantike Paraphrase in arabischer und persischer* Überlieferung. Arabischer Text nebst Kommentar, quellengeschichtlichen Studien und Glossaren, Brill, Leiden - Boston 1998, pp. 708-717.

[137] An epitome of the *DC* by Ḥunayn ibn Isḥāq is also mentioned by Ibn abī Uṣaybiʿa under the title *Ǧawāmiʿ kitāb al-Samāʾ wa-l-ʿālam* (see Ibn abī Uṣaybiʿa, *ʿUyūn al-anbāʾ*, p. 200).

[138] Glasner, *The Hebrew Version* cit., pp. 101-104.

[139] The text was translated from Arabic into Latin in the mid-12th century. It was already quoted in the last quarter of that century. We find a quotation of this treatise in Daniel of Morley, who considers it to be by Aristotle. The first attributions to Avicenna date back to 1230. Among the first writers to attribute it to Avicenna were Vincent of Beauvais and Albertus Magnus. Although Avicenna's paternity was questioned as early as 1266 by Roger Bacon, the treatise had a great fortune in the Latin world, to the point that it still featured in Bonetus Locatellus' Venetian edition of Avicenna's *Opera Omnia* (1508). On the Latin reception of the pseudo-Avicenna's *DCM*, see Gutman, *Pseudo-Avicenna. Liber Celi et Mundi* cit., pp. xvii-xxi.

Table 2: Outline of Pseudo-Avicenna's *De Caelo et Mundo* compared to Aristotle's *De Caelo*

PSEUDO-AVICENNA'S *DCM*	ARISTOTLE'S *DC*
Chapter 1: On the fact that the body is more perfect than every other quantity, and that the world is more perfect than every other body.	I, 1
Chapter 2: On the fact that nature of the heaven is outside the four natures, and that it is a simple body.	I, 2
Chapter 3: On the fact that the body of the heaven does not increase.	I, 3
Chapter 4: On the fact that the heaven is not susceptible to generation or destruction in its nature.	I, 3-4
Chapter 5: On the fact that the heaven is finite.	I, 5-7
Chapter 6: On the fact that there is only one world.	I, 8-9
Chapter 7: On the fact that the motion of the circle of the fixed stars from east to west cannot be a body.	II, 3
Chapter 8: On the fact that the heaven is spherical in shape.	II, 4
Chapter 9: On the fact that the whole universe is spherical in shape.	II, 4
Chapter 10: On the fact that the shape of the earth is spherical.	II, 4*
Chapter 11: On the fact that the motion of the heaven is constant.	II, 6
Chapter 12: On the action of the diversity and multitude of the motions of the heaven.	II, 7*
Chapter 13: On the nature of the planets.	II, 7-8
Chapter 14: On the reason why the heaven does not warm us and the sun and the other warming planets do.	II, 7*
Chapter 15: On the fact that the heaven moves with a motion which is visible to us, but the stars do not.	II, 11
Chapter 16: On the generation of the elements and their action.	III

A preliminary caveat is in order to appreciate the significance of this comparative table. As we have already emphasized, pseudo-Avicenna's *DCM*

is not, strictly speaking, a paraphrase of the *DC*, although it has its point of departure in Aristotle's text and appeals to Themistius' paraphrase in its developments. A comparison with the parallel passages in the *DC*, however, reveals some essential features of the treatise. A quick look at its table of contents shows that the author closely follows the structure of Aristotle's *DC*. First of all, we can remark that the structure of book I is preserved not only with regard to the presence of a preliminary chapter on the perfection of the body and three chapters on the special nature of the celestial body, but also with respect to the demonstration of the finite nature of the heavens and the uniqueness of the whole world, which follow, as in Aristotle's *DC*, the study of the fifth element. Although more emphasis is put on some issues only tangentially referred to in Aristotle's text, the structure of book II is *grosso modo* preserved as well[140]. Last but not least, as in Aristotle's *DC*, the study of the four sublunary bodies and their mutual generation is provided after the enquiry into the celestial world.

However, the comparative table also points out a number of discrepancies that distinguish pseudo-Avicenna's *DCM* from the Aristotelian *DC*. In this case too, as I wish to suggest, the peculiarities of pseudo-Avicenna's *DCM* reflect the nature of the entire treatise. To begin with, we can note the absence of the discussion on the incorruptible character of the universe as a whole that Aristotle undertakes in I, 10-12. Unlike the actual *DC*, which devotes two chapters (II, 13-14) to the study of the Earth, the Arabic treatise does not contain any specific study of it, except for the chapter devoted to its shape. Above all, the very limited space accorded to the study of the sublunary elements must be emphasized. Not only there is merely one question devoted to the contents of the entire book III, but, more importantly, there is no parallel chapter devoted to the light and the heavy, which Aristotle studies in *DC* IV.

Some tentative conclusions can be drawn from this brief overview. First of all, the greater emphasis placed on the cosmological issues to the detriment of the study of the four sublunary elements shows by itself the epistemological nature of pseudo-Avicenna's *DCM*, which is conceived as a cosmological treatise. Moreover, in the last chapter, the author acknowledges that he is dealing with the generation of the four elements only insofar as it is the result of the movements of the celestial spheres. As a matter of fact, the whole chapter is far

[140] This is the case for chapter 14, which discusses the question why the heavens do not warm us, while the sun and the other warming planets do. Aristotle does not address the question in these terms, but he points out at the end of II, 7 (289a31-32) that the air beneath the sphere of the revolving body is necessarily heated by its motion, and particularly in that part where the sun is attached to it. The presence of a chapter on this issue is nevertheless unsurprising, since it was a matter of debate since at least the time of Alexander of Aphrodisias (on this topic see Cerami, *Génération et Substance* cit., pp. 470-473 with bibliography).

from being a paraphrase of the *DC*. It aims at showing that the heavens affect the positions of the elements, which are ordered according to the more or less direct impact of the celestial movement: fire — which is the more affected — is at the top, air and water in between, and earth — which is the least affected — is at the centre.

The treatise ends with an explanation of the necessity of this arrangement, which reveals a 'providentialist' approach. The author claims that the generation of the four elements is the result of an *intentio*: primary in the case of the earth, and secondary in the case of the other three elements. For the existence of an intermediate layer of bodies between the heavens and the earth is necessary in order for the latter to be preserved. The preservation of the earth's stability is thus the result of a primary *intentio*, and the reason for the existence of the other simple bodies[141].

In order to measure the originality of Avicenna's text as compared to pseudo-Avicenna's *DCM*, a final remark on the peculiar character of this latter is in order. In (the short) chapter 4 on the incorruptibility of the fifth body, the author seems to share Aristotle's 'eternalist' position and states that the heaven is everlasting (*sempiternum*). However, in chapter 5, in contrast with this assumption, he admits the created nature of the world[142]. In fact, in the demonstration of the finite nature of the heavens, he claims first that finite space is a consequence of finite motion, which is in turn a consequence of finite time, and concludes that the heavens, or more precisely the 'quantity of heavens', both in time and in its essence, is finite and has a beginning[143]. It is plausible to suppose that the absence of a question parallel to *DC* I, 10-12, on the incorruptible character of the universe as a whole, is the result of the same two-sided attitude[144].

We can suggest, in conclusion, that both external and internal reasons account for the fortune of this treatise in the Latin Middle Ages and its attribution to Avicenna. The Latin translation of Avicenna's original *DCM*, as we shall see, was not carried out before 1274 at the earliest, while pseudo-Avicenna's *DCM* was part of the first wave of translations of Avicenna's work

[141] Pseudo-Avicenna, *DCM*, p. 274, 3-5 : « Ut autem hoc non contingeret, posita fuerunt cetera elementa media inter terram et celum, idcirco ut terra remaneret quiescens et perhennis in quiete ut non moveatur ».

[142] Alonso Alonso, *Hunayn traducido* cit., pp. 38-39 ; cf. Gutman, *Pseudo-Avicenna. Liber Celi et Mundi* cit., p. 49, p. 77 n. 3.

[143] Pseudo-Avicenna, DCM, pp. 75, 18 - 76, 2 : « Amplius autem postquam manifestum est quod non est possibile quantitatem infinitam habere esse vel fuisse vel futuram fore, tunc iam manifestum est quod quantitas celi in suo tempore et sua essentia finita est et initium habet ».

[144] Insofar as these two theoretical features display a certain theological awareness, they offer a new path for research on the authorship of the treatise. But, as I said, this research will be the object of a future study.

that took place in Toledo between 1150 and 1175[145]. As one of the manuscripts attests (MS Vat. Lat. 2186), the treatise was translated into Latin by 'Gundisalvo', to be identified with Gundissalinus, and 'Johanne Hispalensi', who has been tentatively identified with the famous Jewish scholar Avendauth[146]. The text was attributed to Avicenna since at least the mid-13th century, when Vincent of Beauvais mentions it as Avicenna's *DCM* in his *Speculum naturale* (1244-1246). In almost the same years, Albertus Magnus quotes it *verbatim* in his commentary on Aristotle's *DC* (*ca.* 1248-1251) and refers to it as Avicenna's *Sufficientia de libro Caeli et Mundi*[147]. It is indisputable that the reputation of its translators, who rendered most of the original Avicennian treatises from Arabic into Latin, as well as the early date of its translation (*ca.* 1150-1175), played an essential role in the circulation of pseudo-Avicenna's *DCM*. However, we can also suggest that the purely cosmological nature of the treatise, as well as its more 'theological' stance, contributed to the transmission of the treatise among a public eager to fill a gap in the reception of Avicenna's philosophical *corpus*.

Appendix II: The Latin translation of Avicenna's *DCM*

As far as the Latin heritage of the original *DCM* of the *Šifāʾ* is concerned, we have already recalled that Avicenna's *DCM* was not among the sections translated in Toledo during the second half of the 12th century, but it was translated along with the third, fourth and fifth sections of the *Šifāʾ* in the last quarter of the 13th century. Unlike pseudo-Avicenna's *DCM*, the Latin translation of the original treatise by Avicenna had almost no circulation in the Latin Middle-Age. A single manuscript of the Vatican Library, the Latin Urbinate 186, transmits it along with the translation of the other three sections.

[145] The bibliography on this impressive cultural phenomenon is vast. On this topic, see notably M.-T. d'Alverny's ground-breaking studies, republished in Ead., *Avicenne en Occident*, Vrin, Paris 1993; see also the many fundamental studies of C. Burnett (notably C. Burnett, *The Coherence of the Arabic-Latin Translation Program in Toledo in the Twelfth Century*, « Science in Context », 14, 2001, pp. 249-288 (repr. in Id., *Arabic into Latin in the Middle Ages*. The Translators and their Intellectual and Social Context, Routledge, Ashgate 2009, Article VII); Id., *Translating from Arabic into Latin in the Middle Ages: Theory, Practice, and Criticism*, in S. G. Lofts, P.W. Rosemann eds., *Éditer, traduire, interpréter: Essais de méthodologie philosophique*, Peeters, Louvain 1997, pp. 55-78); and most recently A. Bertolacci, *A Community of Translators: The Latin Medieval Versions of Avicenna's Book of the Cure*, in C. J. Mews, J. N. Crossley eds., *Communities of Learning. Networks and the Shaping of Intellectual Identity in Europe*, 1100-1500, Brepols, Turnhout 2011, pp. 37-54.

[146] See Gutman, *Pseudo-Avicenna. Liber Celi et Mundi* cit., pp. x-xiii.

[147] For the exact references, see Gutman, *Pseudo-Avicenna. Liber Celi et Mundi* cit., p. xvii.

This manuscript was first described at the beginning of the 20th century, by Cosimo Stornajolo[148] and a second time in 1963, by Marie-Thérèse d'Alverny[149]. It is a parchment manuscript copied in the 15th century. The beautiful handwriting and the ornaments that decorate it suggest that it was copied for someone of high rank. We know that it belonged to the Count, then Duke of Urbino, Frederic of Montefeltro[150]. It contains only the natural philosophy of the *Šifā'* and, more precisely, the part that was not translated during the first wave of translations. The *DCM* is contained at the folios 83r-102v[151]. As a witness to Avicenna's text, as we will see, this manuscript contains a considerable number of mistakes, either made by its copyist, or already present in its model.

The manuscript provides crucial information about the authors of the translation, as well as on the identity of the recipient. The *explicit* of the first treatise informs us that the translation was carried out at the request of Gonzalo García Gudiel, described as bishop of Burgos. Gonzalo García Gudiel was a quite well-known figure of 13th century Spain. He was a member of an eminent family of Mozarabic origin, close to the kings of Castile. He was bishop of Cuenca between 1273 and 1275, then of Burgos between 1275 and 1280, when he was promoted to the archiepiscopal seat of Toledo[152]. The *explicit* thus allows the date of composition of the translation to be established with some precision. This information is confirmed by the two inventories Gonzalo García Gudiel had made of his books, first before his settlement in Cuenca and a second time before his assignment in Toledo.

The *explicit* also informs us that the translation of the four treatises had been carried out by Juan Gonzalo, referred to as appointed master (magister) in the same city of Burgos, and by a certain Salomon:

> « Explicit Liber sufficientie phisicorum Avicenne. Translatus a magistro Iohanne Gunsalvi de Burgis et Salomone de Arabico in latinum. Ad preceptum Reverendissimi Patri ac Domni Domni Gunsalvi episcopi Burgensis, que est civitas in Hispania »[153].

[148] C. Stornajolo, *Codices Urbinates Latini*, T. I, Codices 1-500, Rome 1902, pp. 186-187.

[149] M.-T. d'Alverny, *Avicenna Latinus III*, « Archives d'histoire doctrinale et littéraire du Moyen Âge », 30, 1963, pp. 253-255.

[150] Cf. Stornajolo, *Codices Urbinates Latini* cit., p. 187. On Frederic of Montefeltro's library, see G. B. Picotti, *Frederigo da Montefeltro, duca di Urbino*, in *Enciclopedia Italiana*, vol. XIV, Roma 1949, pp. 958-959.

[151] A transcription of this part of the manuscript is edited in M. Renaud, *Le "De celo et mundo" d'Avicenne*, « Bulletin de Philosophie Médiévale », 15, 1973, pp. 92-130. The author, however, does not indicate the numerous textual problems the manuscript contains.

[152] J. F. Rivera Recio, *(Gonzalo) Garcia Gudiel*, in R. Aubert ed., *Dictionnaire d'Histoire et de Géographie Ecclésiastiques*, T. 19, Letouzey et Ané, Paris 1981, n. 42, pp. 1191-1192 ; P. Linehan, *The Spanish Church and the Papacy in the Thirteenth Century*, Cambridge University Press, Cambridge 1971, p. 132 ff.

[153] Ms. Vat. Urb. lat. 186, f. 83r.

This information seems to attest that Juan Gonzales and Salomon worked together on the translation of the five treatises. We do not have much information on these two translators who are only known as authors of this translation[154].

The information provided by the *explicit* is partially confirmed by the *incipit* of the translation of the *DCM*, which no longer mentions Salomon:

> « sequitur ac incipit eiusdem Avicenne liber de celo et mundo. Ab eodem magistro Iohanne Gunsalvi De brugis [sic] translatus et dicitur secundus naturalium »[155].

One might be tempted to suggest that the translation of the part corresponding to the *DCM* was carried out by Juan Gonzalo without the collaboration of Salomon. Against this hypothesis, Alonso claims that the whole translation was carried out by the two authors 'in synergy'. The latter, probably of Jewish origin, translated from Arabic into a Castilian dialect, while the former translated from this dialect into Latin[156]. The preliminary study I made of the translation of the *DCM* shows that this part shares the same specificities M. Alonso and S. Van Riet[157] have pointed out for the other ones.

In the following pages, I will analyse some case studies showing these common peculiar characteristics. Afterwards, I will show that the text transmitted by the Vatican manuscript is frequently marred by errors. Finally, I will draw some provisional conclusions on the place of the Latin translation with respect to the Arabic text, which will have to be confirmed by further study of the Arabic tradition.

In their respective studies, Alonso and Van Riet first of all stressed the literal character of the Latin version, attested according to them by the numerous word-for-word translations. Concerning the part corresponding to the *GC*, Van Riet also suggests that it bears the signs of an oral simultaneous work, consisting in a 'progressive translation' implemented by the cooperation of the two authors. She also suggests that the translation reflects the desire of the two authors to clarify Avicenna's text. I am not sure that it is quite possible to prove

[154] For more information, I refer to M. Alonso Alonso, *Las traducciones de Juan Gonzáles de Burgos y Salomon*, « Al-Andalus », 14, 1949, pp. 291-319; M.-T. d'Alverny, *Les traductions d'Avicenne* (Moyen Age et Renaissance), in *Problemi attuali di Scienza e di Cultura*, *Avicenna nella storia della cultura medioevale*, Quad. 40, Accademia Nazionale dei Lincei, Roma 1957, pp. 73-87 (repr. in Ead., *Avicenne en Occident* cit.).

[155] Ms. Vat. Urb. lat. 186, f. 83r.

[156] The role of the intermediate language was brilliantly proved by Alonso, who highlighted the several Hispanisms attested in this translation (see Alonso Alonso, *Las traducciones de Juan Gonzáles* cit.).

[157] S. Van Riet ed., *Avicenna Latinus, Liber Tertius Naturalium, De Generatione et Corruptione*, Édition critique e la traduction latine médiévale et lexiques, Peeters, Louvain-La-Neuve 1987, p. 65*-84*.

the simultaneous oral character of the translation, at least as far as the part corresponding to the *DCM* is concerned. On the other hand, it seems to me that several aspects of this latter part confirm the 'progressive' character of the translation and reveal the translators' effort to render Avicenna's text more explicit than it is.

A first case that seems to attest the authors' willingness to improve their translation is a passage from the translation of the beginning of chap. 2[158]:

> « Iterum Item et quod movetur circa centrum (*wasaṭ*) non sequitur necessario ut centrum (*wasaṭ*) sit eius centrum (*markazan lahū*). Nam quamvis non sit eius centrum (*markazan lahū*) dum tamen sit intra eum dicimus quod movetur supra medium (*wasaṭ*) quia movetur circa eum aliquo modo. Unum enim signatum est intra omnia mota quod movetur recte super centrum (*wasaṭ*) et est quod terminat universum. Et debet esse centrum illius (*markazan lahū*). Et aliud ab isto uno bene poterit esse rotundum vel sphericum (*al-mustadīra*) quod movetur circa centrum (*wasaṭ*) sicut non sit eius centrum (*markazahu*) medium (*wasaṭ*) motus qui movetur versus centrum (*wasaṭ*) et a centro (*wasaṭ*). Istud igitur non erit illud in cuius comparatione medium (*wasaṭ*) terminatur quod assignat partes naturales motibus rectis[159] ».

In the part of the present contribution devoted to Avicenna's doctrine, I have provided the context of this passage and made clear that in these lines, in order to reconcile Aristotle's cosmology with Ptolemy's theory of epicycles, Avicenna distinguishes the more properly geometric notion of 'centre', designated by the term *markaz*, from the physical notion of centre of the universe, namely, the 'middle', designated by the term *wasaṭ*.

The Latin translators seem not to immediately grasp the need to differentiate between the two terms, *markaz* and *wasaṭ*, which ordinarily can be used as synonymous. Accordingly, they translate the two terms by the Latin word *centrum*. Afterwards, although the term *centrum* remains their preferred choice to translate indifferently *markaz* and *wasaṭ*, they try to discriminate *wasaṭ* from *markaz* by translating the first one by *medium* and the second one by *centrum*.

Another feature of the Latin translation of the *DCM* is the translators' desire to clarify Avicenna's text and make it more easily accessible. Quite often, in fact, the translators spell out the reference of a pronoun and add words that, though not really necessary, facilitate the understanding of Avicenna's text. A case in point is a passage from chap. 1, where Avicenna aims at ascertaining how the powers of a simple body can account for its ontological constitution. As we have seen,

[158] The passage corresponds to Avicenna, *DCM*, ch. 2, pp. 6, 13 - 7, 1, cf. *infra*, pp. 303-306.
[159] Ms. Vat. Urb. lat. 186, f. 83r26-34.

Avicenna affirms that we can envisage three solutions either that c, i) each one of the two powers is capable of making matter a subsisting substance in act (*malīʾan bi-iqāmati māddatihī bi-l-fiʿli ǧawharan qāʾiman*); c, ii) only one of the two powers is capable of doing this; c, iii) only the combination of the two powers can do it. The expression *malīʾan bi-iqāmati māddatihī bi-l-fiʿli ǧawharan qāʾiman* is translated by the rather unintelligible periphrasis *sufficiens ad dirigendam materiam ut sit actu substantiam per se stans*. Immediately afterwards, in the negation of this branch of the alternative, the expression *malīʾan bi-iqāmati l-mādda* is again translated by *sufficit ad dirigendam materiam*, but the translators add *in actu* in order to clarify the expression and normalize the two occurrences. *In actu* is also added in the same line to translate the verb *yakūnu al-māddatu taqawwamat*:

> « Nam ista tertia pars similis est ultimo de intellectu: quia vel quelibet erit sufficiens ad dirigendam materiam ut sit actu substantia per se stans, vel una earum erit huiusmodi, vel non erunt huiusmodi nisi ambe simul. Si igitur quelibet earum sufficit ad dirigendam materiam in actu, si separetur per se quelibet, sequeretur ex hoc quod dirigeretur materia in actu cum quacumque earum velles, et alia esset res ab extra ad dirigendam materiam que esset accidens et quelibet earum esset forma et accidens et istud est mendacium »[160].

Immediately afterwards, when Avicenna excludes the second branch of the three-fold division, the translators render *al-muqawwimu* in the same way, but they spell it out by adding *materiam*:

> « Et si fuerit dirigens materiam una earum erit sollumodo accidentalis, reducetur negotium secundum divisionem unam ex primis duabus »[161].

This effort of clarification undoubtedly reveals the translators' insight. Other features of their translation, however, seem to be evidence of a certain lack of experience. Although the translators make use of a standardized vocabulary, their choices are not always consistent. In many cases, they do not decide between two translations and use several expressions more or less synonymously to translate one single Arabic world. Sometimes the two Latin translations are given together in the text.

The presence of double translations, one might object, is not necessarily the sign of inexperience, but of the translator's effort to clarify his text. However, the words our translators hesitate over are mostly technical terms of Avicenna's philosophical lexicon that should not trouble an experienced reader of the Avicennian corpus.

[160] Ms. Vat. Urb. lat. 186, f. 83r29-36.
[161] Ms. Vat. Urb. lat. 186, f. 83r36-37.

Most hesitations concern basic notions of the Avicennian sub- and supra-lunary cosmology. The translators almost systematically translate *al-mustadīra* by the hendiadys *rotundum vel sphericum*; *kuriyyun* by *sphericum seu rotundum*; *muḥīṭ* by *circulus vel circonferentia*. *Madār* is translated sometimes by *axes*, sometimes by *circulos et revolutiones*. Another case in point is the translation of the expression *bi-l-qaṣd al-awwal*, which is translated sometimes by *essentialis*, sometimes by *de prima intentione vel essentie*, sometimes by *per appetitum essentialiter*.

I would now like to consider the reliability of the Urbinate 186. Van Riet has already pointed out that this manuscript contains several errors, either due to its copyist or inherited from its model. As in the case of the translations of other treatises, the part of the Vatican manuscript transmitting the *DCM* is quite complete, but contains several mistakes. Most errors are due to simple misreading of the model's abbreviations. But I have also noted a more significant problem. The whole section corresponding to lines 9, 7 - 22, 7 of the Arabic edition, which correspond to the folio 85r3-87v26, follows the wrong order.

The entire passage of the Vatican manuscript attests the following order: after the translation of line 9, 7 *wa-l-ṯānī an yakūna ḏālika* (85r3 *secundum est quod*), we find the translation of lines 12, 10 *baʿḍuhā*-15, 13 *qūwwa wāḥida* (85r3 *aliqua eorum*-85v43 *una potentia que*); then, that of lines 9, 7 *ḏālika*-12, 9 *aw sakana* (85v43 *illud corpus*-86r35 *vel quiescunt*); afterwards, that of lines 19, 5 *fa-yakūnu*-22, 7 *qismayni* (86r35 *Erit ergo*-87v26 *duas partes*); finally that of lines 15, 13 *hiyā*-19, 5 *allatī aḥaḍtahā* (87v26 *Ipsamet*-88r20 *quas assumpsisti*). After a half-blank page, the translation resumes at folio 89v1 *aliud est*, corresponding to line 22, 9 *minhu* onward.

The misplacement is clearly due to a mechanical error. If one counts the lines of each misplaced section, one realizes that the two inner bifolios of a quire have been switched, the first one containing the translation of lines 9, 7 - 12, 9 and 19, 5 - 22, 7, the second one containing the translation of lines 12, 10 - 15, 13 and 15, 14 - 19, 5. This error enables us to calculate quite precisely the size of one folio of the Vatican manuscript's model, which consisted of approximately 43 lines of the Vatican manuscript. We can then deduce that the model of this latter manuscript was just two lines shorter than it is.

I will briefly conclude this overview by considering the place of the Latin translation with respect to the Arabic tradition. I note first of all that Alonso compared the Latin translation of the Vatican 186 to the Madrid manuscript Biblioteca Nacional 5008, which belonged to the Toledo Cathedral Library. A preliminary survey of the part transmitting the *DCM*[162] points out that this

[162] I wish to thank M. Aouad for providing me a pdf copy of the Madrid manuscript, made in the context of his European Research Council project *Philosophy in Context: Arabic and Syriac manuscripts transmission in the Mediterranean World*.

manuscript was not the model used by the translators. This is confirmed by the presence in the Madrid manuscript of several omissions, due to homeoteleuton, absent from the Latin translation[163].

As I said, no final conclusion can be drawn on the place of the Latin translation before carrying out a more in-depth study of the whole tradition. However, a comparison with the manuscripts used in the Cairo edition could support some tentative hypotheses. In most cases, the Latin translation is on the side of the manuscripts signified by *dal* and *sa* respectively. It shares some specific variants ('varianti separative') with the two manuscripts[164], others with *Dal* alone[165], and others with *Sa* alone[166]. It can also be noted, however, that *Dal* has several omissions that do not appear in the Latin text[167] It could therefore be inferred that the Latin translation belongs to the same family as these manuscripts, but that its model comes from an earlier stage of the tradition. But this, I hasten to repeat, remains a hypothesis to be verified by a further study of the Arabic tradition.

[163] This does not exclude that the translators could also have had available other Arabic manuscripts used to rectify the lacunae.

[164] Avicenna, *DCM*, p. 3, 1-3.

[165] *Ibid.,* pp. 3, 14 - 18 ; p. 3, 5-7.

[166] *Ibid.,* p. 17, 7-8.

[167] See again *ibid.,* p. 3, 14-18.

ABSTRACT

The De Caelo et Mundo *of Avicenna's* Kitāb al-Šifāʾ *: An Overview of its Structure, its Goal and its Polemical Background*

The present paper is devoted to Ibn Sīnā's (Avicenna's) *De Caelo et Mundo* (*al-Samāʾ wa-l-ʿālam*), the second section of the physical books of the *Kitāb al-Šifāʾ*. It aims at providing a study of its structure and goals and its place within the framework of Avicenna's natural philosophy. This inquiry shows that, without being a standard treatise of cosmology, Avicenna's treatise must be seen as a study of the five simple bodies that constitute the universe as a whole. Against this background, Avicenna establishes the unitary nature of the active and passive powers of the simple bodies, as well as the relation between inclination, natural motion and form. By framing the text within a broader philosophical and historical context, this paper also suggests that Avicenna's investigation aims ultimately at rebuking a neo-Philoponian trend among his Arabic contemporaries. Two appendixes are devoted to the Latin heritage of Avicenna's text. The first one provides a general overview of the treatise wrongly transmitted as Avicenna's own *DCM* as part of the earliest Latin translation of his *Kitāb al-Šifāʾ*. The second one takes into account the Latin translation of the authentic *DCM* and highlights some of its peculiarities.

Cristina Cerami, CNRS, UMR 7219-SPHERE: CNRS/Université Paris Diderot/Université Paris 1-Panthéon Sorbonne
cristinacerami@hotmail.com