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Avicenna on the Indemonstrability of Definition*

The reception of Aristotle's theory of demonstration in the *Kitāb aš-šifā'* (Book of the cure), Avicenna's most comprehensive philosophical *summa*, is documented by a large section, entitled *Kitāb al-burhān* (Book of demonstration), which features in the logical part of the *Šifā'* and is devoted to the analysis of demonstration and definition. The *Kitāb aš-šifā'* consists of four parts covering a great deal of the philosophical legacy, especially Aristotelianism, inherited from Antiquity. This huge work encompasses four main areas : logic (*al-manṭiq*), physics (*aṭ-ṭabīʿiyyāt*), mathematics (*ar-riyāḍiyyāt*), and metaphysics (*al-ilāhiyyāt*). The logical section of the *Šifā'* is divided, in turn, into nine subsections corresponding to the treatises in which Avicenna provides his philosophical commentary and analysis of the texts that make up the Aristotelian *Organon* (with the addition of Porphyry's *Isagoge*, the *Rhetoric* and the *Poetics* that are included in the Arabic *Organon*)[1]. The nine logical books deal with the following topics : Porphyry's *Isagoge* (*al-madḫal*), the book of categories (*al-maqūlāt*), the book of interpretation (*al-ʿibāra*), the book of syllogism (*al-qiyās*), the book of demonstration (*al-burhān*), the book of dialectic (*al-ǧadal*), the book of sophistic (*as-safsaṭa*), the book of rhetoric (*al-ḫiṭāba*) and, eventually, the book of poetic (*aš-šiʿr*). Each of them addresses the topic of the corresponding book of the *Organon*. For instance, the book of syllogism (*kitāb al-qiyās*) deals with Avicenna's doctrine of syllogistic reasoning and draws primarily on the content of Aristotle's *Prior Analytics* (*at-taḥlīlāt al-ūlá*).

In the case of the fifth section of Avicenna's logic, the *Kitāb al-burhān* (Book of demonstration), we are in the presence of a treatise covering the content of Aristotle's two books of the *Posterior Analytics*.

The state of present research on this work, as is often the case if we are not to restrict our focus to the examples of metaphysics and psychology, may appear quite discouraging; the *Kitāb al-burhān* has been little investigated so far — undoubtedly less than it would deserve even to the eyes of a hasty reader[2]. Before taking up the translation of the texts this paper is based upon, to my knowledge, just two chapters, out of a book of significant length (totalling two hundred and eighty-two pages in the Cairo edition of 1956 by ʿAfīfī[3] and consisting of forty-one chapters), were available in western languages[4]. Only a chapter of the work (II, 7, on the classfication of sciences) — alien to the *Posterior Analytics* and interrupting the continuity of the *Burhān* — was translated into Latin and incorporated by Dominicus Gundissalinus in his *De divisione philosophiae*[5]. A cursory reading, however, immediately reveals the extremely high level of Avicenna's conceptual analysis, which results in numerous original contributions reaching much further than a mere piece of literary commentary[6]. In this

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[2] A few essential references on Avicenna's *Burhān* are M. E. MARMURA, *The Fortuna of the* Posterior Analytics *in the Arabic Middle Ages*, in M. ASZTALOS, J. E. MURDOCH, I. NIINILUOTO eds., *Knowledge and the Sciences in Medieval Philosophy. Proceedings of the Eighth International Congress of Medieval Philosophy (S.I.E.P.M.), Helsinki 24-29 August 1987*, 2 vols., Helsinki 1990, vol. I, pp. 85-102 (on Avicenna see pp. 89-98); M. MAROTH, *Die Araber und die antike Wissenschaftstheorie*, Brill, Leiden-New York-Köln 1994, (scattered remarks in chapters 3 and 4); J. MCGINNIS, *Logic and Science : The Role of Genus and Difference in Avicenna's Logic, Science and Natural Philosophy*, « Documenti e studi sulla tradizione filosofica medievale », 18, 2007, pp. 165-186 (pp. 173-178 deal with *Burhān*, I, 10).

[3] IBN SĪNĀ, *Aš-Šifāʾ, al-Manṭiq, al-Burhān*, edited by A. ʿAFĪFĪ, al-Maṭbaʿa al-amīriyya, Cairo 1956. The other edition relevant to the present study is IBN SĪNĀ, *Al-Burhān min Kitāb al-šifāʾ*, edited by ʿA. BADAWĪ, Maktaba al-nahḍa al-miṣriyya, Cairo 1954, 1966².

[4] See J. MCGINNIS, D. C. REISMAN, *Classical Arabic Philosophy : An Anthology of Sources*, Hackett, Indianapolis-Cambridge 2007. The chapters in question are *Burhān*, I, 9, at pp. 147-152 and III, 5, at pp.152-156, respectively. In addition to that, excerpts are widespread in other studies, like M. RASHED, *Ibn ʿAdī et Avicenne : sur les types d'existants*, in *Aristotele e i suoi esegeti neoplatonici. Logica e ontologia nelle interpretazioni greche e arabe*. Atti del convegno internazionale, Roma, 19-20 ottobre 2001, a cura di V. CELLUPRICA e C. D'ANCONA con la collaborazione di R. CHIARADONNA, Bibliopolis, Napoli 2004, pp. 107-171 (pp. 151-152 contain the French translation of *Burhān*, II, 2, pp. 132, 15 - 133, 4); A. BERTOLACCI, *The Reception of Aristotle's* Metaphysics *in Avicenna's* Kitāb aš-šifāʾ : *A Milestone of Western Metaphysical Thought*, Brill, Leiden-Boston 2006 (Islamic Philosophy, Theology and Science, 63), pp. 233-234.

[5] See GUNDISSALINUS, *De divisione philosophiae*, edited by L. BAUR, Aschendorff, Münster 1903, pp. 124-133.

[6] On Avicenna's style see especially D. GUTAS, *Avicenna and the Aristotelian Tradition*, Brill, Leiden-New York-Köln 1988, pp. 101-112, 297-318 ; and BERTOLACCI, *The Reception of Aristotle's* Metaphysics cit., pp. 607-612.

respect, the *Burhān* is a systematic investigation of the doctrines of demonstration and definition, within the general philosophical framework outlined by Aristotle in his *Posterior Analytics*.

The purpose of the present paper is twofold: the prominent leading principles have been, on the one hand, that of providing some new (and raw) materials of research on Avicenna with an English translation of a significant textual unit taken from a work that appears to be of great relevance for the fields of the history of philosophy, logic and epistemology; and, on the other hand, that of undertaking a preliminary study of its contents and style of argumentation[7]. I have decided to organize the analysis as follows. The first section contains a preliminary presentation of the contents of the Book of demonstration in the form of a map of correspondences with Aristotle's text. In the second section, I will present some general introductory remarks on *Burhān*, I, 1, which deals with the goal pursued in the art of demonstration and provides an interesting classification of syllogisms and definitions based on a distinction between judgements and conceptual representations. In the third section, the focus shifts to *Burhān*, IV, 2 and I will discuss, as an example of the way Avicenna elaborates on Aristotelian materials, some passages taken from the second chapter of the fourth treatise, where he faces the problem of the indemonstrability of definition in accordance with Aristotle's treatment of this subject in *An. Post., B*, 4. Section 3.1 will be therefore devoted to a sketchy presentation of the content of *An. Post., B*, 4, while section 3.2 will cover Avicenna's views on the topic. In the fourth section, I will conclude the presentation of *Burhān*, IV,2 (whose second part covers a number of issues raised by Aristotle in *An. Post., B*, 5 and *B*, 6) by mentioning Avicenna's arguments against the thesis that definition can be acquired through division.

1. THE INDEX OF THE *KITĀB AL-BURHĀN*: SOME REMARKS ABOUT THE STRUCTURE OF THE BOOK

Before undertaking the analysis of chapters I, 1 and IV, 2 it may be useful to present the general structure of the book. A quick glance at the index enables us to weigh up the attention Avicenna pays to different aspects of the Aristotelian analysis of demonstrative science in general. A table of contents of the book of demonstration and the *loci paralleli* in the Aristotelian source are given as an appendix at the end of the paper. The table contains the

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[7] A general assessment of the philosophical import of the *Burhān* will require a much more extensive investigation of its contents, which I hope I will be able to take up in the future.

translation of the index and suggests a network of correspondences between the chapters of Avicenna's *Burhān* and those of Aristotle's *Posterior Analytics*. The purpose of this section is not to give an exhaustive and conclusive account of the matter, but rather to provide a first preliminary contribution to the understanding of the connections between the two works and stimulate the interest toward the content and the study of the *Burhān*.

The work is divided into four treatises (*maqālāt*). Its first striking feature is that, with respect to the content, the first three treatises correspond, roughly speaking, to *Posterior Analytics*' book Alpha whereas the topics discussed by Aristotle in book Beta are confined to a great extent within the scope of the fourth treatise. A plausible reason we can invoke to explain this asymmetrical approach to the text which inspires Avicenna's investigations about demonstration may be that he seems to be much more interested in the philosophical problems related to the foundation of sciences and the relations between different sciences than in the treatment of technical issues such as those connected with the problem of definition or with the role of middle terms. In this regard, we should not be surprised by another remarkable fact : if taken alone, Avicenna's first two treatises encompass the content of a very limited number of chapters in Aristotle, namely (with few exceptions) the first ten chapters of book Alpha, which in turn represent, to some extent, the theoretical kernel of Aristotle's theory. In addition to that, the first treatise of the *Burhān* deals primarily with the contents of *An. Post.*, A, 1 and A, 2.

The first treatise (*al-maqāla al-ūlá*) opens with two chapters (*fuṣūl*) which are not to be found in Aristotle and explain the goal of the book of demonstration as well as its place in logic. The remaining ten chapters are not always easy to put into correspondence with Aristotle's text. Chapter I, 3 is undoubtedly the counterpart of the opening chapter of the *Posterior Analytics*, as long as it concerns the thesis that every intellectual teaching and learning depends on some pre-existent knowledge. With some exceptions, the rest of the treatise deals with the general features of the principles of scientific knowledge. In the case of chapters I, 4, I, 11 and I, 12, the reference is to *An. Post.*, A, 2 (enumeration of the principles of syllogism, the features of the premises, the principle of demonstration). Chapter I, 6 of the *Burhān* recalls the problem of how pre-existent knowledge must be understood (the text contains a reference to *Meno*'s paradox which is mentioned by Aristotle in A, 1). It is noteworthy that in the opening treatise there are also relevant connections with a number of general problems discussed by Aristotle in the introductory chapters of book Beta, namely B, 1 and B, 2. Chapters I, 5 and I, 7 of the *Burhān* appear to be an anticipation of the content of IV, 1 and IV, 2, namely the investigation of the types of scientific inquiries and of the scientific principles and middle terms they involve. Both chapters go back to *An. Post.*,

B, 1 and B, 2. On the other hand, chapter I, 9 might be regarded as an anticipation of the contents of *An. Post.*, B, 19, since it deals with induction and methodic experience. The two remaining chapters of Avicenna's first treatise, namely I, 8 and I, 10 do not seem to have a parallel in Aristotle.

The second treatise (*al-maqāla aṭ-ṭāniya*) deals with *An. Post.*, A, 3-10 with the exception of chapter II, 7 which, as has been noted above, is an insertion concerning the problem of the classification of sciences. The first chapter II, 1 covers the content of *An. Post.*, A, 3. There is no reference to this in the title because the scope may be wider than that of the original, but I have found in the text several references to scepticism and circular proof that might suggest the existence of a link. Chapter II, 2 and II, 3 correspond to *An.Post.*, A, 4. If we leave II, 7 aside, there is almost a one-to one correspondence from this point on to the end of the treatise, for II, 4 deals with *An. Post.*, A, 5, II, 5 with A, 6, II, 6 and II, 8 with A, 7 whereas II, 9 and II, 10 refer to A, 9 and A, 10. So far, I have not been able to identify in Avicenna a parallel to *An. Post.*, A, 8 (concerning the thesis that there can be no scientific knowledge of perishable things). It is likely to be contained in one of the contiguous chapters.

It is easier to trace the network of correspondences in the case of the third treatise (*al-maqāla aṭ-ṭāliṭa*), for it deals with the rest of book Alpha. The feature of this treatise is that the further Avicenna proceeds in the analysis, the more he tends to assemble the Aristotelian texts dealing with homogeneous problems into specific groups clustered on a thematic basis. This happens to be the case for *An. Post.*, A, 11 and A, 12 that are taken into account by Avicenna in III, 1, the same holding as well for A, 14-17, 19-23, 24-26, 27-32, 33-34 which correspond to chapters III, 4, III, 6, III, 7, III, 8 and III, 9 of the *Burhān*. Only the Aristotelian chapters A, 12, 13 and 18 receive a separate treatment in Avicenna's III, 2, III, 3 and III, 5, respectively.

Finally, the object of the fourth treatise (*al-maqāla ar-rābi'a*), as has been said above, is the content of the whole book Beta of the *Posterior Analytics*. Chapter IV, 1 summarizes the topics of the first three chapters of Beta that are also anticipated, on account of their general character (this holds in particular of B, 1 and B, 2), in the first treatise of the *Burhān*. The second chapter, IV, 2 (which will discussed below in detail), is split into two parts. The first part deals with *An. Post.*, B, 4 (the relation between definition and demonstration), while the second ranges over B, 5 and B, 6 (the relation between definition and division). Again, Avicenna adopts the method of gathering several chapters of the *Analytics* : B, 6-9 correspond to IV, 3, B, 10-11 to IV, 4, and B, 15-18 to IV, 9. It is the other way around in the case of B, 11 and B, 13 whose exposition and analysis take up more than a single chapter in Avicenna : B, 11 is treated in both IV, 4 and IV, 5, while B, 13 is the object of a separate discussion in IV, 6 and IV, 7. To end, two distinct

chapters are assigned to B, 14 and B, 19, which correspond to IV, 8 and to the concluding chapter IV, 10 of the *Burhān*.

A first glance at the index of the work seems thus to convey the impression that we are in the presence of an original piece of philosophical analysis. Avicenna undoubtedly draws on Aristotelian materials and to an extent that should not be neglected, but still his peculiar arrangement of the topics and the conceptual analysis he provides, as we will shortly see, suggest that this work might be reasonably regarded as a treatise laying down his own views on demonstration and definition rather than (just) as a commentary on Aristotle's *Posterior Analytics*. In the rest of the paper I shall try to provide further grounds in support of this claim.

2. JUDGEMENTS AND CONCEPTUAL REPRESENTATIONS, SYLLOGISMS AND DEFINITIONS : THE DOCTRINE OF *KITāB AL-BURHāN*, I, 1

Avicenna's *Burhān* starts, as has been said above, with an introductory chapter (*faṣl*) which has no correspondence in Aristotle's *Posterior Analytics* : it is devoted to the clarification of the goal (*ġaraḍ*) and utility (*manfaʿa*) of the book of demonstration within the context of logic. These are two of the preliminary questions discussed by Aristotelian commentators of Late Antiquity as prolegomena to the exegesis of individual works by Aristotle. The title of the chapter tells us that it is about the goal being pursued in the art of demonstration. According to Avicenna, knowledge or science (*ʿilm*) that is acquired through thought (*fikra*) can be obtained in two ways, namely through judgement (*taṣdīq*[8]) and through conceptual representation (*taṣawwur*). In the first case, i.e. when we have rational knowledge of something by virtue of judgements, this knowledge occurs to us by means of syllogisms (*qiyāsāt*), whereas in the second case, i.e. when we know something by possessing a conceptual representation of it, this happens to be the case on account of the fact that we have a definition (*ḥadd*). Both judgements and conceptual representations can be articulated, according to a further classification, into different levels (*marātib*), depending, on the one hand, upon the degree of certainty that they convey (judgements) and, on the other hand, upon the degree of fidelity that they have (conceptual representations) with respect to the set of notions which determine a given concept.

As far as judgements are concerned, Avicenna puts forward a threefold classification. The first kind of judgement is *certain* (*yaqīn*). Its definitory features are that it must consist of (1) a first belief (*iʿtiqād*) relative to the

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[8] Literally, 'assent' or 'granting assent'.

content expressed by the judgement itself, and, in addition to that, (2) it must always be accompanied by a second firm belief, namely that the state of affairs corresponding to content of the first belief cannot be otherwise than it is (*lā yumkinu allā yakūna ʿalá mā huwa ʿalayhī*). In other words, were the second belief to disappear, the judgement would no longer be certain. The second kind of judgement is *quasi-certain* (*šabīh bi-l-yaqīn*). It consists of a single belief, relative to the content of the judgement, but it does not need to be accompanied by the second kind of belief as in the previous case. An essential feature of *quasi-certain* judgements is that when we possess the first belief relative to the content, we cannot, simultaneously and in act, believe in the possibility of its denial. The third kind of judgement is *persuasive, relative to opinion without [being certain]* (*iqnāʿī ẓannī dūna ḏālika*). As in the first two cases, it implies a belief relative to the content of what is judged, but it also admits of the belief in the possibility of its denial.

As has been said above, rational knowledge acquired through judgements depends, according to Avicenna, on the existence of syllogisms (*qiyāsāt*) capable of carrying out such judgements as their conclusions. Therefore, he straightforwardly classifies syllogisms according to such a distinction between different types of judgements. A syllogism will be labelled depending on the type of judgement it brings about. As a result, we will have, for each class of judgements, a corresponding class of syllogisms. Thus, *demonstrative* (*burhānī*) syllogisms are those producing certain judgements, *dialectical* (*ǧadalī*) or *sophistical* (*muǧāliṭī*) syllogisms generate quasi-certain judgements, while persuasive judgements fall within the scope of *rhetorical* (*ḫiṭābī*) syllogisms. Avicenna eventually mentions *poetic* (*šiʿrī*) syllogisms, which, however, do not bring about any judgement whatsoever, since their purpose is producing imagination which leads the soul to sadness or joy by imitation of good and bad things. To sum up, we can display the notions introduced by Avicenna as follows:

Types of judgement	Types of belief	Types of syllogism
Certain	(1) Content; (2) Belief that things cannot be otherwise than they are according to (1)	Demonstrative
Quasi-certain	(1) Content; (2) Possibility of simultaneously denying (1) is not admitted	Dialectical or sophistical
Persuasive, relative to opinion	(1) Content; (2) Possibility of denying (1) is admitted	Rhetorical

Avicenna adopts an analogous pattern when it comes to classifying different types of conceptual representation and the correlated notion of definition (properly speaking, as we will shortly see, definition is a specific case of a more general concept, namely that of discrimination through a differentiated phrase (*qawl mufaṣṣal*), the latter being in fact the appropriate notion that corresponds to conceptual representation). In order to classify judgements Avicenna has adopted a criterion based on the notion of belief. In the case of conceptual representation things are a little more sophisticated, but still there is a symmetry between the two cases. We are in the presence of a first type of conceptual representation when a given thing is conceptually represented either (1) *by means of accidental notions whose aggregate is proper to that thing in particular* (*bi-l-maʿānī l-ʿaraḍiyyatⁱ llatī yaḫuṣṣuhū maǧmūʿuhā*) and to nothing else — in other words as a proprium — or, on the other hand, (2) *by means of accidental notions in a way which is common to it* [i.e. to the represented thing] *and to other things differing from it* (*ʿalá waǧh yaʿummuhū wa-ġayrahū*). If we replace in (1) and (2) the occurrences of 'accidental notions' with 'essential notions', then we obtain a second twofold type of conceptual representation. We will therefore have conceptual representation of a given thing either (3) *by means of essential notions in a way which is proper solely to that thing* (*bi-l-maʿānī ḏ-ḏātiyyatⁱ ʿalá waǧh yaḫuṣṣuhū waḥdahū*) or (4) *by means of essential notions in a way which is common to it and to other things differing from it* (*ʿalá waǧh yaʿummuhū wa-ġayrahū*). The two types of conceptual representations are therefore characterized according to the distinction between accidental and essential notions that feature in them. Each kind is then subject to a further distinction appealing to the fact that the set of notions, either accidental or essential, relative to what is being represented, pertains uniquely to that thing or is shared as a common set of features with other things as well. In addition to that, Avicenna points out that conceptual representations falling within type (3) are such that they either contain (3.1) the completeness of the essence of the thing (which in turn coincides with an intelligible form corresponding to its existent form) if none of the essential notions is omitted or (3.2) they do not contain the complete essence but just part of it.

As a counterpart of conceptual representation — which has been classified into four types (by means of accidental notions, proper and common, and by means of essential notions, proper and common) — Avicenna introduces a corresponding general notion, namely that of a differentiated phrase (*qawl mufaṣṣal*) used in the discrimination (*tamyīz*) and in the determination (*taʿrīf*) of things. This notion is in turn divided into four types: the first two are grouped under the heading of description (*rasm*), while the other two

under the heading of definition (*ḥadd*)[9]. The discrimination of a given thing may take place either by means of accidental notions (*bi-l-ʿaraḍiyyāt*) or by means of essential notions (*bi-ḏ-ḏātiyyāt*). Furthermore, both discrimination by means of accidental notions and discrimination by means of essential notions may occur either with respect to the part (ʿan baʿḍ dūna baʿḍ) or with respect to the whole (ʿan al-kull)[10]. As a result, the classification of discrimination through differentiated phrase seems to mirror closely the one elaborated in the case of conceptual representation, for the outcome resulting from this analysis shows that the following alternatives are available: (A) discrimination by means of accidental notions with respect to the part, (B) discrimination by means of accidental notions with respect to the whole, (C) discrimination by means of essential notions with respect to the part and, eventually, (D) discrimination by means of essential notions with respect to the whole. Now, Avicenna puts forward his own definition of 'definition' on the basis of this articulated analysis. Case (A) corresponds to what Avicenna calls incomplete description (*ar-rasm an-nāqiṣ*), case (B) corresponds to the notion of complete description (*ar-rasm at-tāmm*), whereas case (C) and case (D) explain the notion of definition: if the discrimination is carried out by means of essential notions with respect to the part, then (C) we will have an incomplete definition (*al-ḥadd an-nāqiṣ*). If by contrast the discrimination relies on essential notions with respect to the whole and if, in particular, *all* essential notions are taken into account and none of them is left behind, then (D) the outcome of this process will be a complete definition (*al-ḥadd at-tāmm*).

Again, a synthetic outline of the relations between these notions is given in the table below:

Types of conceptual representation	Types of discrimination	Types of differentiated phrase
Accidental notions/proper	Accidental notions/whole	Complete description
Accidental notions/common	Accidental notions/part	Incomplete description
Essential notions/proper	Essential notions/whole	Complete definition
Essential notions/common	Essential notions/part	Incomplete definition

As a result of these distinctions we have two parallel pairs of notions: judgements/syllogisms, on the one hand, and conceptual representations/

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[9] In other words, every *qawl mufaṣṣal* is either description or definition, and the latter are of two types each, namely complete or incomplete.

[10] I.e. the characterization is either partial or exhaustive.

differentiated phrase (including the most relevant subtype, i.e. definition) on the other hand. Their classification is articulated according to a criterion hinging on a progressive degree of certainty, in the case of the first pair, and on completeness with respect to the notions involved in the representation, in the case of the second pair. The set of notions introduced by this preliminary epistemological analysis is a requisite for the clarification of the goal and utility of the book of demonstration. After laying down this framework, which is meant to provide a theoretical background for his conclusions, Avicenna mentions the role that definition should play, according to Aristotle's contention in the Book of dialectic (*Kitāb al-ǧadal*) that « definition is a phrase indicating the quiddity »[11] (*al-ḥadd qawlᵘⁿ dāllᵘⁿ ʿalá māhiyyatⁱ*) where 'quiddity' (*māhiyya* or *māʾiyya*) stands for the completeness of the essence of the thing, by virtue of which the thing is what it is and the realization of its essence is completed[12] (*kamāl ḥaqīqatⁱ š-šayʾⁱ llatī bihā huwa mā huwa wa-minhā yatummu ḥuṣūlᵘ ḏātihī*).

Thus, the set of notions that have been discussed so far helps us understand a very short but relevant passage condensing, as it were, the meaning of the whole chapter, and providing a definite answer to the question what the goal of the book of demonstration is. Avicenna maintains the following:

> [Text 1] « This book is the one which provides us with those matters (*mawādd*) that, if employed as terms (*ḥudūd*) in a syllogism, the [resulting] syllogism conduces to the certain (*kāna l-qiyās mūqiʿᵃⁿ li-l-yaqīn*) — i.e. the demonstrative syllogism (*wa-huwa l-qiyās al-burhānī*) — and it provides us with those matters that, if employed as the parts of a definition (*aǧzāʾ ḥadd*), the [resulting] definition conduces to the complete conceptual representation (*kāna l-ḥadd mūqiʿᵃⁿ li-t-taṣawwur at-tāmm*) »[13].

So much for the goal of the book. As for its utility, Avicenna concludes the chapter with the following remark:

> [Text 2] « If we remember the goal of the book, namely providing the methods (*ṭuruq*) that produce certain judgement and true conceptual representation, the utility (*manfaʿa*) of the book is evident, namely the access (*tawaṣṣul*) to the certain sciences (*al-ʿulūm al-yaqīniyya*) and to the true conceptual representations (*at-taṣawwurāt al-ḥaqīqiyya*): not only are [these two achievements] useful to us, but also [they are] necessary if we begin to use this

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[11] ARISTOTLE, *Top.*, I, 5, 101b37 ; cf. (*Kitāb al-ǧadal*, I, 5), in ARISTOTLE, *Manṭiq Aristū*, edited by ʿA. BADAWĪ, 3 voll., Maktabat Dār al-Kutub al-miṣriyya, Cairo 1948-1952, vol. II, p. 474.

[12] *Burhān*, I, 1, p. 52 (here and in the following all references to the text of the *Burhān* will be given by providing treatise, chapter and page numbers according to ʿAfīfī's edition).

[13] *Burhān*, I, 1, p. 53.

tool (*āla*), i.e. logic (*manṭiq*), and to weigh up by means of this scale (*mīzān*) the theoretical (*naẓiriyya*) and the practical (*ʿamaliyya*) sciences altogether »[14].

The conclusion of the introductory chapter, therefore, provides the reader of the *Burhān* with a key to a first grasp of the global architecture of the entire book. In the next section I shall examine a more specific example of how Avicenna elaborates on a peculiar doctrinal problem discussed by Aristotle — the indemonstrability of definition — with the purpose of showing, from a different perspective, that even in contact with genuinely technical issues, Avicenna's contributions always reflect a strongly original character.

3. The indemonstrability of definition in *An. Post.*, B, 4: an example of Avicenna's conceptual analysis

3.1 *The Aristotelian framework*

As is well known, the second book of Aristotle's *Posterior Analytics* begins with a series of ten chapters devoted to the analysis of definition which is taken to be a crucial ingredient of demonstrative science. In the first seven chapters, in particular, Aristotle develops an aporetic discussion of several major problems related to the notion of definition. One of them is the relation between definition and demonstration. In chapter B, 3, Aristotle discusses explicitly the issues regarding the connection between definition and demonstration with the aim of showing that:

(a) not all demonstrations are definitions,
(b) not all definitions are demonstrations and
(c) no definition is a demonstration, i.e. the two classes are disjoint.

Aristotle provides different arguments in support of these theses. In the following chapter, namely B, 4, he pursues this line of thought by proposing a concise logical argument devised to prove that definition cannot be the object of a demonstration, i.e. of a syllogism[15]. The proof proceeds by *reductio*. By assuming that it is possible to prove a definition by means of a syllogism, we are forced into a *petitio principii*. Aristotle asks whether there may be a syllogism or a demonstration of the essence. If something can be

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[14] *Burhān*, I, 1, p. 53.
[15] For a discussion of the topic, see D. CHARLES, *Aristotle on Meaning and Essence*, Oxford University Press, Oxford 2000, especially pp. 180-186; cf. also the notes to B, 4 in J. BARNES, *Aristotle : Posterior Analytics*, Oxford University Press, Oxford 1994², pp. 208-210.

proven by means of a syllogism, it must occur as the conclusion of that syllogism and, therefore, a middle term will be required to connect the two sentences occurring in the syllogism as the premises from which the conclusion is derived. Thus, if definitions were demonstrable, we should supposedly be able to construct syllogisms whose conclusions are definitions, i.e. deductions of the following sort :

$$A \ a \ B \quad \text{(major premise)}$$
$$B \ a \ C \quad \text{(minor premise)}$$
$$\overline{\hspace{2cm}}$$
$$A \ a_{def} \ C^{16}$$

where 'A a_{def} C' is a definition such that A occurs in it as the *definiens* and C as the *definiendum*[17].

According to what Aristotle says in B, 4, since a definition expresses the essence of a certain entity, it must satisfy two requirements : (1) it must be a proprium of that thing, which means that *definiens* and *definiendum* must be coextensive, and (2) the predicative connection between the two terms must be essential. Therefore, if 'A a_{def} C' holds — i.e. if A is truthfully predicated of C as a definition — we are thereby assuming that (i) its subject and its predicate, namely C and A, are coextensive and convertible with each other and that (ii) the predication by means of which one term is said of the other is essential. These are the conditions that must be fulfilled, according to Aristotle, in order for a given sentence to qualify as a definition[18].

Now, if a sentence with such features occurs as a conclusion in a syllogism, what happens to the other elements of its logical structure and what can we infer from this assumption ? As has been pointed out, we are assuming first that the two terms A and C convert with each other, i.e. that the corresponding classes of objects are equal :

$$A = C^{19}.$$

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[16] I adopt the reading 'A belongs to every C' (or 'every C is A') for expressions like 'A a C'. If a predication of this kind is a definition I will use the expression 'A a_{def} C'. In the case of essential predications I will write 'A a_{ε} C' for 'A essentially belongs to every C' or 'every C essentially is A' (I will discuss later two possible readings of essential predication).

[17] Note that the Arabic term *ḥadd* stands both for *definiens* and for the abstract notion of 'definition', i.e. the predication by means of which something is said of something else as a definition (leaving aside the fact that *ḥadd* also stands for 'term') whereas the *definiendum* is usually referred to as *maḥdūd* (literally, 'defined').

[18] In other words, definitional predication is the combined effect of coextensiveness plus essential predication.

[19] I use a capital italic letter to designate the class corresponding to a term.

Moreover, the universal predications expressed by the premises imply that, in both cases, the class of objects corresponding to the predicate-term is at least as big as the class of objects corresponding to the subject-term :

$A \supseteq B$ and $B \supseteq C$.

Since we have assumed that $A = C$, it follows that both $A = B$ and $B = C$ will hold, as Aristotle clearly recognizes when he remarks «all these must convert »[20].

With respect to the second requirement, namely that the predicative connection occurring in a definition be essential, if 'A a_{def} C' holds, then it must express an essential predication. But then, if a definition occurs as a conclusion in a syllogism, what can we say about the predications expressed by the two premises ? Is there any particular requirement to be fulfilled in order to ensure that the predication in the conclusion is essential, as it should be by our initial assumption ? According to Aristotle the answer to this question is affirmative : both premises must express in turn essential predications if we want the conclusion to be of this sort. For, if both premises were to express merely universal affirmative predications, how would the essential character of the predication in the conclusion be secured ?

Even if just one of the premises lacks the essential character, there is no guarantee that the conclusion will hold essentially. As Mignucci points out in his commentary on B, 4, this fact depends on the reading we adopt for the clause 'essentially'[21]. Two alternatives are available. We may take the expression 'A a_ε C', i.e. 'every C essentially is A' to be equivalent to the following :

(E1) $\forall x \, (Cx \to \varepsilon Ax)$,

i.e. 'everything that is C essentially is A'. On the other hand, we may say that the occurrence of the operator in an essential predication should be interpreted as follows :

(E2) $\forall x \, (\varepsilon Cx \to \varepsilon Ax)$,

i.e. 'everything that essentially is C essentially is A'. Now, let us consider a syllogism of the following sort

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[20] ARISTOTLE, *An. Post.*, B, 4, 91a16.
[21] See M. MIGNUCCI, *Aristotele : Analitici Secondi*, Laterza, Roma-Bari 2007, pp. 256-257.

$$\text{A a}_\varepsilon \text{ B}$$
$$\text{B a C}$$
$$\underline{\qquad\qquad}$$
$$\text{A ? C}$$

and try to figure out what kind of predication may be expressed by the conclusion when one of the premises, say the major, contains an essential predication whereas the other is merely a universal affirmative predication. An interesting fact is worth noting : the adoption of reading (E1) for the major premise is enough to guarantee that the conclusion expresses an essential predication as well, since the argument could be rephrased into the following equivalent form :

$$\forall x \ (\text{B}x \to \varepsilon \text{A}x)$$
$$\forall x \ (\text{C}x \to \text{B}x)$$
$$\underline{\qquad\qquad\qquad}$$
$$\forall x \ (\text{C}x \to \varepsilon \text{A}x)$$

which is a perfectly legitimate inference. By contrast, if (E2) were to be the preferred reading, then the occurrence of an essential predication in only one of the premises of our syllogism would not be enough to obtain an essential predication in the conclusion. As a matter of fact, the inference from the premises to the conclusion would be precluded because of the middle term, which would not be one and the same thing in each premise[22] :

[22] This looks like a standard piece of reasoning in modal syllogistic, where the involvement of modal operators that modify the terms (especially the middle) often require a careful assessment of whether a seemingly valid inference is actually valid or not. In the present case, the middle term B stands for what is essentially B in the major premise, while it stands for what simply happens to be B in the minor premise. It should be noted, however, that the issue is more complex than that and it is not unrelated with the problem of the validity of Barbara N-X-N (necessary major/assertoric minor/necessary conclusion). In the above example, a first problem arises if we consider that the major premise is trivially true (on both readings) if nothing happens to be B (either essentially or not). A way out of the problem might be to adopt P. Thom's mixed *de dicto/de re* semantics (see P. THOM, *How to base apodeictic syllogistic on essentialist theory*, « Philosophiegeschichte und logische Analyse », 1, 1998, pp. 171-186). For if we rephrase the major as N [$\forall x \ (\text{B}x \to \varepsilon \text{A}x)$] — where 'N' stands for necessity (in the sense of box) — then we get rid of the difficulties connected with the possibly empty extension of the middle term B. But then another issue is likely to arise : if Barbara N-X-N is taken to be valid, then the Aristotelian requirement, from *An. Post.*, B, 4, that both premises express essential predications seems to be redundant : the necessity in the major is enough on its own to guarantee that the conclusion, too, has the form N [$\forall x \ (\text{C}x \to \varepsilon \text{A}x)$], so why should Aristotle advocate for the minor exactly the same logical form of the major ? One way to have your cake and eat it too seems to consist in assuming that there is nothing going on here about the validity of Barbara N-X-N, and conclude that in order for the syllogism to have the desired kind of conclusion, namely N [$\forall x \ (\text{C}x \to \varepsilon \text{A}x)$], the minor premise must be simply supplemented in turn with the *de dicto* necessity, i.e. N [$\forall x \ (\text{C}x \to \text{B}x)$].

$$\forall x \ (\varepsilon B x \to \varepsilon A x)$$
$$\forall x \ (C x \to B x)$$
_____

no inference.

In this respect, it is worth pointing out that Aristotle must have had in mind an interpretation of this kind and it is sensible to maintain that his reading of 'essentially' must have been the second one.

To sum up, Aristotle's aim was to show that no definition can be demonstrated through a syllogism. The proof, as has been noted above, is by *reductio* : it is assumed, for the sake of argument, that a definition may well occur as a conclusion in a syllogism. If this is the case, then two consequences obtain : first, all terms involved in the syllogism (i.e. major term/*definiens*, middle term and minor term/*definiendum*) must be coextensive and convertible with each other and, secondly, the predications expressed by the premises (as well as by the conclusion) must be essential. As a result, not only does the conclusion possess the features that are required for a sentence to qualify as a definition (convertibility of the terms and essential predication) but also the premises will share these properties with the conclusion. Thus, if 'A a_{def} C' holds, we will also have 'A a_{def} B' and 'B a_{def} C', and consequently the minor premiss — i.e. 'B a_{def} C' — will already contain a definition of the term C. But this is what should have been proved from the very beginning. The outcome of Aristotle's argument is that, as long as the definition of a thing is unique (by virtue of the uniqueness of its essence), if we maintain that a definition can occur as a conclusion in a syllogism, we are bound to beg the question, because, in order to prove the definition of something, we must already have assumed it in one of the premises[23].

3.2 Avicenna on the indemonstrability of definition in Kitāb al-burhān, IV, 2

The title of the second chapter of the fourth treatise of Avicenna's *Burhān* reads « concerning the fact that definition is acquired neither through demonstration nor through division » (*fī anna l-ḥaddᵃ lā yuktasabu bi-burhānⁱⁿ wa-lā qismatⁱⁿ*). This text corresponds, roughly speaking, to the contents

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[23] The point could be also formulated in the following terms : either (i) a syllogism is not strong enough to prove a definition in the conclusion, if at least one of the premises fails to satisfy the requirements of convertibility and essential predication ; or (ii) if the premises satisfy both conditions, the argument, so to say, will be too strong because the minor premise will already contain a definition on its own.

covered in *An. Post.*, B, 4, 5 and 6 which deal with the relation between definition and demonstration and the relation between definition and division. Avicenna's purpose is therefore providing grounds for the following general twofold thesis:

> [T1] Definition is acquired neither through demonstration [T2] nor through division.

Accordingly, the chapter is thematically divided into two main sections. The first half deals with thesis [T1], while the second discusses thesis [T2]. In this section, I shall make some remarks on the outcome of the arguments put forward by Avicenna with respect to the rejection of [T1][24]. Section §I of *Burhān*, IV, 2 can be divided in turn into two parts. Avicenna sets out by stating the purpose of his analysis, namely to show that definition cannot be acquired through demonstration. This theoretical claim amounts, in turn, to denying that definition can be obtained by means of a middle term (*wa-naqūlu inna l-ḥadda laysa yuktasabu ayḍan bi-burhānin wa-bi-ḥaddin awsaṭa*). The general strategy seems to overlap partially with the arguments displayed by Aristotle in *An. Post.*, B, 4, but Avicenna's treatment contains also several elements of originality. The main idea is that if we want to prove a definition through a syllogism we need to have recourse to a middle term (*ḥadd al-awsaṭ*) that will turn out to cause some trouble, by virtue of its peculiar logical features, as we have seen in the previous section. Most of Avicenna's considerations are devoted precisely to the analysis of the features of the middle term involved in a syllogism that purportedly attempts to prove a definition. More specifically, the first part of section one deals with several types of middle terms that might be regarded as eligible to enter in a demonstration of the sort we are interested in and aims at ruling out each alternative except for definition[25]. The second part of section one investigates the consequences of assuming — again in this kind of demonstration — the middle term to be a definition[26]. The conclusion is that no type of middle term is suitable to play the role it should in a syllogism devised to prove a definition. If we look at text one below, we can see how clearly Avicenna follows Aristotle's general strategy at the beginning of the chapter:

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[24] See *Burhān*, IV, 2, pp. 270-274 (§I). From now on, when references to Avicenna's text are given, I will first indicate the reference to the Arabic edition by ʿAfīfī and then, in round brackets, to the corresponding section or subsection of my translation appended at the end of the paper.

[25] See *Burhān*, IV, 2, pp. 270-272 (§I.1).

[26] See *Burhān*, IV, 2, pp. 272-274 (§I.2).

[Text 1] « We say that definition (*ḥadd*) too is not acquired through demonstration (*bi-burhān*), i.e. through a middle term (*bi-ḥadd awsaṭ*), in such a way that what is defined (*al-maḥdūd*) is minor term (*al-aṣġar*) in the syllogism and the definition is major term (*al-akbar*). If definition were the sort of thing that is acquired [through demonstration], a middle term would be required and, since the major [term] in the demonstration needs to be convertible with the minor [term], [the major term] would need to be convertible with the middle [term] and the middle term [would need to be] convertible with both of them. Hence the middle [term] would undoubtedly be one of the [following] properties (*ḥawāṣṣ*): an individualizing property (*ḥāṣṣa*), a coextensive differentia (*faṣl*), a description (*rasm*) or a definition. All these [things] are called 'properties' in this passage of the First Teaching because of their being coextensive [with what they are predicated of] »[27].

The argument is quite straightforward: being acquired through demonstration means being acquired through a middle term. The reason for this is that if a definition — namely a predication of the form 'A belongs to every C' such that (i) the two terms are convertible with each other and (ii) the connection between them is essential — is to occur as the conclusion of a syllogism, we will need to prove it by means of a pair of premises containing the predicate-term and the subject-term of the conclusion, respectively, and having an appropriately chosen middle term in common. Avicenna is aware of the roles played by the major term and the minor term in a syllogism which should, allegedly, prove a definition. Since the major term is the predicate of the conclusion, then — if the conclusion is a definition — the major term will play the role of *definiens* in it, while the minor term, which corresponds to the subject of the conclusion, will stand for the *definiendum*. Within a general framework that, on the whole, parallels Aristotle's view, Avicenna introduces further considerations and broadens the analysis of the role played by the middle term. After concluding that a middle term is required in order to prove a definition, he says that it should fall into one of the following four categories: (a) individualizing property, (b) coextensive differentia, (c) description or (d) definition. The first two cases, namely (a) and (b), are discussed and ruled out on the basis of an argument that I shall shortly reconstruct. Case (c) is apparently dropped from consideration and never spelled out explicitly, although Avicenna brings it up again at least twice in the course of the chapter, taking its rejection for granted, probably on account of the fact that it should be obvious. These three types of middle term

[27] See *Burhān*, IV, 2, pp. 270 (§I.1).

and the issues arising from their potential use are not considered by Aristotle and their discussion seems to represent an original contribution by Avicenna.

Now, why should an individualizing property[28] or a differentia not work if it is taken as a middle term ? The answer to this question rests upon the idea that if they did, then a principle that Avicenna reasonably seems to be willing to maintain, i.e. that the definition of property, the definition of differentia and the definition of species are not one and the same thing, would be violated. Let us see how the argument runs :

> [Text 2] « Nor is it fit that the property and the differentia are the middle term [sought for]. For when you say 'every C is B' and 'every B is essentially such and such' (*kull*u *b kāḏā wa-kāḏā min ṭarīq*i *mā huwa*) — i.e. [something] defined by means of [the predicate] 'such and such' — and you conclude 'every C is essentially such and such' — i.e. [something] defined by means of [the predicate] 'essentially such and such' — it necessarily follows that what is the definition of the property or the definition of the differentia is the definition of the species too »[29].

Before the passage in question, Avicenna claims that what is more common — i.e. what has a greater extension — than the thing which is being defined (*mā huwa a'amm*u *min*a *š-šay'*i) cannot not be taken as a middle term between a thing and its definition. The possibility that the middle term is something more general than the object whose definition is sought is ruled out from the outset. By contrast, in the case of property, differentia, description and definition the situation is different, because they are (or can be) all coextensive with the object we want to define. As for the case of property and differentia, consider the following syllogism :

$$X \ a_{def} \ B$$
$$B \ a \ C$$
$$\overline{\phantom{X \ a_{def} \ C}}$$
$$X \ a_{def} \ C$$

Avicenna seems to assume, for the sake of argument, that X plays the role of a definition of B, B is either a property or a differentia, and C is a species. Since the definitions of these three notions are not interchangeable, it follows that, if B is either a property or a differentia and C is a species, then X cannot be the definition of both. A reason in support to this claim is provided within

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[28] The notion is equivalent in this context to the proprium.

[29] See *Burhān*, IV, 2, pp. 270 (§I.1).

the context of an argument that follows the text just quoted above. Avicenna argues that the inadequacy of property and differentia as middle terms in a syllogism that is supposed to prove a definition holds no matter whether we take the expression 'every B' to mean (1) 'everything which is characterized through B' (*kull^u mā huwa mawṣūf^un bi-b*) or to mean (2) 'every B insofar as it is B' (*kull^u b min ḥayṯu huwa b*). The above syllogism would unconditionally force us to admit that the definitions of the three notions coincide

> [Text 3] « [...] regardless of whether, by saying 'every B', you mean [*(a)*] everything that is characterized through B, or you mean [*(b)*] every B insofar as it is B, for the case is not well-grounded. [*(a)*] In the first respect, [it is not well-grounded] because the particulars [falling] under B might be of different species, and consequently things that are of different species would [turn out to] have one and the same definition, since they are all defined through the major [term], and it is not the case that the middle [term] alone — which is B itself and is a differentia or a property or something else — is defined through [the major term]. [*(b)*] In the second respect — i.e. when we mean that every B, insofar as it is B, is such, where 'such' indicates [its] quiddity — [it is not well-grounded] because this phrase precludes the [predicative] connection from resulting in the conclusion and changes the middle [term] by modifying it. And if this phrase were capable of yielding the conclusion, then what is the definition of B insofar as it is B would necessarily be the definition of C, whereas [B] is different from [C] in the definition and it is not the definition of [C]. And this is absurd, for although the property and the differentia are said of the species and their definition is predicated of the species, [their definition] is predicated [of the species] not because it is the definition of the species or because their definition is one and the same (so that their definition would be the definition of the species), but rather only because it belongs to the species. And there is a difference between the fact that this thing belongs to something and the fact that it is a definition of it, or [that] their definition is one and the same. Rather, the definition of the nature of the species, the definition of the nature of its differentia and the definition of the nature of its property are distinct : the definition of its differentia is part of its definition, whereas the definition of its property is something in which its definition is included, in potency or in act. Therefore the middle term cannot be property or differentia, according to this point of view ; nor [can it be] description ».

The structure of Avicenna's argument is quite clear. By the first alternative (a) — i.e. when we take the C's to be B, but not B as such — as a result it might be the case that the definition of B — i.e. the predicate-term A — is predicated as a definition, in the conclusion, of things that are of different sorts altogether and that simply happen to fall under B. Avicenna makes this point clear when he says that it is not of the middle term alone that the major term-

definiens is predicated but also of whatever the minor term stands for[30]. In the second case (b), on the other hand, what causes trouble is the incorrect move from the claim that the definition of a property or the definition of a differentia can be predicated of the species, to the conclusion that they are definitions of the species so as to overlap and coincide — i.e. the definition of the property, the definition of the differentia and the definition of the species. The correct view, on the contrary, is that of keeping a clear-cut distinction between the claim that the definition of a property and of a differentia are predicated and belong to a species, and the claim that the definitions of these three notions are identical with one another[31]. On these grounds, Avicenna draws the conclusion that the middle term cannot be property or differentia[32].

Thus, the achievement of sec. §I.1 is, on Avicenna's general strategy, that three of the four alternative types of middle term have been ruled out. The only option left, at this stage of the argument, is that the middle term is a definition. The second part of the first section of *Burhān*, IV, 2 brings to completion the proof of [T1] — i.e. of the thesis that a definition cannot be demonstrated by means of a syllogism — by dealing precisely with the task of ruling out definition as well, as a potential candidate to play the role of middle term. And this is the context in which Avicenna's strategy more closely resembles that of Aristotle, despite some relevant exceptions. First of all Avicenna notes that the true definition of something is unique[33]:

> [Text 4] « Thus, it is now clear that the middle term in the syllogism yielding the definition as a conclusion (*fī l-qiyāsi l-muntiǧi li-l-ḥaddi*) is neither a property nor a differentia nor a description, but rather — if it really has to be something at all — must be another term. As to the fact that one thing has only one true definition (*al-ḥadd al-ḥaqīqī*), that is apparent if we know what the true definition is and [if] we know that it is equal to the essence of the thing (*musāwin li-ḏāti š-šayʾi*) in two respects. First, from the perspective of predication

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[30] This remark raises another more general question, namely to what extent the requirements for something to serve as a middle term in a syllogism have to be contracted so that the term can serve as a middle term in a demostration. In this passage the condition of being characterized through B seems too weak.

[31] In other words, what counts here is that even though the three notions may coincide extensionally, there is still a relevant intensional difference that should be preserved and that would be deprived of meaning if we were to take the predications in the major premise and in the conclusion of the syllogism to be definitional.

[32] In fact not even description. No explicit reason is provided, however, in support of the exclusion of the latter.

[33] Unsurprisingly, if we consider the general framework set up in *Burhān*, I, 1 that I have outlined in sec. 2 of the paper : definition expresses the essence of a thing, and it does so by displaying the complete and ordered series of essential features of the thing in question.

and conversion (*min ǧihat^i l-ḥaml^i wa-l-in'ikās^i*) ; second, from the perspective of the complete inclusion [in the definition] of every essential notion pertaining to the quiddity, until [the definition] becomes equal to the latter and is an intelligible form equal to its existent form. And it is known that of the single essence there is only one definition of this sort. [For] if [the single essence] were to have a second definition containing essential attributes external to the content of the first definition, then the first definition would not be a definition [which is] equal to the notion of the essence of the thing ; nor [would it be] in general a true definition »[34].

In order to understand accurately the development of the argument by means of which Avicenna rejects the eligibility of definition as a potential middle term, it will be useful to highlight some points that are clear in the text. As we will see shortly, in this case as well, the general structure of the argument is straightforward despite the difficulty of some specific points. First, Avicenna, before taking up the task of discussing the problems caused by assuming definition as a middle term, thinks it worth bringing up the Aristotelian tenet according to which the true definition of an entity must be unique. This is the case because the essence of a thing is unique and, since true definitions are devised to represent conceptually essences (at a linguistic and epistemological level, as it were) they must necessarily be unique as their metaphysical counterparts. Moreover, true definitions and essences are correlated in two ways. The first has to do with a twofold logical relation that connects the subject-term and the predicate-term in a given definitory phrase : (1) the predicative link must be essential and (2) *definiens* and *definiendum* must be convertible with each other and have the same extension. This is what Avicenna is alluding to, in the above passage, when he says « from the point of view of predication and conversion ». The second kind of connection between true definition and essence lies in that the former must contain the complete collection of notions that fall within the scope of the latter. If these two requirements are satisfied, there is no chance that a given essence corresponds to two distinct true definitions.

In this connection two aspects are noteworthy. First, the whole argument about the uniqueness of true definition calls into play, in Avicenna (at the very beginning of section §I.2, where he starts dealing with the problem of definition as a middle term), an implicit but necessary assumption that we should ascribe to Aristotle, too, if we want his argument in B, 4 to be sound and work properly[35]. As a matter of fact, if we do not assume that the

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[34] See *Burhān*, IV, 2, p. 272 (§I.2.1).
[35] In this respect see also MIGNUCCI, *Aristotele* cit., p. 257.

definition is genuinely unique, there is no problem at all when we realize that in order to prove a definition we must already make use of a definition in the minor premise of the syllogism[36]. We cannot accuse someone of begging the question unless the two definitions in question must actually be one and the same. Second, Avicenna mentions two features — essential predication and conversion — that are explicitly present in Aristotle as long as they determine the nature of the premises needed for the alleged proof of a definition (see section 3.1 above). Let us leave aside for a moment these considerations and take into account another passage that contains, in a very condensed formulation, Avicenna's criticism of the use of definition as a middle term. If, on the one hand, it is quite clear that the kind of logical error Aristotle imputes to those who try to prove definitions by means of syllogisms is *petitio principii*, in the case of Avicenna, there seem to be two alternatives: not only *petitio principii* but also infinite regress[37]. Here is the relevant text:

> [Text 5] « Frequently, however, they have not gone to the root of this condition, being content with a genus and some discriminating differentiae (*fuṣūl mumayyiza*), so that once the discrimination has resulted, they come to a stop even if there are other essential notions that are needed in order for the true definition to be complete. Thus, it might be the case that something has two definitions of this sort: for instance that 'human' is defined one time as 'two-footed walking animal', and another time as 'mortal rational animal', and that 'soul' is [defined as] 'self-moving number' and also [*A273*] [as] 'what is itself explanatory of being alive', and that 'wrath' is [defined as] 'ebullition of blood in the heart' and also [as] 'desire to undertake revenge' and the like.
>
> Thus, if one of these two definitions is taken to be the middle term and the other [is taken to be] the major term, [the outcome] will be a certain syllogistic arrangement. Yet, two things occur therefrom. [*(a)*] The first is that, in truth, what is acquired is not a complete definition but rather an incomplete definition, i.e. the part of a complete definition.
>
> [*(b)*] The second is that this middle [term] is such that one of the two must obtain: [*(ba)*] either its being predicated of the minor [term] is such that one

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[36] As we will see shortly, this raises a different problem, namely that of an infinite regress, but not necessarily a *petitio principii*.

[37] Ross points out that one might be tempted to recognize a potential reference to an infinite regress in the original argument of B, 4, although he then offers convincing arguments to suggest that this is not likely to be the case, at least as far as Aristotle's text is concerned, see W. D. Ross, *Aristotle's Prior and Posterior Analytics*, Oxford University Press, Oxford 1949, pp. 617-618. Interestingly, here Avicenna seems to be elaborating on a theoretical option that after all might have appeared, from the logical standpoint, as strong as the recourse to the charge of a *petitio principii*, because if one claims to be able to prove a definition through a syllogism, there is still a problem when it comes to the minor premise, which should in turn be proved as well, in such a way that the process, in principle, never comes to an end.

presupposes in it, as a requirement, that [the middle term] is the definition of [the minor term], the same holding of the major [term] in its being predicated of [the middle term]; [*(bb)*] or the predication is, in one of the two cases, only a predication, and one does not say that [the term] is a definition of that of which it is predicated. In which case, if one says, for instance, 'A is definition of B, B is definition of C; therefore A is definition of C, because the definition of the definition is a definition', one has already deviated from the correct determination (*ta'rīf*) in various respects.

[*Preliminary clarification relative to (bb): the minor premise should be demonstrated*]

This is because the fact that B is a definition of C has been posited and conveniently assumed without syllogism, whereas the condition in [the process of] defining (*taḥdīd*), after the genus has become manifest to the eyes of this opponent, is that [this fact] should be [proved] only through a syllogism. As to [the possibility] that B is not [a definition of C], it has already proved true beforehand that [B] is a definition of C through another syllogism.

[*Conclusion: the process of definition does not take place through syllogism. The claim that definition can be demonstrated leads either to an infinite regress or to a* petitio principii]

As to the fact that the method of defining is not producing a conclusion through a syllogism — on the contrary, in the attempt to clarify that notion one cannot rely on a syllogism, otherwise a third definition would be required as an intermediate term and between every two definitions there would always be a definition — one thing would have infinitely many definitions, since it is not possible that the definition between B and C is A, for this would be a circle. Thus, it is now clear that [the process] ultimately gets to middle [terms] that do not admit of any [further] middle [terms] and are, therefore, [middle] terms [that are] not acquired [through demonstration], which is the opposite of what they contend »[38].

It is not quite clear whose misbehaviour Avicenna is addressing in this passage, but the condition that has not been sufficiently investigated (or seriously taken into account) is likely to be the uniqueness of true definition. The example may help us understand what Avicenna is trying to do here. The argument runs as follows: let us admit that there are people who can only construct incomplete definitions (i.e. definitions that do not contain the whole set of essential notions belonging to a given thing or, better, to its essence). In this case, a thing may happen to be assigned more than one single definition, say two, for the sake of argument. For instance 'human' can be defined as 'two-footed walking animal' or alternatively as 'mortal rational animal' where the three terms 'human', 'two-footed walking animal' and 'mortal rational animal' are the *definiendum* and the two *definiens*, respectively.

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[38] See *Burhān*, IV, 2, pp. 272-273 (§I.2.2-§I.2.3).

We can set up a syllogism of the form:

$$A \; a_{def} \; B$$
$$B \; a_{def} \; C$$
$$\overline{\phantom{A \; a_{def} \; C}}$$
$$A \; a_{def} \; C$$

where A stands for 'mortal rational animal', B for 'two-footed walking animal' and C for 'human' (it might have been the other way round as well, namely by inversion of A and B). Avicenna's first criticism of this syllogism is that its outcome is not a complete definition but an incomplete one, or in his words, the part of a definition. I can see just one way to make sense of this claim[39]. Avicenna is probably assuming that we are discussing with someone who is seeking the complete definition of something, say 'human', but can preliminarily count just on a pair of incomplete definitions — sharing the same genus and differing otherwise by virtue of some discriminating differentiae — of the notion that is being defined. He therefore tries to put two of them together in a syllogism in order to get a conclusion capable of providing a complete definition. Now, Avicenna's claim seems to be that this effort is bound to fail because of the general way syllogisms work. For the middle term (i.e. one of the two incomplete definitions, the other being the major) does not explicitly feature in the conclusion. The only definition occurring in the latter is the one that coincides with the major term, which is in turn, by hypothesis, an incomplete definition.

The second criticism is more sophisticated. Avicenna considers two possible situations. Either (1) both the middle term (in the minor premise) and the major term (in the major premise) are predicated as definitions, or (2) in one of the premises, at least, the predication does not imply that the predicate is a definition of the subject. In case (1), we should now be familiar with the problem: the minor premise already provides a definition of the subject of the conclusion and, regardless of whether the true definition is unique or not, this condition is sufficient to invalidate the claim that definitions are provable because in either case, respectively, a *petitio principii* or an infinite regress is involved. In case (2), by contrast, the difficulty arises because one of the premises would lack the strength required for it to yield (in conjunction with the other premise) a definitional conclusion. To be honest, the text is not always so explicit, but I am confident that the general drift of the section can be understood by appeal to this explanation. Moreover, Avicenna's point

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[39] Note that in this argument it is implicitly assumed that 'mortal rational animal' is an incomplete definition of 'human'.

seems to be that it is too wholesale to claim that A is a definition of C because (i) it occurs as a conclusion of a syllogism, whose premises say that A is a definition of B and B is a definition of C, respectively, and because (ii) the definition of a definition is a definition. For it can be argued that the minor premise of this syllogism, which by virtue of its logical features, already provides a definition of C, should be proved in turn by means of another syllogism. The fact that B is a definition of C cannot be assumed without a proof and must have become clear in advance as a conclusion of another syllogism — i.e. before we can use it as a premise to demonstrate that A is a definition of C .

Avicenna explains more generally why the process of defining does not coincide with the demonstrative process embodied by syllogistic structures. If the acquisition of a definition were to depend on a syllogism, then it would depend on a structure that, as we have seen, in order to prove the definition in the conclusion, must already contain a definition in one of the premises. This fact alone shows that such a structure is logically unsuitable to the purpose, because the process would never come to an end. For to prove that A is a definition of C, we need to prove that B is a definition of C and this would require us in turn to have recourse to another syllogism having 'B a_{def} C' as its conclusion :

$$B \ a_{def} \ D$$
$$D \ a_{def} \ C$$
———————
$$B \ a_{def} \ C$$

This, however, can be done only at the cost of introducing a new middle term, say D, required to prove the minor premise of the first sllogism. And again, this new middle term in turn cannot be simply assumed as a definition of C in the minor premise of the second syllogism. An additional syllogism along with an additional middle term, say E, are required to prove that D is the definition of C :

$$D \ a_{def} \ E$$
$$E \ a_{def} \ C$$
———————
$$D \ a_{def} \ C$$

It is easy to recognize the outcome of these assumptions : an infinite series of middle terms or, which is the same, at each step of a 'syllogistic chain' of infinite length, for every pair of definitions a third definition. Hence, Avicenna's conclusion is that the middle term cannot be definition because this would lead to an infinite regress. There are, however, at least two things that need

to be pointed out with respect to this interpretation. First of all, it fits just one of the two cases mentioned by Avicenna in text 5 above, namely case (1), i.e. when both premises are definitional. What about case (2), i.e. when one of the premises is not definitional ? This situation seems to parallel the one described above within the context of Aristotle's argument : both premises must express essential predications, otherwise the essentiality in the conclusion is not secured. In such a case, Avicenna would simply say that the middle term is incapable of producing the definition as a conclusion of the syllogism. Secondly, after advocating infinite regress, Avicenna adds a clause whose meaning is not entirely clear : « if it is not possible that the definition between B and C is A, for this would be a circle ». The circularity that Avicenna mentions here does not seem to coincide, as one might be inclined to think at first glance, with that of a *petitio principii* prompted by taking the middle term to be a definition in the minor premise. Rather the point might be tentatively understood as follows : we have established that an infinite regress is involved when we try to demonstrate a definition through a syllogism because of the role played by the middle term. The infinite regress is due to the necessity of introducing at each step a new middle term to prove the minor premise of the immediately preceding syllogism. Now, what if one objected that there is no need to have recourse to a new middle term, and suggested instead to make use of the major term of the original syllogism (since it is convertible by hypothesis with the original middle) ? I take the passage just quoted above to be Avicenna's hypothetical reply to that argument : the middle term between B and C cannot be A, because this would be circular, since in order to prove that every B is C we would be asked to use the premises 'every B is A' and 'every A is C' (where A is the major term of the original syllogism now used as a middle term). Hence we would be assuming 'every A is C', i.e. the conclusion that we wanted to prove from the outset in the first syllogism.

So much for infinite regress. Afterwards Avicenna presents an additional argument that is supposed to provide another reason against the idea that the middle term can be a definition. In this case he explicitly says that *petitio principii*[40] (resuming, so to say, the original Aristotelian objection) is the charge against those who employ definition as a middle term in the attempt to prove a definition : « whoever puts definition in between [something and its] definition, is begging the question without being aware [of it] »[41]. Thus, as a result of the development of section §I.2, whose aim was ruling out definition

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[40] Note that whereas in the above example Avicenna uses the term 'circle' (*dawr*), in this context he usually refers to *petitio principii* by means of the expression *muṣādara ʿalá l-maṭlūb l-awwal*.

[41] See *Burhān*, IV, 2, p. 274 (§I.2.4).

as a potential middle term, Avicenna seems to put forward at least two reasons against [T1]. Both arguments proceed by *reductio*, showing that if we assume that it is possible to prove a definition by means of a syllogism and use a definition as the middle term in it, we are forced either to an infinite regress or to a *petitio principii*.

4. DEFINITION AND DIVISION IN *KITĀB AL-BURHĀN*, IV, 2

Before concluding, I shall now provide an outline of the second section of *Burhān*, IV, 2 and briefly summarize its contents. I will not go through the details of Avicenna's exposition since they would involve a number of theoretical considerations that lie far beyond the scope of the present paper[42]. The section deals with another relevant issue concerning definition, namely the fact that it cannot be acquired through division, and partially covers chapters B, 5 and B, 6 of the *Posterior Analytics*[43]. The topics are arranged as follows : a brief introduction ; a comparison of division with circular induction (sec. §II.1) ; a list of three crucial defects that make the method of division incapable of providing definitions (sec. §II.2) ; the presentation of two syllogisms aimed at proving a definition, starting from a division (sec. §II.3) ; the rejection of both syllogisms (sec. §II.4) ; some additional arguments elaborating on *An. Post.*, B, 6 (sec. §II.5). Finally, the chapter ends with a few lines that summarize the constitutive difference between definition and demonstration.

[42] The relationship between definition and division and its philosophical implications (in *An. Post.*, B, 5) have been the object of an extensive range of studies. See for instance D. M. BALME, *Aristotle's Use of Division and Differentiae*, in A. GOTTHELF, J. G. LENNOX eds., *Philosophical Issues in Aristotle's Biology*, Cambridge University Press, Cambridge 1987, pp. 69-89 ; R. BOLTON, *Definition and Scientific Method in Aristotle's* Posterior Analytics *and* Generation of Animals, in GOTTHELF, LENNOX, *Philosophical Issues* cit., pp. 120-166 ; M. DESLAURIERS, *Plato and Aristotle on Division and Definition*, « Ancient Philosophy », 10, 1990, pp. 203-219 ; I. DÜRING, *Aristotle's De Partibus Animalium. Critical and Literary Commentaries,* Elanders Bocktryckeri Aktiebolag, Göteborg 1943 ; A. FALCON, *Aristotle's Rules of Division in the Topics : The Relationship between Genus and Differentia in a Division*, in « Ancient Philosophy », 16, 1996, pp. 377-387, ID., *Aristotle's Theory of Division*, in R. SORABJI ed., *Necessity, Cause and Blame. Perspectives on Aristotle's Theory*, Duckworth, London 1980, pp. 127-145 ; W. KULLMANN, *Wissenschaft und Methode. Interpretationen zur Aristotelischen Theorie der Naturwissenschaft,* De Gruyter, Berlin-New York 1974 ; G. E. R. LLOYD, *The Development of Aristotle's Classification of Animals*, « Phronesis », 6, 1961, pp. 59-81 ; P. PELLEGRIN, *Division et syllogisme chez Aristote*, « Revue philosophique de la France et de l'Étranger », 171, 1981, pp. 169-187 ; and, finally, A. VON FRAGSTEIN, *Die Diairesis bei Aristoteles*, Hakkert, Amsterdam 1967.

[43] The thesis that definition is not acquired as the combined effect of a division and a syllogism is found also in Aristotle's *Prior Analytics*, I, 31. Again, the relationship between the two notions is discussed at some length by in Avicenna in *Qiyās*, IX, 5, see IBN SĪNĀ, *Aš-Šifā', al-Manṭiq, al-Qiyās*, edited by S. ZĀYID, al-Hay'a al-ʿāmma li-šuʾūn al-maṭābiʿ al-amīriyya, Cairo 1964, treatise IX, chapter 5, pp. 455-459.

The Academic method of division is already criticized by Aristotle because of its inability to produce definitions provided with the required character of necessity and uniqueness. If we try to construct a definition by appeal to the method of division, what we really obtain in the end is in fact only a collection of predicates that are progressively *assumed* and not proved to belong to the thing that is being defined. Avicenna adopts this line of thought, too, as is clear from the opening lines of the section :

> [Text 1] « For in [the process of] division the existence of something is not posited, but rather [a thing] is only divided (*yufaṣṣalu faqaṭ*) by saying 'it is this way or it is that way'. And from this it does not follow that one of [the alternatives resulting from] the division is posited by way of necessity, unless one begs the question and [one of them] is posited [as something which is] taken for granted, as if there had been no syllogism »[44].

There seems to be a parallel with the former case of the relationship between definition and syllogism. Definitions are the sort of constructs that cannot be *obtained* by appeal to argument forms (syllogisms) or techniques (division) that would produce them as conclusions. And the reason is that in both cases those argument forms or techniques would either (i) lack the necessary strength to produce suitable conclusions, i.e. such as to be really definitions (indicating univocally the essence of a thing) ; or (ii), if they have that strength, the reason is that there is a *petitio principii* involved in some way : in other words there is no way to *prove* a definition, if it is not assumed, in the form of a premise, from the very beginning. These seem to be the general lines of Avicenna's position which make the general framework outlined in this chapter systematic and characterized by a strong theoretical unity.

The circularity component of division is stressed in connection with an example of a bad use of induction, where the proof of the conclusion is obtained only on the (vicious) assumption that its predicate applies to the whole extension of the subject-term. So if one wants to have a suitably strong and necessary conclusion, he is forced to beg the question by assuming what he has to prove, for otherwise the conclusion is not proved by way of necessity and remains affected by a degree of arbitrariness. The same holds of division, because this method consists in the progressive assumption, at each step of a sequence, of one single alternative among several (in the simplest case, if the division is a dichotomy, only two) and this is by no means sufficient to secure the uniqueness and necessity of the conclusion when all the features that have been assumed (or posited) during the process are put together in a single definitory phrase.

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[44] See *Burhān*, IV, 2, p. 274 (§II).

In this respect Avicenna explicitly points out that (i) after the division has taken place, at each step, the alternative that one picks out is not determined by an inference, but is only posited or conceded ; (ii) there is no guarantee that the mere sum of a number of predicates gives rise to a genuine unity (in this respect he brings up two objections put forward by Aristotle in the *De interpretatione*[45] and adds that the order in which the notions are arranged is strictly relevant, too) ; (iii) some essential features of the defined thing may turn out to be omitted or some features that are inessential to it may turn out to be included in the definitory phrase.

In addition to these arguments, that would be by themselves enough to rule out the possibility of acquiring a definition through division, Avicenna considers another interesting case (to reject it) consisting of two syllogisms that, if combined, might be used by someone to prove that a given phrase (or set of predicates) is the definition of something. First, suppose that one constructs a syllogistic argument on the basis of a division in the following way[46] :

1. Every A is either B or not-B
[Assume B]
2. Every B is either C or not-C
[Assume C]
3. Every C is either D or not-D
[Assume D]

_____
Every A is B, C, and D

He sets out by laying down a first premise based on a dichotomous division, namely 'every A is either B or not-B'. Then he assumes, on independent grounds, that every A is B. Then he introduces a new premise, again based on a further division, this time applied to B (the alternative just picked out), and says that every B is either C or not-C and so on for an arbitrary number of steps (in the example I have used only three predicates). In the end, he will conclude by collecting all choices made at the intermediate steps and obtain an ordered list of predicates. This is what Avicenna has probably in mind when he says :

> [Text 2] « And if one extends the division to a syllogism by dividing, he will thus repeat (*fa-staṯná*) one of the opposite [alternatives] of one or more divisions and produce, as a conclusion, one single [thing] which is what remains [common] among the divisions ».

[45] See ARISTOTLE, *De Int.*, 11.
[46] My reconstruction is tentative, Avicenna does not give an explicit example like the one I am using to clarify the argument, see *Burhān*, IV, 2, pp. 276-277 (§II.3-§II.4).

Now, suppose Avicenna's hypothetical opponent has been able to collect a sufficient number of predicates (in the example B, C and D) to express the essence of A. He may want to prove that the set of those predicates is the definition of A by means of another syllogism :

1. A differentiated phrase, indicating the quiddity and equal to A is the definition of A (major premise)
2. The ordered set of predicates B, C, D is a differentiated phrase, indicating the quiddity and equal to A

_____
3. The ordered set of predicates B, C D is the definition of A

Again, this seems to be what Avicenna proposes in the following passage :

> [Text 3] « In which case, he will aggregate the parts of the definition and extend this syllogism[47] further to a[n additional] syllogism by gathering several single substantial predicates until something equal to the thing [which is being defined] results from them . Thus he will say 'the set (ǧumla) of these predicates is a differentiated phrase, indicating the quiddity, equal [to the thing], and everything which is like that is definition ; therefore this [set of predicates] is definition' ».

For the rejection of the whole argument, Avicenna puts forward two objections against the syllogisms just presented. The first addresses the first syllogism and points out that it is in fact no syllogism at all, since each step presupposes an assumption rather than an inference : when one of the two alternatives is granted (the other being excluded or eliminated), this happens to be the case, so to say, by virtue of the fact that we know in advance which of them is to be preferred. And this in turn depends on the fact that the essence of the thing that is being defined has occurred beforehand to our faculty of estimation (on an independent basis) so that what we are actually doing, in the process of division, is simply spelling it out by displaying in an ordered sequence the set of all notions of which it consists.

As to the second objection, Avicenna points out that the conclusion (a given set of predicates is the definition of A) and the minor premise (the set of those predicates is a differentiated phrase indicating the essence of A) of the second syllogism are epistemically equivalent. Therefore, trying to prove the former by means of the latter (together with the definition of definition as the major premise, i.e. the claim that a suitable differentiated phrase is a

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[47] I.e. the above 'syllogism', based on the division, concluding that every A is B, C, and D.

definition) amounts to a *petitio principii*. In other words, the whole point of seeking the definition of A is seeking *which* differentiated phrase has the property of indicating the essence of A : once this is done, the proof that *this* particular differentiated phrase, namely 'B, C, and D', is the definition of A is not only a trivial fact, but it is also based on the circular assumption (already present in the minor premise) of what one is supposed to prove.

The section ends with an additional series of remarks concerning the involvement, in the second syllogism, of the definition of definition as the major premise. Avicenna's contention, following Aristotle, is that this is of no help for the proof, because the only relevant point remains always that of assessing the status of the minor premise. If the latter is verified, then there is no need to proceed further by calling into play the definition of definition to prove the conclusion, because the proof would be flawed by circularity ; if, on the other hand, the minor premise is not verified, then introducing the definition of definition through the major premise would serve no purpose whatsoever, because it is not by virtue of the information provided in the major that one will grant the minor[48].

As a conclusion of the whole chapter, Avicenna mentions the basic distinction between the purpose of definition and that of demonstration. The former is supposed to express the quiddity of a thing, while the latter is concerned with the 'that-ness[49]' (*inniya*), i.e. with the proof that something belongs to something else. The two tasks fit very well, at an abstract level, in the framework of the types of scientific inquiries outlined by Avicenna in *Burhān*, IV, 1. This, however, lies beyond the scope of this paper and stands in the need of further investigation.

CONCLUSION

To conclude, I would like to stress once again the elements of originality of Avicenna's investigation as they have emerged from the analyses of his texts. The preliminary translation of the chapters I have taken into account will need further elaboration and, above all, it will be enriched by widening the scope of our knowledge of the whole *Burhān*. For this work, as I have

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[48] We might also formulate the problem as follows : convincing someone that the set of predicates $Y_1...Y_n$ is the definition of X (= conclusion of our syllogism) or convincing him that $Y_1...Y_n$ is a differentiated phrase indicating the essence of X (= minor premise) are two equivalent tasks and they are both accomplished not by means of a syllogism but on independent grounds. For this reason, if one is not willing to grant that $Y_1...Y_n$ is the definition of X, then he won't be willing to grant as well that $Y_1...Y_n$ is a differentiated phrase indicating the essence of X. For a similar line, see sec. (§II.5).

[49] I.e. Aristotle's τὸ ὅτι.

suggested, is not just a commentary on Aristotle but an example of original philosophical analysis by Avicenna. Both the introductory chapter and the chapter on the indemonstrability of definition (through syllogisms or division) seem to corroborate this view. In the first case, Avicenna introduces a series of notions (judgement-conceptual representation) and classifications (syllogisms according to the degree of certainty — description-definition according to the completeness of conceptual representation) — alien to Aristotle — which justify and explain the goal and the utility of the book from a very general point of view. In the second case, the topic dealt with is much more specific and clearly follows an Aristotelian pattern. Avicenna's insights, however, are far from being confined within the limits of treatment of his predecessors. This is attested by the generalization of the problem of the middle term, and the inclusion of infinite regress among the logical issues generated by admitting that the middle term can be definition.

APPENDIX I

Table of contents and correspondences between
Avicenna's *Kitāb al-burhān* and Aristotle's *Posterior Analytics*

Chapter	*Kitāb al-burhān*	*An. Post.*
	FIRST TREATISE	
I, 1	On the indication of the goal [pursued] in this art	
I, 2	On the rank of the Book of demonstration	
I, 3	On the fact that every intellectual teaching and learning is due to pre-existent knowledge	A, 1
I, 4	On the enumeration of the principles of syllogism in general terms	A, 2
I, 5	On the inquiries and what is connected to them. Clarification of the types of scientific principles and middle terms	B, 1-2
I, 6	On how unknown things are grasped from things that are known	A, 1
I, 7	On absolute demonstration and its two divisions : one of them is the demonstration of the 'reason why' and the other is the demonstration of the 'that' and it is called sign	B, 1
I, 8	On the fact that the certain knowledge of everything that has a cause comes from the type of its cause ; consideration of the relation between the terms of demonstration	
I, 9	On how to discover whatever does not have a cause for its predication in its subjects : on induction and methodic experience and what makes it necessary	B, 19
I, 10	On the clarification of how the less general is the cause of the more general being applied to things coming under the less general. Clarification of the difference between genera and matters and between forms and differentiae	
I, 11	On the consideration of the premises of demonstration with respect to priority, causality and other conditions	A, 2
I, 12	On the principle of demonstration	A, 2
	SECOND TREATISE	
II, 1	On the knowledge of the principles of demonstration, their universality and necessity	A, 3
II, 2	On the essential predicables which are requisite in the demonstration	A, 4

APPENDIX II

Translation of *Kitāb al-burhān*, chapter IV, 2

NOTE TO THE TEXT

The following translation of chapter IV, 2 is based on the text of Avicenna's *Kitāb al-burhān* edited by Abū ʿAlá ʿAfīfī, Cairo 1956 [= A]. The latter has been carefully compared with ʿAbd ar-Raḥmān Badawī's edition, Cairo 1954 (1966²) [= B] which I have used as a control text, although the two editions have some remarkable differences, beginning with the list of manuscripts they adopt.

Unless noted otherwise, the translation reproduces ʿAfīfī's text which, on the whole, seems to me more reliable (albeit merely from the standpoint of the philosophical content : I cannot for the moment say much about the philological state of the text, because I have not seen the manuscripts yet). I have not reported in the footnotes all variants but only the ones that I consider strictly relevant to the meaning. Just to have a rough idea of the state of this text, if we confine ourselves to the chapter in question, 104 variants are to be found (leaving punctuation aside).

I have omitted to indicate the explicitation of pronouns whenever their interpretation was clear from the context ; in all other cases I have inserted in square brackets the term that a given pronoun (supposedly) stands for. Also in square brackets are all expressions that needed to be supplemented in order for the translation to become readable and understandable.

In general, I have privileged in the translation as often as possible homogeneity and adherence to the Arabic text so that one can grasp at least some of the structural features of the original. This is done on several occasions at the cost of some awkwardness. Whenever a literal translation would have affected the ability to understand the sense of a passage in English, I have opted for less literal solutions to secure intelligibility.

I shall not note the numerous cases in which I omit to translate *wa* at the beginning of a sentence or other particles that do not affect the sense.

Unless there is a strong influence of the interpretation of a passage, I have also omitted to indicate all cases in which my punctuation differs from that of ʿAfīfī and Badawī. The same holds for the division of the text in sections (= e.g. [§I ...]), subsections (= e.g. [§I.1...], [§II.3...]), paragraphs (= e.g. [§I.2.1...], [§II.3.2...]), and subparagraphs (= e.g. [*(a)*], [*(bb)*]), which is entirely mine.

Finally, as a general practice, I have made use of « ... » for expressions of direct speech, whereas I always use '...' for the distinction between use and mention or to highlight a word or an expression.

Second chapter concerning the fact that definition is acquired
neither through demonstration nor through division

[§I *Definition is not acquired through demonstration* (A270,1-274,15)]

[§I.1 *If definition were the sort of thing that is acquired through demonstration, a middle term would be required. The middle term would be one of the following: (i) property, (ii) differentia, (iii) description or (iv) definition. Cases (i)-(iii) are ruled out* (A270,1-272,9)]

[A270] We say that definition too is not acquired through demonstration, i.e. through a middle term, in such a way that what is defined is minor term in the syllogism and the definition is major term. If definition were the sort of thing that is acquired [through demonstration], a middle term would be required and, since the major [term] in the demonstration needs to be convertible with the minor [term], [the major term] would need to be convertible[50] with the middle [term] and the middle term [would need to be] convertible with both of them[51]. Hence the middle [term] would undoubtedly be one of the [following] properties: an individualizing property[52], a coextensive[53] differentia, a description or a definition. All these [things] are called « properties » in this passage of the First Teaching because of their being coextensive [with what they are predicated of][54]. Thus, it is not fit[55] that what is more common[56] than the thing [that is being defined] is a middle term between the thing and its definition.

[§I.1.1 *First proof (by* reductio*): the definitions of property, differentia and species would turn out to coincide* (A270,8-271,10)]

Nor is it fit that the property and the differentia are the middle term [sought for]. For when you say « every C is B » and « every B is essentially (*min ṭarīq mā huwa*) such and such » — i.e. [something] defined by means of [the predicate] 'such and such' —

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[50] convertible (= *munʿakis*ᵃⁿ): *om*. A.

[51] with both of them (= *ʿalayhimā*): *ʿalayhi* B.

[52] individualizing property (= *ḫāṣṣa mufrida*): it will be clear in the following by Avicenna's examples that this expression stands for proprium in this context.

[53] coextensive (= *musāw*ⁱⁿ): literally 'equal' or 'equivalent'. In the present context I adopt this translation (cf. also McGinnis, Reisman, *Classical Arabic Philosophy*, cit., p. 151) because it suitably explains the underlying reason of those notions' being associated with one another.

[54] See Aristotle, *Posterior Analytics* (*Kitāb al-burhān*), in Aristotle, *Manṭiq Aristū*, edited by ʿA. Badawī, 3 voll., Maktabat Dār al-Kutub al-miṣriyya, Cairo 1948-1952, vol. II, p. 415.

[55] The Arabic text has a *ayd*ᵃⁿ that I omit to translate.

[56] more common (= *aʿamm*): middle terms whose extension is greater than the extension of the thing which is being defined cannot be employed in the purported demonstration of a definition, because they would fail to satisfy the convertibility requirement.

and you conclude « every C is essentially such and such » — i.e. [something] defined by means of [the predicate] 'essentially such and such' — it necessarily follows that what is the definition of the property or the definition of the differentia is the definition of the species too, regardless of whether, by saying « every B », you mean [(a)] everything that is characterized through B, or you mean [(b)] every B insofar as it is B, for the case is not well-grounded (*al-amr ġayr mustaqīm*)[57].

[(a)] In the first respect, [it is not well-grounded] because the particulars [falling] under B might be of different species, and consequently things that are of different species would [turn out to] have one and the same definition, since they are all defined through the major [term], and it is not the case that the middle [term] alone — which is B itself and is a differentia or a property or something else — is defined through [the major term].

[A271] [(b)] In the second respect — i.e. when we mean that every B, insofar as it is B, is such, where 'such' indicates [its] quiddity — [it is not well-grounded] because this phrase precludes the [predicative] connection from resulting in the conclusion and changes the middle [term] by modifying it. And if this phrase were capable of yielding the conclusion, then what is the definition of B insofar as it is B would necessarily be the definition of C, whereas [B] is different from [C] in the definition and it is not the definition of [C][58]. And[59] this is absurd, for although the property and the differentia are said of the species and their definition is predicated of the species, [their definition] is predicated [of the species] not because it is the definition of the species or because their definition is one and the same (so that their definition would be the definition of the species), but rather only because it belongs to the species. And there is a difference between the fact that this thing belongs to something[60] and the fact that it is a definition of it, or [that] their definition is one and the same. Rather,

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[57] I assume, in the translation, that by the clause *al-amr ġayr mustaqīm* Avicenna means the following : it is not right (hence 'the case is not well-grounded') to claim that on a convenient reading of 'every B' the above objection fails, because no matter how 'every B' is taken, the argument shows that in either case the definition of the property or the definition of the differentia would turn out to be the definition of the species. It has been pointed out to me by T. Street that one would have expected *mustaqīm* to mean something like 'direct' (instead of 'right' or 'well-grounded'), albeit not in the standard sense that the term has in the syllogistic. In the first case (a) the problem would lie in that we are trying to link the defined with the definition through a term that may be true of a number of species, while in the second case (b) B is reduplicative in the major and not in the minor in such a way that the middle term is not in fact one and the same in the two premises. Thus, the idea might be that in both cases the link between the defined and its definition is not directly proved through the middle. For another occurrence of the clause *ġayr mustaqīm* in a different context (*bi-ǧawāb ġayr mustaqīm*) see *Burhān*, I, 6, p. 73.

[58] whereas ... definition (= *wa-huwa ġayruhū fī l-ḥaddi wa-ġayru ḥaddihī*). The meaning of this passage is made explicit in the translation, but it should be said that the Arabic original is much more ambiguous, because of the presence of a number of pronouns.

[59] and (= *wa*) : *om.* A.

[60] to something (= *li-šay'in*) : *li-š-šay'i* A.

the definition of the nature of the species, the definition of the nature of its differentia and the definition of the nature of its property are distinct : the definition of its differentia is part of its definition, whereas the definition of its property is something in which its definition is included, in potency or in act.

Therefore the middle term cannot be property or differentia, according to this point of view ; nor [can it be] description.

[§I.1.2 *Second proof : either the middle term [(a)] would not provide the definition or [(b)] it would make the major premise false* (A271,11-272,9)]

I say, resuming [the discussion] from the very beginning, that a middle [term] of this sort [is such] that either [*(a)*] it does not provide the definition, or [*(b)*] the major [premise] is false. For one of the two must obtain : either [*(a)*] you say, for instance, « everything laughing[61] or everything rational is a mortal rational animal », then fall silent, so that consequently one concludes that every human is a mortal rational animal, without adding a clarification that this is its definition. And consequently the definition's being predicated of the subject of the conclusion is not more obscure than its being predicated of the middle term, but rather it is sometimes even more evident : for we know that what is laughing is a mortal rational animal only because we know that it is human. And it is now clear to you, with regard to the status of the differentia, that the definition of the species' being predicated of [the differentia] needs to be more obscure that its being predicated of the species, if you remember some fundamental principles that precede.

Or [*(b)*] you say « everything laughing or everything rational is defined as mortal rational animal » and [you add] that this phrase [is] its quiddity, in which case this premise is false : for the meaning of your phrase 'everything laughing' or 'everything rational' can be understood in two ways that are implicit in it. The first is [*(ba)*] 'everything laughing, in as much as it is laughing' or 'everything rational, in as much as it is rational', while the other is [*(bb)*] 'everything which is laid down [as a subject] of 'laughing'' and 'everything which is laid down [as a subject] of 'rational'' [*A272*] without being the essence of 'laughing' or the essence of 'rational' [respectively]. Both ways are included in our phrase 'everything laughing' or 'everything rational'.

[*Rejection of (ba)*] Then, this definition is not a definition of 'laughing in as much as it is laughing and is essentially such'[62], nor is it [a definition] of 'rational[63] in as much

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[61] Originally I had chosen to translate the Arabic *ḍaḥḥāk* as 'capable of laughter' so as to make it explicit that it is used as an example of proprium in this context. However, there are good reasons — as has been pointed out to me by T. Street — to think that this would create problems of fit with Avicenna's work on the *Prior Analytics* where the term *ḍaḥḥāk* is clearly meant to have to do with the fact of laughing rather than the potential to do it. Otherwise the sentence 'no man is *ḍaḥḥāk*' could not be true, and Avicenna wants it to be, given his understanding of the *muṭlaqa* temporality, which is to say, true by virtue of the fact that every man is at least once not *ḍaḥḥāk*.

[62] essentially such (= *ḏāt*un *ḍaḥḥāk*un) : literally the Arabic means « [in as much as it is] a laughing essence » (cf. also below *ḏāt*un *nāṭiq*un = rational essence). I cannot offer any better translation than this.

[63] nor ... rational (= *lā li-n-nāṭiq*i) : *lā n-nāṭiq*i A.

as it is rational and is essentially such', but rather it is [a definition] of a certain thing —
i.e. human — among those to the essence of which 'laughing' occurs[64] [as a property] and
which are constituted because 'rational' is predicated of them. Therefore, it is not valid to
say that this notion[65] is predicated of 'laughing' or [of] 'rational' as a definition.

[*Rejection of (bb)*] As for the second way — i.e. that one means whatever is
truthfully laid down [as a subject] of 'laughing' or 'rational' — this is its definition and
one thereby means 'human' and refers to it in thought. Thus, if this is clear, there is
no need of a clarification through the major [premise], but rather [it is] in fact the
major [premise which] turns out to be clear, once that is clear. And if we do not refer
to it, but refer instead to each single [subject], we are speaking falsely. And if we do
none of these things, the major [premise] is not granted.

[*§I.2 The middle term in a syllogism devised to prove a definition can only be a
definition. Rejection of this latter alternative (A272,10-274,15). §I.2.1 The true definition
of something is unique (A272,10-272,16)*]

Thus, it is now clear that the middle term in the syllogism yielding the definition as a
conclusion is neither a property nor a differentia nor a description, but rather — if it really
has to be something at all — must be another term[66]. As to the fact that one thing has only
one true definition, that is apparent if we know what the true definition is and [if] we know
that it is equal to the essence of the thing in two respects. First, from the perspective of
predication and conversion ; second, from the perspective of the complete inclusion [in the
definition] of every essential[67] notion pertaining to the quiddity, until [the definition]
becomes equal to the latter and is an intelligible form equal to its existent form. And it is
known that of the single essence there is only one definition of this sort. [For] if [the single
essence] were to have a second definition containing essential attributes external to the
content of the first definition, then[68] the first definition would not be a definition [which is]
equal to the notion[69] of the essence of the thing ; nor [would it be] in general a true definition.

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[64] of ... occurs (= *li-šay'in mā mimmā ya'ruḍu li-ḏātihī ḍaḥḥāk^un*) : *aš-šay'ī mimmā ya'ruḍu li-
ḏātihī annahū ḍaḥḥāk^un* B.

[65] The notion in question is 'mortal rational animal', i.e. the major term (*definiens*) in the
purported syllogistic demonstration of the definition of 'human' (*definiendum*) which in turn
makes use in our example either of 'laughing' or of 'rational' as a middle term.

[66] another term (= *ḥadd^an āḫar^a*) : theoretically, given the ambiguity of *ḥadd* (= 'term', but
also 'definition') one might wonder whether in the present case it might actually be better
rendered as 'definition'. After all Avicenna has just gone through a number of arguments devised
to rule out the first three types of middle terms (property, differentia and description), to the
effect that the last option at hand is indeed definition. However, the qualification of *ḥadd*, made
by means of *āḫar*, prompts me to adopt a more generic translation : it is in fact to another type
of term, as opposed to the three just excluded, that one is forced to appeal at this stage.

[67] essential (= *ḏātiyy^in*) : *lahū add.* B.

[68] then (= *la*) : *om.* B.

[69] to the notion (= *li-ma'ná*) : *li-ma'ānī* B

[§I.2.2 *Some people construct incomplete definitions : in this improper sense one thing may have two definitions* (A272,17-273,2)]

Frequently[70], however, they have not gone to the root[71] of this condition, being content with a genus and some discriminating differentiae, so that once the discrimination[72] has resulted, they come to a stop even if there are other essential notions that are needed in order for the true definition to be complete. Thus, it might be the case that something has two definitions of this sort : for instance that 'human' is defined one time as 'two-footed walking animal', and another time as 'mortal rational animal', and that 'soul' is [defined as] 'self-moving number[73]' and also [A273] [as] 'what is itself explanatory of being alive[74]', and that 'wrath' is [defined as] 'ebullition of blood in the heart' and also [as] 'desire to undertake revenge' and the like.

[§I.2.3 *A syllogism making use of such definitions as the middle term and as the major term, respectively, is either (a) incapable of producing a complete definition as a conclusion, or (b) is bound to cause logical mistakes : (ba)* petitio principii, *or (bb) infinite regress* (A273,3-273,13)]

Thus, if one of these two definitions is taken to be the middle term and the other [is taken to be] the major term, [the outcome] will be a certain syllogistic arrangement. Yet, two things occur therefrom.

[(a)] The first is that, in truth, what is acquired is not a complete definition but rather an incomplete definition, i.e. the part of a complete definition.

[(b)] The second is that this middle [term] is such that one of the two must obtain : [(ba)] either its being predicated of the minor [term] is such that one presupposes in it, as a requirement, that [the middle term] is the definition of [the minor term], the same holding of the major [term] in its being predicated of [the middle term][75] ;

[(bb)] or the predication is, in one of the two cases, only a predication[76], and one does not say that [the term] is a definition of that of which it is predicated. In which

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[70] frequently (= *kaṯīrᵃⁿ mā*) : *idᵃⁿ add.* B.

[71] have not gone to the root (= *yastaqṣū*) : i.e. they have not closely investigated or thoroughly examined.

[72] discrimination (= *tamyīz*) : *tamayyuz* B.

[73] self-moving number (= *ʿadad muḥarrik li-ḏātihī*) : *ʿadad muḥarrik bi-ḏātihā* A. The reading *bi-ḏātihā* is adopted on the basis of ms. Ǧ, as of ʿAfīfī's edition. Cf. also the Arabic translation of the *Organon* (p. 416 [*An. Post.*, 91a38-39]) where the corresponding passage is translated as *ʿadad muḥarrik li-ḏātihī*.

[74] what ... alive (= *mabdaʾ li-l-ḥayātⁱ li-ḏātihī*) : *mabdaʾ li-l-ḥayātⁱ bi-ḏātihā* A. For the expression *li-ḏātihī*, see the textual remark in the previous footnote which holds in the present case, too (p. 416 [*An. Post.*, 91a38]). Cf. also Barnes' translation of the corresponding Greek expression (as ʿAfīfī recognizes, p. 272, f. 9, the definition occurs in Aristotle).

[75] In other words, with regard to both premises it is assumed that predications are definitional.

[76] No matter what premise we may want to consider, Avicenna is pointing at those situations in which one of the premises does not consist of a definitional predication, but rather of a predication *tout court*.

case, if one says, for instance, « A is definition of B, B is definition of C ; therefore A is definition of C, because the definition of the definition is a definition », one has already deviated from the correct determination (*ta'rīf*) in various respects.

[*Preliminary clarification relative to (bb) : the minor premise should be demonstrated*]

This is because the fact that B is a definition of C has been posited and conveniently assumed without syllogism, whereas the condition in [the process of] defining (*taḥdīd*), after the genus has become manifest to the eyes of this opponent, is that [this fact] should be [proved] only through a syllogism. As to [the possibility] that B is not [a definition of C], it has already proved true beforehand that [B] is a definition of C through another syllogism[77].

[*Conclusion : the process of definition does not take place through syllogism. The claim that definition can be demonstrated leads either to an infinite regress or to a* petitio principii]

As to the fact that the method of defining is not producing a conclusion through a syllogism — on the contrary, in the attempt to clarify that notion[78] one cannot rely on a syllogism, otherwise a third definition would be required[79] as an intermediate term[80] and between every two definitions there would always be a definition — one thing would have infinitely many definitions, since it is not possible that the definition between B and[81] C is A, for this would be a circle. Thus, it is now clear that [the process] ultimately gets to middle [terms] that do not admit of any [further] middle [terms] and are, therefore, [middle] terms [that are] not acquired [through demonstration], which is the opposite of what they contend.

[§I.2.4 *Further arguments against the thesis that syllogisms can provide definitions* (A273,14-274,11)]

It is now clear that taking the middle [term] as a definition of the minor [term], and taking the major [term] as a definition of the middle [term], will be just a convenient

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[77] The passage is quite puzzling. Both editions read *wa-ammā allā yakūna b*, while ms. S, as of 'Afīfī's edition, omits the final *b* (so that the sentence would become *wa-ammā allā yakūna*, where we should probably take the clause '*lā yakūna*' to refer to the immediately preceding passage '*an lā yakūna illā bi-qiyās^in*'). I assume that the reading with *b* is correct and take the passage to mean the following : it cannot be maintained that B is a definition of C unless another syllogism (with a new middle term) has proved it already. The role of this argument at this stage, however, remains unclear.

[78] notion (= *al-ma'ná*) : *om.* A.

[79] otherwise ... required (*wa-illā la-uḫtīǧa ilá ḥadd^in ṯāliṯ^in yakūnu ḥadd^an mutawassiṭ^an*) : I have been forced to interpret tentatively the text at this crucial passage, because both editions do not seem to be entirely reliable. Badawī's text reads *wa-illā lammā [u]ḫtīǧa*, supplementing a *lammā* after *wa-illā* which does not seem to fit the sense, since it inserts a further level of grammatical subordination in the sentence. On the other hand, 'Afīfī reads *wa-illā lā ḫ[a]tīḫ* (the last letter being probably a typo for the correct reading ǧ) or *wa-illā la-[u]ḫtīǧa*, but there is no explicit indication as to the editor's intention to justify this choice.

[80] term (= *ḥadd^an*) : *om.* A.

[81] and (= *wa*) : *om.* A.

assumption. For, again, the question is one and the same : is this (*hāḏā š-šay'*) a definition of a thing[82] or a definition of its definition ? And it has not proved clear that it is a definition of its definition, or, [which is the same], it is clear that it is a definition of the thing.

[*(a)*] Hence, this is also another way in which one can deviate from the correct determination (* taʿrīf*), if one posits that A is definition of the definition of C, while it is doubtful whether A is definition of C. This [happens to be the case] if one posits that A is definition of B and B is definition of C. But if one does not posit B as a definition of C, then it is not known whether its definition[83] is a definition of C or not. However, it is said that its definition is something predicated of C, in the same way as [one says] that the definition of the differentia, of the genus and of the property are something predicated of the species without being definition of the species.

[*(b)*] This syllogism [moreover] does not provide the definition, if it has not been posited [from the outset] that A is definition of B. For, once it is known that A belongs to the definition of B, it does not need to be the definition of B : not every inseparable attribute (*lāzim*) and every essential predicate are a definition[84].

[*(c)*] [A274] And if it is said in the end, as a conclusion of this kind of clarification, that A is definition of C, then it will be something which has already been somehow posited without being produced as the conclusion of a syllogism. Accordingly, whoever puts definition in between [something and its] definition[85] is begging the question without being aware [of it], in the same way as whoever says « soul is self-moving number » — if that were to be a definition — and then says « everything which is self-moving number is the perfection of a natural body endowed with organs ». And one does not thereby mean to demonstrate solely the predication and the position [of the thesis], but [one also intends] to demonstrate that the major [term] is a definition of the minor [term], as if one were to say « the thing whose quiddity, true nature and definition are 'being self-moving number' [takes as] its definition and true nature 'being the perfection of a natural body endowed with organs' ». But the definition of this thing is the very [thing that is being] sought. Therefore, if it were clear that the definition of the thing whose definition is 'being self-moving number' — of which it is actually known that it is the soul and nothing else, and whose [definition] is being sought[85] — is 'perfection of a natural body', then this [definition] would not be sought. And this is not like when the middle[86] [term] is not a definition of the minor[86] [term],

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[82] a definition of a thing (= *ḥaddun li-š-šay'i*) : *ḥaddu š-šay'i* A.

[83] Viz. the definition of B, which in this case would be the major term A.

[84] every inseparable ... predicate (= *kullu lāzimin wa-maḥmūlin ḏātiyyin*) : *kullu lāzimin maḥmūlun ḏātiyyun* B. On B's reading the text would mean, therefore, 'not every inseparable attribute, which is [also] an essential predicate, is a definition'.

[85] A tentative translation of the Arabic expression *man wassaṭa l-ḥadda li-l-ḥaddi*.

[86] a ... minor (= *ḥaddin li-l-aṣġari*) : *ḥaddi l-aṣġari* B.

because in that case the minor [term] is not the middle [term] itself and [does not coincide with] its true nature, but rather it is another thing of which [the middle term] is predicated. As for what is defined, it is the very thing which has the definition.

[§I.2.5 *Conclusion : there is no middle between a thing and its essence* (A274,12-15)]

Hence, this passage should be understood in this manner, and the business concerning the true nature [of something] goes back to the fact that whoever seeks a middle[87] between the definition and the defined thing is thereby seeking a middle term between the thing and its true essence (*ḥaqīqa ḏātihī*), which is absurd. Rather, there is no middle whatsoever : the middle is [to be found] only between some entities and other things which are not the essences (*ḥaqā'iq*) of those entities unless by accident, according to what we have clarified elsewhere.

[§II *Definition is not acquired through division* (A274,16-278,17)]

Then it is said that neither does the method of division prove that A is the definition of C. On the contrary, there is no syllogism whatsoever [proving] something through division, as we made evident in the preceding [logical] art (*fann*)[88]. For in [the process of] division the existence of something is not posited, but rather [a thing] is only divided (*yufaṣṣalu faqaṭ*) by saying [A275] « it is this way or it is that way ». And from this it does not follow that one of [the alternatives resulting from] the division is posited by way of necessity, unless one begs the question and [one of them] is posited [as something which is] taken for granted, as if there had been no syllogism.

[§II.1 *Circular induction* (A275,2-11)]

This [approach], in a way, is similar to circular induction. For, if it is doubtful to us whether every C is B, someone might make it evident that this is the case because every C is A and every A is B, and then set out to clarify that every A is B, by observing and saying « [It is the case that every A is B] because D is B, H[89] is B and Z is B » — i.e. the particulars [falling] within the category of C — « therefore every A is B ». Hence, one might say [in reply] — if he wants to accept nothing but what is necessary — that what [falls] under A is not only D, H and Z, but also C, to the effect that if you

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[87] middle (= *mutawassiṭᵃⁿ*) : cf. also McGINNIS, REISMAN, *Classical Arabic Philosophy* cit., pp. 147-148, where the term is occasionally translated as 'connection'.

[88] The preceding logical art, i.e. the syllogistic, corresponds also to the immediately preceding section (*fann*) of the logical part of the *Šifā'*, namely the *Kitāb al-qiyās* : Avicenna deals with the relationship between division and syllogism in the fifth chapter of the ninth treatise (the same is true of Aristotle who deals with the topic both in *An. Post.*, B, 5 and *An. Pr.*, A, 31).

[89] H (= *h*) : *om.* A.

grant that D, H and Z — among the things that are A — are[90] B, it does not necessarily follow that every A is B. Thus, it might be that what has not been observed or enumerated is different from what has been observed and enumerated so that it might be [in turn] that what is B are only some of the A's — that is D, H and Z — and that the C with respect to which we have raised an objection is different.

And if you assume, in the induction, that C, too, is B, in such a way that [C] does not turn out to remain a particular with respect to A unless B has already been predicated of it[91], you have already begged the question and assumed that C is B [in the attempt] to clarify that A is B, in order to clarify [in turn] that C is B, which is absurd.

[§II.2 *Three defects of division in producing the definition* (A275,12-276,14)]

In the same way that such an induction [neither] posits what is sought nor makes it necessary, or begs the question[92], so too [does the process of] dividing (*taqsīm*) ; and this passage needs to be understood accordingly. For when one has made the division [claiming] that 'human' is either 'animal' or 'not-animal' (rather : 'inanimate body'), and then posits that it is 'animal', and then says that 'animal' is either 'walking', 'swimming', 'creeping' or 'flying', and then posits, for instance, that it is 'walking' and then says « therefore 'human' is 'walking animal' », he is open to criticism in three respects, in producing the definition as a conclusion from this set [of predicates] :

[*(a)*] The first is that when he has made the division, [it is not the case that] one of the two alternatives turns out to be determined for him through the division, but rather he posits it circularly and by way of concession.

[*(b)*] [A276] The second is that he aggregates what is separate (*mutafarriq*)[93] and the defect occurs in this [case] in various ways. [*(ba)*] The first of these is that, sometimes, the phrase can be true [if one takes it] separately (*mutafarriq^{an}*) and false [if one takes it] jointly (*muǧtami^{ʿan}*)[94]. [*(bb)*] The second is that, sometimes, it can be that an essentially unique nature does not derive, through aggregation, from distinct things. And these two things are mentioned in the *Peri Hermeneias*[95]. [*(bc)*] The third is that, sometimes, it can be that the aggregation does not occur according to the

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[90] are (= *huwa*) : *om.* B. The *huwa* is correctly supplemented by ʿAfīfī according to the sense of the passage.

[91] I.e. of C.

[92] In sum, the method described above has two possible outcomes : either it is not strong enough to prove the conclusion or it is too strong, in the sense that the conclusion must be assumed as a premise, which makes the argument circular. The same, says Avicenna, holds in the case of division, when one tries to use it as a method for proving definitions.

[93] But also 'distinct' or 'disgregate'. I will use 'separate' for this root in the following.

[94] Which is to say that all predicates can be true of the subject if taken one by one, but it might not be the case that their conjunction, in a strong sense, is true of the subject (ie. that it is its definition).

[95] Cf. ARISTOTLE, *De int.*, 11, 20b37-38 and in general the whole chapter.

recommended order which should be complied with in the definition, so as to observe in it[96] which differentiae need to be put first and which of them need to be postponed (this [obtains] when a number of differentiae are put together). So these are the three ways in which the second respect is subdivided (*yanša'ibu*)[97], that is the error of aggregating what is separate.

And, by virtue of these three ways, it is guaranteed that the occurrence of division [should be] through [features that are] essential and primitive in the division, according to what you have already learned, namely : that into which a thing as such is divided, not on account of something more particular than [the thing itself]. Yet, despite this, in that [process] there is no syllogism of the definition, because of what you know.

[*(c)*] The third among the defects in producing the definition as a conclusion from these [predicates] is that it is only an aggregate and one does not indicate that it is a definition. For not every collection of essential [properties] conforming to correctness in the ordering is a definition : sometimes something necessary is lacking or there is something in excess, in such a way that it is difficult or unlikely that a jump or an extension of the essential [properties] does not occur, in the division, towards[98] something which is alien to the essence[99]. For in the division all of that may occur : for instance that 'laughing', 'wide-nailed' or 'erect of stature' may enter in it.

[§II.3 *Two purported syllogisms of division* (A276,15-277,3). §II.3.1 *First syllogism* (A276,15-16)]

If clarifying the occurrence of caution with respect to that[100] [matter] causes too much trouble, one has already left behind the requirement of division[101]. And if one extends the division to a syllogism by dividing, he will thus[102] repeat (*fa-staṭná*) one of the opposite [alternatives] of one or more divisions and produce, as a conclusion, one single [thing] which is what remains [common] among the divisions[103].

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[96] Viz. in the recommended order.

[97] On the notion of *inši'āb* (= branching) which came to mean something like dichotomous division, see T. STREET, *Ṭūsī on Avicenna's Logical Connectives*, « History and Philosophy of Logic », 16, 1995, pp. 257-268.

[98] towards (= *ilá*) : i.e. 'so as to include'.

[99] alien to the essence (= *ḫāriǧ min al-ǧawhar*) : or also 'extraneous to the substance [that is being defined]'.

[100] with respect to that (= *'an hāḏā*) : *faqaṭ add.* B.

[101] The sense of this passage is likely to be that the previous criticisms cannot be overlooked and must be seriously taken into account : if one is reluctant to do it then he is not fully aware of what the appropriate criteria of division are.

[102] thus (= *fa*) : *ṯumma* B.

[103] what remains [common] among the divisions (= *al-baqī minᵃ l-aqsāmⁱ*) : Suppose the division has a tree structure : 'what remains common among the divisions' is the path which leads from the starting point of the division down to the last differentia, i.e. the path that contains all differentiae that have been progressively assumed (by repeating them : cf. above the use of *istiṯnā*').

[§II.3.2 *Second syllogism* (A276,17-277,3)]

In which case, he will aggregate the parts of the definition[104] and extend this syllogism further to a[n additional] syllogism by gathering several single substantial predicates[105] [A277] until something equal to the thing [which is being defined] results from them . Thus he will say « the set (*ǧumla*) of these predicates is a differentiated phrase[106], indicating the quiddity, equal [to the thing], and everything which is like that is definition ; therefore this [set of predicates] is definition ». Thus, he does not achieve anything when he makes an attempt to prove the definition through division and through syllogism together with the latter.

[§II.4 *Criticisms against the two syllogisms* (A277,4-278,2). §II.4.1 *Reply to the first syllogism* (A277,4-9)]

As to the first syllogism, [one does not achieve anything] because in truth it is no syllogism at all, since the parts of the definition by themselves clearly [belong] to the defined [thing], since[107] its essence[108] has occurred (*ḥaṣala*) to [the faculty of] estimation [as] an aggregate, and its delimitation[109] has been necessary. For the parts of that aggregate clearly [belong] to the aggregate and no clarification is required. Thus, if one thinks that a clarification is [indeed] required, their clarification[110] does not amount to the elimination (*rafʿ*) of the remaining [alternatives of the] divisions, since their proof[111] is more clear than the elimination of the remaining [alternatives of the] divisions or just as obscure. For it is more clear that 'rational' [belongs] to 'human' — once it is known what 'rational' is — than the fact that 'human' is not 'irrational'. And the repetition (*istiṯnāʾ*) [of the antecedent] needs to be more clear than the conclusion, not similar to or more obscure than the latter.

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[104] the definition (= *al-ḥadd*) : *ḥudūd* A.

[105] single substantial predicates (= *maḥmūlāt^in ǧawhariyyat^an mufradat^an*) : *al-maḥmūlāt^i mufradat^in ǧawhariyyat^in* A.

[106] differentiated phrase (= *qawl mufaṣṣal*) : I found it quite difficult to translate this locution (which might also be, according to another vocalization '*qawl mufaṣṣil*', i.e. 'differentiat*ing* phrase'). I have opted for 'phrase' to translate '*qawl*' and 'differentiated' to render the participial expression derived from the Arabic root *f-ṣ-l*. Be this as it may, the idea is that a *qawl mufaṣṣal* (resp. *mufaṣṣil*) is an articulated linguistic expression which contains in it some predicates corresponding to differentiae (*fuṣūl*). Note that *qawl* stands also for the Greek λόγος.

[107] since (= *iḏ*) : A closes the preceding sentence with a period and premits a '*wa*' to the '*iḏ*', which would make the passage less intelligible.

[108] Viz. the essence of the defined.

[109] delimitation (= *taḥdīd*) : note that the root is the same as that of *ḥadd* = definition, term.

[110] I have translated literally the expression '*bayānuhā*' (= 'their clarification' or 'the clarification relative to them') which is likely to mean in this context 'the clarification of the fact that the parts of the aggregate clearly belong to it'.

[111] Again, as above, the expression might be explicited : the proof of their (i.e. the parts') belonging to the aggregate.

[§II.4.2 *Reply to the second syllogism* (A277,10-278,2)]

As to the second syllogism, again one does not achieve anything and that is because our query (*ṭalabunā*) whether 'mortal rational animal' [is] a definition of 'human' and our query whether 'mortal rational animal' is a differentiated phrase equal to 'human' [and] indicating its quiddity do not differ in obscurity and clarity. Thus, if we were to know that 'mortal rational animal' is a differentiated phrase equal to 'human' [and] indicating its quiddity, we would definitely not seek the definition of 'human', but rather we would only seek this differentiated expression which [abides] by this condition. Therefore, in the same way as we do not grant that this is a definition of 'human', so [neither] do we grant that it is a phrase which [abides] by this condition in such a way that it is taken to be a definition, since we have taken 'phrase [which abides] by this condition' as a middle term[112] that somehow begs the question in potency, leaving act aside[113]. I mean that frequently, in other passages, putting the definition of something as a middle [term][114] in the syllogism does not amount to begging the question in act, if the differentiation (*tafṣīl*) is more widely known than the aggregation. As far as this passage is concerned, [however], the differentiation is what is sought, that is the obscure thing. Therefore, since putting the definition of something as a middle [term] does not [generally] amount to begging the question, then [in] this [case] it also does not amount to begging the question in act. Yet, since in the present passage the potency of putting [the definition] as a middle [term] is like the potency of putting the major term as a middle [term], then it does amount to begging the question in potency, in that passage. However, on this [account], the definition of the definition has already been taken to [belong] to the definition[115] without mediation (*wāsiṭa*), in the same way as 'mortal rational living [being]' has been taken, without [appeal to] a syllogism, to be something which belongs to 'human' [and is] equivalent to it — which is what is sought. And [the question is]: as a result of what does the definition of the definition clearly belong to the definition?

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[112] since ... term (= *wa-aḫaḏnā l-qawlᵃ bi-hāḏihi l-ḥālⁱ ḥaddᵃⁿ*) *om.* B.

[113] Recall the structure of the second syllogism presented in sec. II.3.2 above:
 1. 'The set (*ǧumla*) of these predicates is a differentiated phrase, indicating the quiddity, equal [to the thing] (= Minor premise),
 2. Everything which is like that [i.e. a differentiated phrase etc.] is definition (= Major premise);
 3. Therefore this [set of predicates] is definition (= Conclusion)'
Here the expression 'differentiated phrase etc.' is actually the middle term of the syllogism.

[114] The expression corresponds to the Arabic *tawsīṭᵘ ḥaddⁱ š-šay'ⁱ ḥaddᵃⁿ*.

[115] to the definition (= *li-l-ḥaddⁱ*): *om.* A. I am not entirely sure that the clause should be retained.

[§II.5 *Further arguments*[116] (A278,3-17)]

Then here is another thing, namely that the one who masters the art (*ṣinā'a*)[117] needs to have a rule for knowing correct definition as opposed to incorrect definition, in the same way as he needs to have a rule for knowing correct syllogism as opposed to incorrect syllogism. And in the same way as it is not required that the one who syllogizes be [*(a)*] one who syllogizes[118] and, besides that, [*(b)*] also demonstrate [*(ba)*] that he is syllogizing, [*(bb)*] that the argument he has made up [conforms] to the syllogistic rule and [*(bc)*] that it produces the conclusion, except [when arguing] with those who annoyingly make use of sophistical arguments and ignore the rules of syllogism, so the one who defines is required to define according to that rule, without employing it in act [when he is defining].

And, in general, in the same way as the one who syllogizes simply syllogizes (*yaqīsu faqaṭ*) and does not syllogize about the fact that he is syllogizing by saying « every argument (*qawl*), among those whose nature is such and such, is a syllogism », so it is required that the one who defines only define and not that he define definition[119] by saying « every phrase (*qawl*), which is such and such, is a definition ». On the contrary, it needs to be already known in the first place what syllogism is and what definition is.

And in the same way as the one who denies that this is the case[120] — when someone confronts him with something that should count as a demonstration and takes much trouble to indicate that it is a demonstration, by appeal to the fact that the definition of demonstration [belongs] to it — can say [in reply] « if I were to grant that this [characterization by means of 'such and such'] is the definition of demonstration, or [to put it better] that, if[121] it is the definition of demonstration, then it belongs to this argument, then I would grant that this argument is a demonstration; but, since I do not grant that this [argument] is a demonstration, how could I grant that the definition of demonstration [belongs] to this argument ? » — such[122] is the condition of the one who denies definition[123], for he can say [in reply] « if I were to grant that this [characterization by means of 'such and such'] is the definition of definition, or

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[116] See ARISTOTLE, *An. Post.*, B, 6.

[117] the one ...art (= *ṣāḥibᵘ ṣ-ṣinā'atⁱ*) : in other words, the logician.

[118] that ...syllogizes² (= *an yakūna l-qayyāsᵘ qayyāsᵃⁿ*) : *an yakūna l-qā'isᵘ yaqīsu qiyāsᵃⁿ* B

[119] definition (= *al-ḥadd*) : *fī l-ḥaddⁱ add*. B.

[120] Namely that something is a demonstration in the circumstances envisaged by the following incidental clause (I have been forced to rephrase the sentence slightly because of the complexity of the Arabic original).

[121] if (= *in*) : *wa add*. B.

[122] The 'such' translates an occurrence of *ka-ḏālika* which is related to the *kamā* at the beginning of the argument (cf. eight lines above).

[123] Which is to say 'if someone denies that a certain phrase with certain features is a definition'.

[to put it better] that, if[124] it is the definition of definition, then it belongs to this thing[125], then I would grant that [this phrase] is a definition, and that it is a definition of that thing[126].

[§III *Conclusion* (A278,18-19)]

In general, as a matter of fact, definition is about the quiddity of something, whereas demonstration is about the fact that something [belongs] to something [else][127] ; [now] the that-ness (*inniya*) of something is alien to its quiddity and external to it ; [thus] it is not unlikely that in such cases one ignores what [something] belongs to[128], as you have learned, and hence seeks it through demonstration.

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[124] if (= *in*) : I have corrected the text removing a *'wa'* that both A and B premit to the conditional conjunction *'in'*. This would not fit the sense of the passage since it introduces a concessive clause.

[125] I.e. to a certain phrase.

[126] I have intentionally left the translation ambiguous, as it is in the original : *'wa-annahū li-ḏālika š-šayⁱ ḥaddᵘⁿ'*. I am inclined to think that the pronoun *'-hū'* refers to the demonstrative *'hāḏā'* of the previous line (which I have translated 'this [characterization by means of 'such and such']). The expression *'li-ḏālika'* thus would refer to *'li-hāḏihi š-šayⁱ'* of the previous line where I take this to mean, in turn, 'to this phrase', i.e. the minor term of this meta-syllosigm ; cf. above, in the previous example, the parallel use of *'qawl'*.

[127] the fact ... something² (= *inniyatⁱ š-šayⁱ li-š-šayⁱ*) : *ānniya* B. Literally the 'that-ness of something to something'. The term *'inniya'* often occurs alone in the treatise (cf. for instance the preceding chapter *Burhān*, IV, 1) and corresponds to the Aristotelian τὸ ὅτι question.

[128] what ... to (= *li-š-šayⁱ*) : *aš-šayⁱ* B. The clause points out that in the case of demonstration the object of inquiry is what a given predicate belongs to, so that what is ignored is the *li-š-šayⁱ* referred to in the technical locution *inniyatⁱ š-šayⁱ li-š-šayⁱ*.

ABSTRACT

The paper provides some introductory comments and a preliminary translation of Avicenna's *Burhān*, IV, 2. I shall first set the stage by outlining the structure of the book (sec. 1). I will then briefly introduce (sec. 2) a number of notions that are dealt with in the first treatise of the *Burhān* (e.g. definition, description). *Burhān*, IV, 2 is split into two parts : the first focuses mainly on Aristotle's *An. Post.*, B, 4, whereas the second covers some of the topics of B, 5 and B, 6. Accordingly, sec. 3 will be devoted to a cursory presentation of Aristotle's arguments in *An. Post.*, B, 4 along with a more detailed discussion of its Avicennan counterpart, focusing on the indemonstrability of definition ; sec. 4, finally, will be a presentation of the second part of the chapter, concerning the relationship between definition and division.

An English translation of the entire chapter is appended to the paper and is accompanied by some notes.