Ibn Sīnā on the definition of logic

Wilfrid Hodges
Herons Brook, Sticklepath,
Okehampton, Devon EX20 2PY, England
wilfrid.hodges@btinternet.com

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This paper aims to pick up where A. I. Sabra left off in his classic paper [28], 'Avicenna on the subject-matter of logic'. More precisely, Sabra discussed the contribution of Ibn Sīnā (Avicenna) to what Sabra describes as 'the ancient debate about whether logic was a part or an instrument of philosophy' ([28] p. 746), and placed Ibn Sīnā's views on this alongside those of Al-Fārābī and other logicians in the Arabic tradition. In the course of this, Sabra mentioned the question what Ibn Sīnā meant by the 'subject' (*mawḍū*^{c}) of logic, and expressed some 'preliminary' (his word, [28] p. 750) views on it. The paper has rightly been found valuable and is often cited. But in spite of its title, Sabra never directly addressed the question what Ibn Sīnā himself understood the *mawḍū*^{c} of logic to be.

To address this question, Sabra would have needed to do at least three things that he did not do. The first is to assemble those places where Ibn Sīnā himself discusses the *mawḍū*^{c} of logic. Sabra was well aware of this. In his closing paragraph he says:

> (1) Avicenna returns to the question of the relation of logic to philosophy and the related question of the subject matter of logic in other parts of the logic of *Kitāb al-Shifā'*. In the section on *Categories*, for example, he ... emphatically exclud[es] the doctrine of categories from the proper domain of logic. ... And in the section of *Syllogism* he devotes a chapter to showing how the function of logic as an instrument is to be understood. His interesting views in these and in other places are, however, too detailed and too complex to be dealt with adequately here. ([28] p. 764)

The section he refers to in *Qiyās* (*Syllogism*), namely *Qiyās* i.2, is in fact one

of the cardinal reference points for Ibn Sīnā's understanding of the *mawḍūᶜ* of logic. Sabra misses some other cardinal passages. One is *Mašriqiyyūn* [24] 9f, which is Ibn Sīnā's only surviving self-contained definition of the *mawḍūᶜ* of logic. Another is *Taᶜlīqāt* [22] 502.4–507.9, which is a detailed study of the logically-relevant *aḥwāl* ('features') of the subject individuals of logic. (The passage in *Taᶜlīqāt* is noted by Gutas [8] p. 302; I have never yet seen the passage in *Mašriqiyyūn* mentioned except in Goichon's *Lexicon* [6].)

The second thing that Sabra did not do—and as far as I know, nobody else has attempted to do it since—is to correlate what Ibn Sīnā says about the *mawḍūᶜ* of logic with what Ibn Sīnā actually does in his logic. We have many hundreds of pages of Ibn Sīnā's own development of formal logic, and it would make no sense for Ibn Sīnā to give a philosophical account of logic that ignores the facts of the subject. Since Ibn Sīnā's formal logic was in several ways highly innovative (see [9]), we should be prepared for the possibility that Ibn Sīnā's account of the *mawḍūᶜ* contains notions that were simply not available to Al-Fārābī and earlier logicians. For example the distinction that Ibn Sīnā draws between primary and secondary intelligibles might be a completely new one, and not a revamp of the traditional distinction between terms of first and second imposition. (Briefly, the meaning of a word is of first imposition if it applies directly to things in the external world; it is of second imposition if it applies to word meanings of first imposition.)

The third thing is to establish what Ibn Sīnā means by the *mawḍūᶜ* of a theoretical science. Here at least there is a body of modern discussion that we can call on. But some recent expositions of Sabra's conclusions tend to confuse three different things: (1) the subject term of a science, (2) the subject individuals of the science, i.e. the individuals that fall under the subject term, (3) those features of the subject individuals that are studied in the science. The result of this confusion can be a total loss of Ibn Sīnā's original contributions to this topic. This is not to criticise Sabra; it is merely to say that, as he indicated, there is more work to be done. And Sabra is certainly right that Ibn Sīnā's views in this area are interesting and complex.

1 The structure of an Avicennan science

[This section is a holding operation. I need to check its contents with specialists in the field.]

For Ibn Sīnā a 'science' (*ʿilm*) is a body of knowledge. In theoretical sciences—and this includes logic—the knowledge is primarily propositional, though Ibn Sīnā often makes the point that having the concepts operated by the science is also a form of knowledge. We can distinguish two kinds of proposition within a theoretical science: (1) the 'principles' (*mabādiʾ*), which are either self-evidently true or deduced in another science, and (2) the 'theorems' (*masāʾil*, singular *masʾala*), which are deduced from principles and/or other theorems within the science. (Warning: Ibn Sīnā also uses *masʾala* for a question to be debated in a science; if the debate leads to a definite conclusion, then this conclusion will be a theorem.) In some cases a theoretical science—and again logic is a case in point—can be regarded also as an 'art' (*sināʿa*), which means that the science teaches and regulates the use of instruments for certain purposes. The rules for the use of instruments will be propositions too, called 'rules' (*qawānīn*). These rules may in fact also be principles or theorems.

These three classes of proposition—principles, theorems and rules—are distinguished by their role in the science, not by their form. The main examples in any of these three classes are normally universally quantified affirmative sentences.

Any theoretical science has a certain term T called its 'subject' (*mawḍūʿ*) which expresses what the science is 'about', in the sense that a typical principle, theorem or rule of the science can be put in a form such as

(2) For every T, ...

or

(3) For every pair of Ts, ...

or the same with triples, etc. (See *Najāt* [23] 135.2–11.) The device of quantifying over ordered pairs, ordered triples etc. was introduced into Peripatetic logic by Alexander of Aphrodisias in answer to a challenge from Galen, and Ibn Sīnā uses it freely in his logic. But as Galen insisted and Ibn Sīnā confirms, this device only reflects what was standard practice in some theoretical sciences such as arithmetic and geometry.

Ibn Sīnā remarks that sometimes it may be convenient to split the subject term of a science into a small number of terms. For example in plane geometry we talk about all points, lines and plane figures, while in solid geometry we add solid figures to the list. Likewise in medicine we can separate off anatomy from physiology. Normally in such cases there is still an all-embracing subject term (such as 'figure' in the geometric case), and the

number of subterms split off is very small. So when a scientist mentions 'subjects', this can usually be taken to be a reference not to more than one subject term, but to the subject individuals, i.e. the individuals that fall under the subject term. In this way the subject of arithmetic can be described as 'number' (naming the subject term) or 'numbers' (referring to the subject individuals).

But since there could be more than one subject term for a science, the distinction between subject term and subject individual can't always be made by the difference between singular and plural. For this reason I will keep using the terms 'subject term' and 'subject individual' rather than simply 'subject'. While we are on terminology, I don't know how 'matter' got into the phrase 'subject matter', but my impression is that this is a fairly recent development within European languages. In English for example, the phrase 'the subject of history' is easily understood as just a long-winded way of saying 'history'; so 'matter' came to be added from the mid 16th century onwards to resolve the ambiguity. There is no such ambiguity in Classical Arabic. As far as I know, Ibn Sīnā never drew attention to any connection between the *mawḍūᶜ* of a science and matter in any sense.

Two sciences can have the same subject term. This happens for example when the sciences address different questions about the subject individuals, so that the sciences are distinguished by their aim. In *Aqsām al-ᶜulūm* [13] Ibn Sīnā classifies sciences by their 'aim' (*ḡaraḍ*); but in the *Šifā'* he tends to describe the aim of a science by adding a *min ḥayṯu* ('in as far as' or 'in the context of') or *min jiha* ('from the aspect of') to the description of the subject individuals. Thus medicine studies human bodies 'from the aspect of being healthy or sick' (*Burhān* [19] 163.19), and music studies sounds not 'absolutely' but 'in the context of their being receptive of combination' (*Taᶜlīqāt* 505.8f). It is not implied that 'sounds in the context of their being receptive of combination' are different individuals from sounds (though there are some subtleties here that we will need to come back to). The phrase about combinations is a restriction on what can be said about sounds within the science of music, not on what counts as a sound.

The aim of a science constrains what kinds of idea can be predicated of the subject individuals within the science. Or better, since for Ibn Sīnā a science takes place at the level of ideas, the aim of the science constrains what kinds of idea can be 'attached' (*yalḥaqu*) to the essences of the subject individuals, and to essences generally, within the science. The notion of attaching ideas covers several things that today we would usually distinguish more carefully than Ibn Sīnā does. For example attaching 'singing'

to (the essence of) Zayd could mean forming the idea of Zayd singing; or it could mean forming the proposition that Zayd is singing; or in some contexts it could even mean its being true that Zayd is singing. Attaching 'generality' to 'animal' can mean forming the idea 'every animal'; this example is important in logic.

An idea I that can be (or is) attached to an essence E is described as an 'accident' (*ʿaraḍ*) of E or as a 'feature' (*ḥāl*, plural *aḥwāl*) of E. A special case is where we can prove within the science, using the definition of E, that I is true of E; in this case I is called an 'essential accident' of E, or an 'adherent' (*lāzim*) of E. For example 'having internal angles summing to 180 degrees' is an essential accident of 'triangle'. I will generally use *aḥwāl* to cover all cases. So the aim of a science constrains, and can largely be expressed in terms of, the *aḥwāl* that can be attached to the subject individuals in that science.

Much of the account above can be translated into the logistic account of 'theories' that was a feature of logic and philosophy of science in the first half of the 20th century and still survives in some quarters. For example the subject term of a science defines the intended domain of the deductive theory corresponding to the science, and the *aḥwāl* translate well into what Tarski (following Pascal) called the 'primitives' of the theory. But if we make these translations, we should always remember—and Ibn Sīnā is not likely to let us forget—that for him the sciences live in the world of ideas, not of symbolic expressions. The symbolic expressions are necessary for the human mind to keep track, but their purpose lies entirely in what they mean. In this respect Ibn Sīnā's theoretical sciences are much closer to the deductive sciences of Bolzano or early (Polish) Tarski than they are to those of Carnap or late (American) Tarski.

2 The relevant passages in Ibn Sīnā's text

We list first the primary passages, then the secondary ones.

Passage A. *Mašriqiyyūn* [24] pp. 9, 10. This is a section carrying the title 'On the science of logic'. It appears in *Mašriqiyyūn* immediately after the introductory discussion of contents. Page 10.15–20 is a statement of the *mawḍūʿ* of the science of logic.

Passage B. *Madḵal* [14] i.2, 12.3–16.12. Sabra took this section, and page 15 in particular, to contain the main discussion of the *mawḍūʿ* of logic in

the part of the *Šifā'* devoted to the Organon—although the phrase '*mawḍūᶜ* of logic' occurs nowhere in the section. I agree with him about this, but it would be better to give some reasons.

In the text of *Šifā'* there are eight explicit mentions of the *mawḍūᶜ* of logic:

(1) *Madḫal* [14] i.4, 21.1, 23.5, 23.9, 23.16f, 24.3;

(2) *Maqūlāt* [15] i.1, 4.15.

(3) *Ilāhiyyāt* [21] i.2, 10.17, 12.10.

Ibn Sīnā is generally not good at cross-referencing, but at *Maqūlāt* 4.15f he does include an unusually explicit cross-reference:

(4) And the atomic expressions (*al-alfāzu l-mufrada*) have other features (*aḥwāl*), namely that they signify things that exist (*mawjūd*) in one of the two modes of existence (*wujūdāni*) that we explained when we specified the subject of logic. (My translation; 'mode of existence' for *wujūd* in this context is from Marmura's translation of *Madḫal* 15.19 below.)

This has to be a reference back to *Madḫal* i.2 page 15, where Ibn Sīnā twice refers to *wujūdāni*. This whole page is in the same ballpark as the definition of the *mawḍūᶜ* of logic in Passage A above.

The second reference in *Ilāhiyyāt* i.2 is clearly a continuation of the discussion at the first reference. The first reference reads:

(5) As you have learned (*ᶜullimta*), the subject of the science of logic was the secondary intellected meanings (*al-maᶜānī l-maᶜqūlātu l-ṯāniyya*) which rest on the primary intellected meanings … (*Ilāhiyyāt* 10.17f)

So Ibn Sīnā indicates that this is a secondary passage that summarises material already covered at some earlier point in *Šifā'*. The language of the paragraph is strongly reminiscent of *Madḫal* i.2–4, and I think it is universally accepted that Ibn Sīnā means to refer back to those sections of *Madḫal*. But then what part of those sections is he sending us to for 'secondary intellected meanings'? No phrase like this occurs in *Madḫal*, or indeed anywhere in Ibn Sīnā's logical writings.

Sabra [28] p. 753 quotes this passage (5) of *Ilāhiyyāt*, and jumps at once to the assumption that 'primary' and 'secondary' here are descendents of 'the

Porphyrian distinction between terms in first position ... and terms in second position', making no attempt to connect up Ibn Sīnā's cross-reference with the text of *Madḵal*. This is unfortunate, because there is an obvious candidate in *Madḵal* i.2–4 for the notions that Ibn Sīnā is referring back to, namely things in first and second mode of existence. If we had only Ibn Sīnā's text to draw on, the obvious inference would be that 'secondary intellected meanings' is shorthand for 'intellected meanings that are in second mode of existence'. This again places the target of the back-reference squarely in page 15 of *Madḵal*. I will assume this is right. Theoretically somebody might argue that Ibn Sīnā's reference to what 'you have learned' refers back not to *Madḵal* but to some hitherto unidentified Farabian text that discusses first and second imposition; but I have not seen this case made, and until it is made I am regarding this approach as too implausible to take seriously.

The passage at *Ilāhiyyāt* 10.17ff continues with some comments on the *mawḍūᶜ* of logic that are overtly ontological rather than logical. These are presumably still a part of what we 'have learned', and they fit with the contents of *Madḵal* i.4. Since that section contains five mentions of the *mawḍūᶜ* of logic, including its title, we should form some view on how it relates to page 15 in *Madḵal* i.2. People can read the passages and draw their own conclusions. Mine are as follows.

In *Madḵal* i.2, Ibn Sīnā gives us his own views. After an interlude in *Madḵal* i.3 to discuss *taṣawwur* and *taṣdīq*, he returns in *Madḵal* i.4 to the topics of *Madḵal* i.4 but in a polemical mode. His polemical targets probably include texts that no longer survive, so that we have only half the story. In principle what he says in *Madḵal* i.4 may contain refinements of his account of second mode of existence in *Madḵal* i.4, but we don't know this; it was not Ibn Sīnā's usual style to introduce his views as resolutions of problems raised by earlier authors. Also Sabra is right when he says that Ibn Sīnā's remarks in this polemical part of *Madḵal* i.4 'are much too brief' ([28] p. 763). Furthermore we will find that the account in Passage A closely matches that in *Madḵal* i.2. Putting all this together, it makes best sense to regard Passage B as definitive and *Madḵal* i.4 as secondary. (But note that El-Mernissi REF has given an account of the *mawḍūᶜ* of logic based mainly on *Madḵal* i.4. We will take this on board BELOW.)

Passage C. *Qiyās* [17] i.2, particularly 11.11–13.4. At *Madḵal* i.2, 16.3–5, just a few lines later than page 15, Ibn Sīnā mentions the question whether logic is a part or a tool of philosophy, and says 'We will give an exposition of this later'. The obvious candidate for this later exposition is *Qiyās* i.2. In

this section Ibn Sīnā gives, for the first time in *Šifā'*, some concrete examples of *masā'il* of logic. It would have been harder for him to give examples before defining the sentence-forms of logic, which he begins to do in *ᶜIbāra*, the book of *Šifā'* immediately before *Qiyās*. The examples are given as illustrations of the sense in which logic is a tool; but in view of the facts mentioned in Section 1 above, they are directly relevant to the question of identifying the *mawḍūᶜ* of logic.

Passage D. *Taᶜlīqāt* [22] 502.4–507.9. This passage consists of notes comparing logic and physics in the way that they relate to First Philosophy. In the course of the comparison there are many remarks on the *aḥwāl* ('features') of the subject individuals of logic and of physics. The status of *Taᶜlīqāt* is a little uncertain; see Janssens [26] and Gutas [8] pp. 160–164. Gutas, endorsing remarks of Janssens, speaks of 'a context of live discussions ... which lends the work a flavor of oral teaching'. Maybe we have a student's lecture notes. But the contents of Passage D are so close to *Madḵal*, and so far removed from anything on this topic from any other known author, that I have no hesitation in assuming that the passage is a report of Ibn Sīnā's own words.

The chief secondary passages have already been mentioned. They are:

Passage E. *Madḵal* i.4, 21.1–24.7. Besides the polemical material mentioned above, there is also some relevant discussion of the construction of compounds, using houses as an analogue of mental constructions.

Passage F. *Ilāhiyyāt* i.2, 10.17–11.2 and 12.10. Ibn Sīnā refers back to the definitions in *Madḵal* i.2 and draws out some consequences of ontological interest.

On our present understanding, all these six passages were written within a relatively short period while Ibn Sīnā was at the height of his powers. According to the dating given by Gutas [8] pp. 107, 165, *Madḵal* was written in 1022–4, *Qiyās* in 1024 and *Mašriqiyyūn* in 1027–9. Janssens [26] places *Taᶜlīqāt* at the same date as *Mašriqiyyūn*. So we should not expect to find major differences between the views expressed in any of the passages.

Ibn Sīnā often has parallel discussions at corresponding points in different books. So it may well be that we should count passages in some of his other works as implicit discussions of the *mawḍūᶜ* of logic. Sometimes we can identify parallel passages by the use of distinctive terminology. On

this criterion the use of *muwaṣṣil* at *Išārāt* [25] 41.9 is suggestive, when compared with *Mašriqiyyūn* 10.15 or *Madḵal* 23.18 (both *muwaṣṣil*) or *Ilāhiyyāt* 10.18 (*yatawaṣṣalu*) in similar contexts. So maybe *Išārāt* i.1.4, 40.12–41.13, belongs with the passages above. Gutas [8] p. 165 dates *Išārāt* to around 1030–4.

3 Identifying the subject term

In Subsection 3.1 we identify what Ibn Sīnā claims are the subject individuals of logic. His claim raises some difficulties; in Subsection 3.2 we discuss one which has damaging consequences for his own logic.

3.1 Intellected meanings

Given the connection between the subject term of a science and the typical *masā'il* of the science, we could go straight to Passage C above and identify the objects quantified over in the *masā'il* identified in that passage. But in the spirit of moving from what is known to what is unknown, let me start from the definitions in Passages A and B.

Question. What kinds of entity can be subject individuals of the science of logic?

Passage A answers:

(6) Meanings in the context of their being subject to composition through which they reach a point where an idea is made available in our minds which was not in our minds [before] … (*al-maᶜānī min ḥayṯu hiya mawḍūᶜatun lil-ta'līfi allaḏī taṣīru bihi muwaṣṣilatan ilā taḥṣīli šay'in fī 'aḏhāninā laysa fī 'aḏhāninā …*; Goichon [6] p. 244 translates: les idées en tant qu'elles sont sujettes à entrer en composition et que, par là, elles arrivent à mettre en acte dans nos esprits quelque chose qui n'y était pas.) (*Mašriqiyyūn* 10.15f)

The implied answer to the Question is 'meanings'. There is a requirement that the meanings can enter into composition; but this is a feature that all meanings have, unless we want to make an exception of marginal cases like the meaning of 'Ouch!'. There is also a requirement that the resulting composition leads us to new knowledge; but since any meaning can occur in a logical inference, that again is no restriction.

We turn to Passage B. I quote Marmura's translation of *Madḵal* 15.1–7, from his [27] p. 10:

(7) The quiddities of things may exist in the real instances of things or in conception. They will thus have three aspects: [(a)] a consideration of the quiddity inasmuch as it is that quiddity, without being related to either of the two [modes of existence], and what attaches to it inasmuch as it is such; [(b)] a consideration thereof inasmuch as it is in external reality, where there will then attach to it accidents proper to this existence it has; [(c)] a consideration thereof inasmuch as it is in conception, where there will then attach to it accidents proper to this existence, for example, being a subject, predication, and like universality and particularity in predication, essentiality and accidentality in predication, and other things that you will learn [in this book].

At '[modes of existence]' Marmura has '[kinds] of existents', following a manuscript that reads *mawjūdayni*. The Cairo edition [14] follows the majority and has *wujūdayni*. In the present context the majority reading seems to me to make better sense, hence the adjustment to Marmura's text.

Here Ibn Sīnā speaks about the 'quiddities of things', with no restriction on the kinds of thing. Any such quiddity, he says, can be either taken on its own, or taken in one or other of the two modes of existence. A quiddity (*māhiyya*) is not the same thing as a meaning (*maᶜnā*), but in practice there is no difference. For Ibn Sīnā a meaning is a complex structure; at its heart is its quiddity or nature (*tabīᶜa*) or essence (*ḏāt*), which determines the meaning by supplying its essential or definitional constituents. So if Ibn Sīnā says 'quiddities' in *Madḵal* and 'meanings' in *Mašriqiyyūn*, we need not take this as a change in his opinions. In both *Madḵal* and *Mašriqiyyūn* it seems that *any* meaning can be taken as a subject individual of logic, and hence in second mode of existence.

Marmura's translation of *Madḵal* 15.9–12 ([27] p. 12), still within Passage B, confirms that anything that 'we want to think about' can serve as a subject individual of logic:

(8) If we want to think about things and know them, we need necessarily to include them in conception (*taṣawwur*), whereupon the states [peculiar] to conception will occur to them. We will thus necessarily need to consider the states (*aḥwāl*) that belong to them in conception, particularly when through cogitation we seek the apprehension of unknown things, this taking place by means of things that are known.

The parallel with Passage A continues; the meanings have to be capable of being put into compositions which give us new knowledge.

Passage F might impose a constraint; again it has 'meanings', but here they are restricted to be 'intellected' or 'intelligible' (*ma^{c}qūl*). As far as I know, Ibn Sīnā never provides a formal definition of *ma^{c}qūl*, but of course he gives many explanations of what he means by 'intellect' (*^{c}aql*). The question here is how much of the operations of the intellect we are supposed to read into the secondary intellected meanings (see Gutas [7] on the operations of the intellect). A minimal reading is that these meanings have been detached from sense perception enough to be handled as concepts; in this case 'intellected meanings' can be taken as just 'meanings'. A maximal reading could be that the meanings have been tidied up by the intellect so as to remove ambiguities, borderline cases and the other defects of real-life meanings that cause problems for reasoners. In this case Ibn Sīnā's restriction to 'intellected' meanings would play a similar role to Zermelo's requirement, when he gave his Aussonderungsaxiom for set theory [29], that the properties used to specify sets should be 'Definit', i.e. well-defined. Since presumably any meaning that is worth reasoning with can be tidied up, even this maximal reading is in line with what we found in Passages A and B, that *any* meaning—or at least any meaning capable of being put into a compound meaning—can serve as a subject individual of logic.

To sum up so far: with marginal exceptions, any well-defined meaning can be a subject individual of logic. So by Section 1, we should find that the paradigm *masā'il* of logic take the form

(9) For all well-defined meanings $X_1, \ldots X_n, \ldots$

The content of the '…' depends on the aim as expressed by the *min ḥayṯu*:

(10) This kind of reflection is called the science of logic. It examines the aforementioned matters (*al-'umūru l-maḏkūra*) inasmuch as they lead to making the unknown known. (*Madḫal* 16.10f, trans. Marmura [27] p. 13)

This should be taken with Passage A, which says the same thing in very similar words. The upshot is that a typical *mas'ala* of logic of the form (9) tells us how to get new information out of old information.

We can test these conclusions against Passage C above.

In *Qiyās* i.2, Ibn Sīnā addresses the question 'In what sense is logic a tool of the sciences?' His answer is that logic is a tool mainly by providing tools

that serve to measure features of arguments, in particular to determine (a) whether a given set of premises is productive and (b) whether a given sentence is the conclusion of a given productive set of premises. (See *Qiyās* i.2, 11.14–12.3.) He adds that logic also provides logical truths, i.e. sentences that are guaranteed by logic to be true. (See *Qiyās* i.2, 12.15–17.)

Thus logic tells us that the premises

(11) Everything that moves is a body, and the soul is not a body.

are productive. But as Ibn Sīnā says, the matter in these two sentences is not 'logical' at all (*Qiyās* 11.15). He intends us to see that what logic detects is the form that makes these two sentences productive. The form is what we get by generalising from this particular matter 'moves', 'body', 'soul'. From the conclusion that Ibn Sīnā offers ('The soul doesn't move', *Qiyās* 11.15) we see that he is taking the sentences as premises for the mood *Camestres*, or as he calls it, the second mood of the second figure. At *Qiyās* ii.4, 115.17 he will set out *Camestres* for us as follows:

(12) No C is a B; and every A is a B; so no C is an A.
lā šay'a min j b, wa-kullu a b, fa-lā šay'a min j a.

The productivity statement that he referred to at *Qiyās* 11.14–12.3 is the statement

(13) For all meanings A, B and C, the negative universal sentence with subject C and predicate B together with the affirmative universal sentence with subject A and predicate B form a productive premise-pair.

Likewise the statement about the conclusion can be written:

(14) For all meanings A, B and C, the conclusion of the productive premise-pair consisting of the negative universal (etc. etc. as above) is the negative universal sentence with subject C and predicate A.

And here we see exactly how theorems of logic quantify universally over meanings.

Likewise the logical truths that Ibn Sīnā cites at *Qiyās* 12.15–17 are instances of the general logical theorem:

(15) For all meanings A and B, it is true that every A is either a B or not a B.

3.2 Logic as formal

The results of Subsection 3.1 add up to a claim that the main results delivered by the science of logic are along the following lines:

(16) Given any well-defined meanings $M_1, \ldots, M_n$, if these meanings are arranged in the following pattern [and here follows a collection of compound meanings with parts of the forms $M_1, \ldots, M_n$], then the result is a proposition p and a set Q of propositions such that the truth of p is a consequence of the truth of the sentences in Q.

(In the limiting case of logical truths, Q will be empty.) In modern terminology we might paraphrase this as the claim that the main business of logic is to tell us the forms of formally valid inferences, or simply that logic is formal.

Ibn Sīnā doesn't use the terminology of 'formal logic' or 'formal inference'. ('Formal logic' goes back to Kant's *Critique of Pure Reason*.) But he expresses the idea clearly enough in his discussion of the definition of syllogism in *Qiyās*:

(17) When we say 'No person is a horse, and every horse neighs', so that we have introduced a predicate ['neighs'] that is co-extensional with the middle term ['horse'], then it has to be the case (*lazima*), both in this matter and in every matter that has the same properties of co-extensionality and conversion, that 'No person neighs'. But the corresponding conclusion doesn't always follow from every premise-pair consisting of a negative minor premise and a universal affirmative major premise, and so this premise-pair is not a syllogism. (*Qiyās* i.6, 64.9–13)

See El-Rouayheb's discussion of this passage in [3] p. 20. I strongly agree with El-Rouayheb's conclusion that 'one cannot make sense of the distinction that Avicenna is drawing here without imputing to him some notion of formal … productivity'; though in the light of Subsection 3.1 above I can hardly agree that 'he may not have drawn the distinction systematically'. (Also I think El-Rouayheb is wrong to read *lazima* here as 'implied by the premises'; it just means 'must be true'. Ibn Sīnā is not describing an alternative notion of 'material productivity' here.)

Ibn Sīnā makes it clear in *Qiyās* i.2 that he regards *masā'il* of the form (16) as central to applications of logic in other sciences. We can add that it

would be odd to deny that these *masā'il* are central for understanding what logic is in itself. But Ibn Sīnā never claims that all *masā'il* of logic take this form. The book [10] will review the candidates for *masā'il* of logic in Ibn Sīnā's writings. One case where Ibn Sīnā himself uses the word *mas'ala* is in *Jadal*:

(18) An example of a question (*mas'ala*) of logic is: When two ideas are mutually contrary, can a definition of one be found in the other? (*Jadal* [20] 83.7f)

This is a question to be debated, not a theorem. But if the debate led to an affirmative conclusion, we would have a theorem

(19) For all meanings X and Y, if X and Y are mutual contraries then either X contains a definition of Y or Y contains a definition of X.

This would be another illustration of 'meaning' serving as *mawḍūᶜ* of logic, but it is not in the form (16). It does serve to remind us that for Ibn Sīnā, logic delivers both propositional knowledge of conclusions of inferences, and also knowledge of concepts through definitions of those concepts.

But there is another class of theorems of logic that Ibn Sīnā consistently sidelines. These are theorems that say that some general property *doesn't* hold: for example that a certain mood is sterile (i.e. doesn't yield a syllogistic conclusion). Theorems of this kind are the contradictory negations of universally quantified statements, so they come out as existentially quantified propositions. Peripatetic theory of science tended to be weak on existentially quantified propositions, and this certainly holds of Ibn Sīnā. This theoretical weakness feeds through directly into Ibn Sīnā's practice in formal logic, and in some cases leads to actual errors there. Let me illustrate this with two examples.

(1) Aristotle had a technique for showing that a given syllogistic mood is sterile; it involved finding two sets of terms, one to show that the mood leads to no affirmative conclusion, and one to show that it leads to no negative conclusion. Aristotle never stated the theory supporting this method, and neither does Ibn Sīnā. The method works because of certain properties of the sentences of Aristotle's categorical and modal logics. If one introduces new forms of logic, as Ibn Sīnā did, then one needs to check how the method should be adjusted to these logics. Ibn Sīnā failed to do this; he simply followed Aristotle's examples mechanically. Luckily the sentences of Ibn Sīnā's two-dimensional logic are close enough to Aristotle's

sentences for the obvious analogue of Aristotle's approach to work. But when Ibn Sīnā extended *munfaṣil* ('disjunctive') sentences to his own two-dimensional framework, he should have realised that Aristotle's method would now need four sets of terms, not two. As a result, Ibn Sīnā claims to have shown that several of these moods are sterile when in fact they are productive. (Further details are in [9].)

(2) Ibn Sīnā also recast Aristotle's approach to sterility in the categorical case and its analogues in his own logic. Instead of proving case by case that the sterile moods were sterile, as Aristotle had done, he formulated general rules that all moods with certain features were sterile. He gave hand-waving proofs for these general rules; probably he reckoned that they could be learned empirically by testing many concrete examples. Replacing individual cases by general rules is of course progress for a Peripatetic scientist. But it is interesting to note that a century after Ibn Sīnā, Abū al-Barakāt—whose logic was in other ways closely based on Ibn Sīnā's—was having none of it. In his *Mujtama^c* [1] he insisted on going through Aristotelian sterility proofs case by case, just as Aristotle had done. Presumably he smelled something inadequate about Ibn Sīnā's approach to sterility.

Ibn Sīnā is generally a very accurate calculator. He does make occasional slips, but his mistakes about sterility are the only systematic errors that I know of in his formal logic. So it is significant that these mistakes coincide with a weakness in his general framework for the science of logic. This is one illustration—but not the only one—of how closely he integrated his theory of the science of logic with his logical practice.

4 The second mode of existence and its attachments

We still have to explain two parts of Ibn Sīnā's account of the *mawḍū^c* of logic. One is the difference between first and second mode of existence. The other is the features that attach to the subject individuals. These two items are not independent. For example at *Madk̲al* 15.5f:

(20) [In second mode of existence] there will then attach to it accidents proper to this existence (*wujūd*), for example its being a subject, predication, and like universality and particularity in predication ... (Marmura [27] p. 10)

Or at *Taʿlīqāt* 167.15–17:

(21) A thing has primary intellecteds, like 'body' and 'animal' and the like, and secondary intellecteds which rest on (*tastanidu ʾilā*) these, namely these things being universally quantified, existentially quantified and singular.

We have already seen that one and the same meaning can be in first mode of existence, or in second mode of existence, or in neither. So the mode of existence is not something intrinsic to the meaning; it must be something added. We naturally ask: what has to be added to a meaning to make it possible to describe the meaning as a subject, or a predicate, or as universally or existentially quantified?

Ibn Sīnā continues (*Madḵal* 15.7f):

(22) For in external things there is … no [such thing as] a thing's being a subject nor its being a predicate, no [such thing as] premise or syllogism, or anything of the sort. (Marmura [27] p. 10)

At this point I have to interpret these passages in my own words, because Ibn Sīnā's understanding of the situation has some problematic features. We can identify the main issue and then come back to Ibn Sīnā's own analysis.

Certainly there are no premises or syllogisms in the external world, because premises and syllogisms are abstract objects that don't have a physical location. But subjects and predicates are detached from the external world in a stronger sense than this. In the abstract or mental world there are premises and syllogisms. But if you list the things in this abstract world, you will never list subjects or predicates. The reason is that 'subject' and 'predicate' are seriously relational terms; one and the same meaning is the subject of proposition X and the predicate of proposition Y, and not a member of proposition Z at all. (But every meaning is the subject of some proposition, so even the condition 'subject of something' doesn't serve to distinguish one meaning from any other.)

Exactly what is intended in *Taʿlīqāt* 167.15–17 I am not sure, but analogues elsewhere in Ibn Sīnā suggest that by ' 'body' being universally quantified' he means 'body' in the context 'every body'. Likewise we have 'some animal', 'this animal'.

In short, to be able to describe a meaning as a subject, or as universally quantified, you have to *put it into a phrase or a proposition*. What is properly described as a subject is not the meaning itself but the occurrence in

a certain place in a certain proposition. A meaning can become a subject, or universally quantified, by becoming a certain component of a certain abstract compound.

And now we notice that Passage A places exactly this constraint on the subject individuals of logic:

(23) meanings in the context of their being subject to composition
al-maᶜānī min ḥayṯu hiya mawḍūᶜatun lil-taʾlīf (*Mašriqiyyūn* 10.15)

(The appearance of the word *mawḍūᶜ* here is nothing to do with the 'subject' of logic; Ibn Sīnā is talking of a meaning being 'subject to' being made a component of an abstract compound.) So yet again the definition in *Mašriqiyyūn* is in lock-step with the definition in *Madḵal*. Being in second mode of existence is the same thing as being 'subject to composition'—or at least being subject to being made a component of propositions.

Now comes the problem with Ibn Sīnā's understanding of this situation. Ibn Sīnā consistently avoids saying what I said above, that what is properly described as being a 'subject' is not a meaning but an occurrence of a meaning in a particular compound. This is not because Ibn Sīnā has no word for 'occurrence' in the present sense. When he wants to talk about occurrences he is perfectly capable of doing so, for example with the help of *min ḥayṯu* again:

(24) An occurrence of a single syllable in the phrase 'the human' doesn't signify at all.
(Literally, 'A syllable doesn't signify at all *min haythu* it is a part of the phrase "the human" '. *ᶜIbāra* [16] 30.7f.)

Rather he wants to say something about second *wujūd* which doesn't fit with the notion of occurrences.

At *Madḵal* i.4, 21.10 he says 'As for conception . . . ' (*wa-ammā l-taṣawwur*), and moves at once into an extended discussion of what is involved in building a house. A house is a compound of parts, he says, and you can't know the nature of the house unless you know its simple parts (*Madḵal* 21.15f). For example the builder needs to know that the wood and the adobe are in fit condition to be incorporated into the house (*Madḵal* 22.2–7). In the same way (*ka-ḏālika*) the logician needs to know about quiddities

(25) whether these quiddities are predicate or subjects or universally quantified or existentially quantified, and the other things that happen to these meanings from the aspect that we discussed earlier. (*Madḵal* 22.10–12)

Ibn Sīnā appears to be saying here that a meaning, in order to form the subject of a proposition, has to be *first conceptualised as a subject, before it can be put into the compound*. Likewise 'animal' has to be *conceptualised as universally quantified* before it is fit to be put into the compound 'every animal'. This is a very puzzling view, and one's first inclination is to guess that we have misread it somehow. But this passage in *Madḵal* is thoroughly articulate and looks as if it says what it was meant to say. Also note the phrasing in (23) from *Mašriqiyyūn*: not 'in a compound' but 'subject to composition'.

A sentence in *Taᶜlīqāt* seems to endorse the picture:

(26) They have features which occur to them in the context of their being conceptualised (*min ḥayṯu hiya mutaṣawwaratun*), like being universal or existential or essential or accidental. (*Taᶜlīqāt* 507.4f)

But admittedly this sentence has suspicious features. 'They' seems to refer back to 'expressions', which can hardly be conceptualised.

To add to the complexity, *Taᶜlīqāt* 503.2f speaks of a universal being made a subject individual of logic through a procedure in First Philosophy, and 'then' (*ṯumma*) acquiring adherents and essential accidents in logic. If we are to take all this literally, there is a three-stage process here: (1) 'establishment' (*'iṯbāt*) of a meaning in First Philosophy, making it a subject individual of logic, followed by (2) 'conceptualisation' (*taṣawwur*) of the meaning so as to give it one of the *aḥwāl* of logic, followed by (3) introduction of the meaning into a compound meaning that matches (2). Does Ibn Sīnā really mean all of (1)–(3)? This is one place where the transmission of *Taᶜlīqāt* may have added a needless complication.

The naive view is that this is all a lot of fuss about nothing. If you want to make 'animal' the subject of a proposition, then you just form the proposition with 'animal' as its subject; job done. Let me not quarrel with common sense. But some people will want to ask questions that go deeper.

Two examples of questions to be asked are:

(a) What kind of thing is an occurrence?

(b) (The wrapping problem, cf. Ibn Sīnā *Nafs* [18] 212.11—213.4, Frege [5] p. 157) The same person can have a coat on at one time and not at another time. It seems that in the same way a meaning can be a subject when it is in one proposition but not when it is in another proposition; but this can only be a metaphor (or a 'Sufi-ism', to quote Ibn Sīnā), because meanings are eternal objects that don't have different properties at different times. So what is it a metaphor for?

This is the wrong place to explore these questions in detail. Suffice it to say that Ibn Sīnā raised and struggled with both these questions. His strange view about meanings becoming predicates before they enter into compounds is very likely an emanation from his attempts to answer the questions. As Sabra said, Ibn Sīnā's views in this area are interesting and complex.

5 The 'features' of the subject individuals

When he introduces the notion of second *wujūd* in *Madḵal* p. 15, Ibn Sīnā lists several *aḥwāl* that attach to quiddities in second *wujūd*. *Taᶜlīqāt* paragraphs [919]–[924] picks up this list and expands it. There are problems about this section of *Taᶜlīqāt*. As we noted earlier, people have felt that the whole of *Taᶜlīqāt* has the air of a not entirely coherent set of notes from discussions or lectures; this is certainly my impression too. There is a more specific problem: the passage is largely concerned with allocating different responsibilities to the sciences of First Philosophy and logic. A pattern that it reports in several cases is that a concept is 'established' (*uṯbita*) in First Philosophy and then 'defined' (*maḥdūd*) in logic. There are also some comments on which of the two sciences takes care of the 'teaching' (*taᶜlīm*) of a concept. I don't know whether 'teaching' goes with 'establishing' or 'defining', or is something different from both; and I don't know how any of these relate to the process of attaching *aḥwāl* to a quiddity. So some of the concepts that I have listed as *aḥwāl* in the sense of second *wujūd* may not belong in the list at all; it seemed best to err on the side of inclusivity.

With those cautions, here is the list. For *Ta^{c}līqāt* I give the page references in Mousavian's edition [22], together with paragraph numbers in square brackets (which agree with Badawi's edition).

Feature	*Madk̲al* i.2	*Ta^{c}līqāt*
subject *mawḍū^{c}*	15.5	
predicate *ḥaml*	15.6	
universal *kullī*	15.6	502.7 [919], 506.5 [920], 507.4 [924]
existential, particular *juz'ī*		502.7 [919], 506.5 [920], 507.4 [924]
singular *šak̲sī*		502.7 [919], 506.5 [920]
affirmative *mūjib*		504.11 [919]
negative *sālib*		504.11 [919]
contradicts *tunāqidu*		505.1 [919]
essential *d̲ātī*	15.6	507.5 [924]
necessary *wājib*		503.5 [919], 505.5 [919]
absolute *muṭlaq*		503.5 [919]
possible, contingent *mumkin*		503.5 [919], 505.5 [919]
generic *jinsī*		503.1 [919], 505.4 [919], 506.6 [920]
specific *naw^{c}ī*		503.1 [919], 505.4 [919], 506.6 [920]
differential *faṣlī*		505.4 [919], 506.6 [920]
accidental *^{c}araḍī*	15.6	505.5 [919], 507.5 [924]
proper *k̲āṣṣī*		505.5 [919]
premise *muqaddama*	15.8	505.12 [920]
syllogism *qiyās*	15.8	

One thing leaps to the eye. Most of the items in this list are notions that are needed for describing the sentences and moods of Aristotle's logic as Ibn Sīnā understood it, both categorical and modal. Thus each sentence has a *subject* and a *predicate*, it is either *universal* or *existential* or *singular* (or unquantified, *muhmal*, but Ibn Sīnā in his formal logic makes no use of this class anyway), and either *affirmative* or *negative*. Ibn Sīnā follows the Arabic translations of Aristotle in making each modalised sentence either *necessary* or *absolute* or *possible/contingent*. Finally a mood has *premises* (Ibn Sīnā doesn't always count the conclusion as part of the mood, even for productive moods).

If we add the notions that are needed for forming definitions, then the presence of *generic* (i.e. *being a genus*) and *differential* (i.e. *being a differentia*) is explained.

What items in the list does this leave unaccounted for? They are

(27) contradicts, essential, being a species, being an accident, being a proprium, syllogism.

Of these, 'being essential' and 'being an accident' are in both the *Madḵal* list and the *Taᶜlīqāt* list, so they are presumably both intended.

I suspect that 'being a species' and 'being a proprium' are intruders in the list. They both appear only in *Taᶜlīqāt*, not in *Madḵal*. There are several lists of predicables in the *Taᶜlīqāt* passage, and in at least some of them Ibn Sīnā seems to be saying 'Universal meanings are classified in these ways in First Philosophy, and then it's the job of logic to apply the *aḥwāl* that are specific to logic'. This is one place where the oral setting could have caused confusion in the student's notes.

'Essential' is interesting, because two of the sentence forms of Ibn Sīnā's own two-dimensional logic (cf. [9]) are defined in terms of 'essence' (*ḏāt*). If Ibn Sīnā was listing the notions needed for defining his sentence forms, one would expect to see 'so long as' (*mā dāma*) as well. But perhaps Ibn Sīnā included 'essential' as a modest gesture to his own logic; the student could easily fill in further details if needed.

'Contradicts' and 'syllogism' both occur in contexts where there is more than one sentence. Also they are the only two notions in the whole list that are defined in terms of some kind of entailment relation between sentences. Such notions could easily occur in *masā'il* of logic. A sufficient condition of productivity could take the form 'Every premise-pair of the following form is a syllogism'. 'Contradicts' could appear in some *mas'ala* expressing the Law of Excluded Middle. But neither 'productive' nor 'sterile' is in the list. The absence of 'sterile' is par for the course; this is an existential notion.

'Accident' is the hardest item to account for. Presumably, in view of Ibn Sīnā's vigorous views on the uselessness of category distinctions for logic (cf. Gutas [8] pp. 300–303), Ibn Sīnā has in mind accidental as opposed to essential, not accidental as opposed to substantial—this is certainly the case at *Madḵal* 15.6. *Taᶜlīqāt* 506.11f tells us that accident, along with genus, differentia, species and proprium, 'is not taught in logic', but it is not clear that this relates to their status as *aḥwāl* in logic. Just conceivably Ibn Sīnā includes 'accident' in the list because he has in mind the use of accidental properties for generating counterexamples to invalid moods.

In sum: the *aḥwāl* that Ibn Sīnā lists are primarily the notions needed for describing the forms of sets of premises. This is entirely in line with his view in *Qiyās* i.2 that the main way in which logic contributes to the other sciences is by having *masā'il* that allow us to give formal validations of natural language arguments. The few other notions that Ibn Sīnā lists are ones that can easily occur in describing definitions, proofs of sterility and other mainstream features of formal logic.

The list is not by any stretch of the imagination a representative list of terms of second imposition.

A more interesting observation is that the list, even in the possibly swollen form I gave, contains no category notions—for example no 'quality', 'quantity' or 'substance'.

Sabra [28] p. 764 comments:

(28) [In *Maqūlāt*, Ibn Sīnā] asserts his independence from the Peripatetics (including Fārābī and Ibn al-Ṭayyib) by emphatically excluding the doctrine of categories from the proper domain of logic. This agrees with his understanding of logic as concerned with second-order concepts.

May I dare say here that Sabra shows he is not a logician? Ibn Sīnā's often-stated claim in *Maqūlāt* is not a theory that the doctrine of categories should be excluded from the proper domain of logic. It is a factual observation that no distinction of categories ever plays a part in any rule of formal logic. You can check it for yourself. We have about a thousand pages of Ibn Sīnā's formal logic in Arabic or Persian, with many rules stated and illustrated. Nowhere do the rules ever appeal to the fact that something is a quality, or not a relation, for example. Category distinctions are simply irrelevant to the rules.

In fact Ibn Sīnā chooses some of his examples to illustrate the point that logic is not confined to discussion of substances. One example is his second example of a 'necessary' sentence in his own two-dimensional logic as he sets it up in *Qiyās* i.3, 21.16: 'Every whiteness is a colour'. (Whitenesses are qualities, not substances.) In his relatively early *Muḵtaṣar* [12] 50a.3 he gives a syllogism 'Some differentiae are quantities; and no quantity is a quality. So not every differentia is a quality'. Reading the syllogism, we can see why logic applies to all entities regardless of their category.

So, to repeat, Ibn Sīnā's dismissal of categories is a factual observation about logic as he does it, not a thesis to oppose the Peripatetics. If there is an issue here, it is whether Ibn Sīnā is right to regard the logic that he does as representative of logic as a whole. There could for example be a branch of logic where we specifically examine the rules that govern the notion of substance; this would be a 'logic of substance', rather as today people study logics of time, logics of process, logics of constructive mathematics and so on. Possibly some logics studied by Al-Fārābī or Ibn al-Ṭayyib were of this type, though I know no evidence to support this. I think we can say that Ibn Sīnā had no interest in pursuing limited logics of this type; he was after

what Kant would have called an *allgemeine Logik*. So his list of *aḥwāl* could be read as a first crude attempt at a list of 'logical concepts', rather a modern enterprise. But before anybody seeks to bring him into that enterprise, let me state my own impression that his list of *aḥwāl* is just read off empirically from logic as he has it; there is no sign that he has in mind any kind of guiding principle like those popular in modern discussions, for example that logical concepts are topic-free.

Some readers may be shuffling nervously by this point. Don't we read that Ibn Sīnā had in his logic a class of sentences that he called 'substantial'? The answer is: No, he didn't. It's true that some recent papers have described two of his sentence forms (one affirmative and the other negative) as 'substantial'. I don't know why they chose this word; Ibn Sīnā's own name for these forms was 'necessary' (*ḍarūrī*, cf. *Qiyās* 31.14–32.1, *Mašriqiyyūn* 65.5f). (There is some further information about this substance abuse in [9] Section 9.1.)

There is more to be said about the role of categories in logic. Ibn Sīnā himself several times refers to categories as useful for some aspects of the practice of logic. For example they serve as a useful basis for cataloguing the possible implied but unstated conditions in a natural language argument that is being analysed. I believe some observation of this kind lies behind Ibn Sīnā's remark in *Mašriqiyyūn* 10.18–20 that 'being substances or qualities or quantities' can be relevant to whether a meaning can be made into a part of an explanatory phrase or inference. [11] will say more about this from the point of view of the practice of logical analysis.

6 Several loose ends

Sabra finished his paper by pointing to passages which still needed explanation. I hope we have made progress on the passages that Sabra mentioned, but the course of the enquiry has thrown up some further questions to answer.

One question to resolve is what it is for a meaning to be in first *wujūd*. How is it different in practice from not being in any *wujūd* at all? There are several places where Ibn Sīnā speaks of the secondary intelligibles as 'resting on' primary intelligibles. The default reading of this should be that meanings in second *wujūd* rest on meanings in first *wujūd*. But *Madḵal* seems to say nothing to support this picture. Meanings in second *wujūd* do in an obvious sense rest on meanings not in any *wujūd*; has Ibn Sīnā simply

conflated first *wujūd* with zero *wujūd*? This conflation seems to occur in *Ta^{c}līqāt*.

There are some passages in *Nafs* where Ibn Sīnā seems to speak of secondary intelligibles as intelligibles that are inferred from primary intelligibles. Bertolacci [2] p. 273 (footnote) thinks this is a different notion of secondary and primary intelligibles from that involved in the *mawḍū^{c}* of logic; this seems likely. But then what does Ibn Sīnā intend by 'secondary intelligibles' in his late treatise *On the Rational Soul*? I think I could argue either case; possibly he means some kind of higher synthesis of the two notions.

Another question is what Ibn Sīnā intends by his statements, in *Madḵal*, *Mašriqiyyūn* and *Ilāhiyyāt*, about the connection between the *mawḍū^{c}* of logic and the contrast of worldly versus mental existence. This question feeds back into discussions above, because some authors have tried to justify Sabra's conclusions after the event by reading Ibn Sīnā's remarks about worldly and mental existence as references to first and second imposition. (Probably this is the place to review El-Mernissi's reading of *Madḵal* i.4.)

Most of these loose ends troubled Ibn Sīnā's successors, and one can find many discussions of them in the later literature. Mullā Sadrā is still chewing over them in his *Asfār* in the seventeenth century.

Mention of later authors points to another loose end. One benefit of pinning down Ibn Sīnā's views is that it makes it possible to compare his views with those of later authors. El-Rouayheb [4] has put together a valuable collection of texts illustrating later views on the *mawḍū^{c}* of logic in the later Arabic tradition. But El-Rouayheb takes for granted Sabra's view of Ibn Sīnā's position on the *mawḍū^{c}* of logic, and his comments on the texts reflect this. To take one example, on his p. 74 he finds in some logicians of the thirteenth and fourteenth centuries a distinction between 'the intrinsic accidents of the subject matter' and 'the subject matter itself'. But this distinction is fundamental not only to Ibn Sīnā's own description of the science of logic, but to Ibn Sīnā's whole understanding of a theoretical science; the contents of *Madḵal* page 15 presuppose the distinction throughout. As a result the position of Kātibī, which El-Rouayheb discusses on his pp. 71ff, seems on the evidence of the texts given by El-Rouayheb to be a rather soundly based return to at least an approximation of Ibn Sīnā's own position. Assuming that in the passage quoted on p. 73 Kātibī uses 'second intentions' to mean 'terms of second imposition', Kātibī argues convincingly that some of the *aḥwāl* listed by Ibn Sīnā are in fact features of terms of first imposition too, and so these terms of first imposition must be included among the subject individuals of logic. Kātibī's conclusion seems

to be that the notion of 'second intelligible', if understood as meaning second imposition, should be distinguished from the *mawḍūᶜ* of logic and we should return to Khūnajī's description of the subject individuals of logic as the objects of *taṣawwur* and *taṣdīq*. (Khūnajī's description is not a bad précis of Ibn Sīnā's position.) I base these comments only on the texts quoted by El-Rouayheb, who on the strength of Sabra's account sees the relationship between Kātibī and Ibn Sīnā very differently from this. In the background of Kātibī's comments there lies some work of Rāzī, which I think is unlikely to be correctly understood until we have a good answer to the question two paragraphs above, about exactly what contrasts Ibn Sīnā intends between worldly and mental existence.

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