Handout for: Ibn Sīnā: analysis with modal syllogisms

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November 2011

1 Peiorem rule

Ibn Sīnā introduces the peiorem rule at *Qiyās* 108.8–11 as follows:

> Know that there is no syllogism from two negative premises, or from two existentially quantified premises .... And know that the conclusion follows the worse of the two premises, not in every respect, but in quantity and quality though not in modality. (1)

(The text is after correcting *ʾahsan* ('better') to *ʾaḵass* ('worse'), as required by the logic.) The corresponding passage in *Išārāt* runs:

> Don't pay attention to what is said to the effect that the conclusion follows the worse of the two premises in every respect. It's [just] in quality and quantity — note the exception mentioned above. (2)

The main difference seems to be that in *Qiyās* Ibn Sīnā introduces the peiorem rule at the head of his discussion of absolute moods of the syllogism, as one of a number of guiding principles. In *Išārāt* he delays it to near the end of his treatment of the first figure, so that he can point to a counterexample to applying it to modalities.

A further point about the peiorem rule: Ibn Sīnā's counterexample is worthless as it stands, because it depends on the arbitrary decision to

count universally quantified descriptionals (see below) as 'not necessary'. We know that this decision is arbitrary, because when he has his epistemological hat on, Ibn Sīnā votes the other way. To take a favourite example of his, 'The moon gets eclipsed' merely reports temporary events and so has no necessity. But if we study astronomy and expand it to 'The moon with the earth passing between it and the sun is eclipsed', we have a proposition which states the cause of its predicate and hence has both necessity and certainty. (The examples count as universally quantified, Ibn Sīnā explains, not because they are singular but because they apply to anything that is a moon; it's irrelevant that the earth happens to have just one.)

Maybe Ibn Sīnā responds to this point somewhere. It's my strong impression that he is not in the habit of dressing up terminological decisions as real discoveries. One possible resolution is that the counterexample is merely meant to show that we can't take the peiorem rule as robust, because there are defensible decisions about modality that produce counterexamples to it. This is a very fair point. But if Ibn Sīnā offers the counterexample in this spirit, without further explanation, this does suggest that other statements of his are made in the spirit of 'This is one view you could reasonably take', not as views that he commits himself to. I do believe that.

2 References to descriptional reading

The descriptional reading of 'Every A is a B' is 'Every A is a B so long as it continues to be an A'. Ibn Sīnā calls this reading *lāzim* in *Easterners*. Elsewhere he has no special name for it, and he spells out the sense when he needs to refer to it. (The word *wasfī* apparently never occurs in Ibn Sīnā's logical writings.) Below I list the places in *Qiyās* Chs. iii, iv and *Išārāt* vii where I found descriptionals mentioned. They match pretty closely, though *Qiyās* has several items not in *Išārāt*.

In *Qiyās* 36.8, 43.2 and *Išārāt* iii 10, iv 2, Ibn Sīnā introduces the descriptional readings. His usual formulation goes along the lines

> Every C is a B so long as it continues to fit the description C (*mā dāma mawṣūfan bi* C) (3)

which suggests he thinks of C as a description that holds over continuous intervals. But an example at *Qiyās* 29.12 shows that he is well aware of

descriptions that hold at repeated separate points of time. So my guess is that he just means 'at all times at which it is a C'. (For the negative descriptionals, see *Qiyās* 36.12 and *Išārāt* iv 6; in both passages he discusses specific languages.)

Two other descriptional readings are worth a mention. First, Ibn Sīnā sometimes adds 'necessarily', as for example at *Qiyās* 126.8. This conflicts with other things he says about necessity; I can't offer a clarification. (At *Qiyās* 36.8 he adds a redundant 'permanently'.)

Second, at *Išārāt* i.4, Inati p. 137 we find

> Every C is a B so long as it continues to fit the description C, but not always. (4)

This reading may be a figment. As Ibn Sīnā says explicitly, his point here is about *wujūdī* sentences, which deny permanence; so the descriptional part is probably an accidental irrelevance. This is one of the passages mentioned below where Ibn Sīnā attacks uses of descriptionals by other logicians; so maybe he has just copied a text in front of him.

There are four argument-forms where Ibn Sīnā invokes descriptionals. They are as follows.

> Every C is a B as long as it exists.
> Every B is a C at all times when it is a B. (5)
> Therefore every C is an A as long as it exists.

(5) is at *Qiyās* 128.13–129.1.

> Same as (5) but with 'Some C' in minor and conclusion. (6)

(6) is at *Qiyās* 129.5f, though as a follow-on from (1) with no explicit mention of descriptionals.

> Every C is a B as long as it exists.
> No B is an A at any time while it is a B. (7)
> Therefore no C is an A at any time while it exists.

(7) is at *Qiyās* 131.11–16.

> Some C is a B as long as it exists.
> No B is an A at any time while it is a B. (8)
> Therefore some C is not an A at any time while it exists.

(8) is at *Qiyās* 129.13, but he leaves it to the reader to work out what sense of 'absolute' is needed to make it work. All four arguments are covered by a very laconic statement in *Išārāt* vii.4, which again leaves it to the reader to find the relevant sense of 'absolute' (though with a clue).

Paul Thom suggests (*Medieval Modal Systems* p. 74) that Ibn Sīnā was the first to 'construct a theory articulating the inferential capacities of [the descriptional] propositions, their logic'. This is possible but I think unlikely. Already in the 2nd century AD, Sosigenes was proposing to use descriptionals in modal Barbara; Flannery in *Ways into the Logic of Alexander of Aphrodisias* Ch. 2 has a detailed discussion. Also in *Qiyās* 126.14–127.2 (parallelled in *Išārāt* vii 4) and *Qiyās* 144.11ff there are two places where Ibn Sīnā discusses and rejects some uses of descriptionals by earlier logicians.

The 'inferential capacities' that Ibn Sīnā notes are limited to (5)–(8) above, and Ibn Sīnā claims no originality for these observations. At least in *Qiyās* and *Išārāt*, Ibn Sīnā makes no attempt to draw out the 'logic' of these propositions any further.

Ibn Sīnā says in one place that the use of descriptionals 'has been customary':

> And likewise the custom has been (*qad jarrat al-ᶜāda*) to use the sentence 'Every B is an A.' with the meaning that every B is an A while it is a B. (*Qiyās* 113.14f.)

From the context, 'custom' here refers to custom in scientific writing and in debate. So he could still claim to have been the first person to have detected this custom; but in fact he doesn't claim this, and from the references above it seems unlikely.

So what is original in Ibn Sīnā's treatment of descriptionals? The answer seems to be the semantic context in which he explains them. There are three components to this:

(1) He argues that all descriptions contain a temporal reference, usually implicit. For example 'eclipsed' has to mean 'eclipsed at time t' (he says at a time which is 'indeterminate', *ġayr muᶜayyan*, e.g. *Qiyās* 23.13f). This is a special case of a much more general observation about implied parameters; for example 'father' means 'father of y', where the 'of y' is normally implicit.

Comment. So it's not appropriate to speak of 'ampliation' here. Ampliation is where a restriction on the range of values is lifted. But at the basic level Ibn Sīnā has no temporal restriction.

(2) He argues that in normal usage the speaker will intend some 'condition' (*šarṭ*) which makes the parameter definite. For example I might notice an eclipse and say 'The moon is eclipsed', where a full analysis would be 'If t is the present moment, then the moon is eclipsed at t'. Or I might add (explicitly or tacitly) a more elaborate condition, thus: 'At every time t when the earth comes between the sun and the moon, the moon is eclipsed at time t'. Normal usage in the relevant context will show what kind of condition is likely to be meant. Ibn Sīnā gives examples where the descriptional reading is clearly appropriate:

> Everybody who writes moves his hand.
> (Sc. at any time t, everybody who writes at time t moves his hand at time t.)

But also he gives examples where it is clearly not the right reading:

> Everything that breathes in breathes out.

Comment. These are factual observations about customary meanings; they are not recommendations or requirements. So statements in Ibn Sīnā that we 'ought to' use the descriptional reading are presumably short for something like 'need to if we want to regard the argument as Barbara XLL'.

(3) He argues that when sentences with indeterminates are used, a common interpretation is that the indeterminate is existentially quantified. In some cases this is clearly correct: 'He is a father' means 'He is a father of someone'. (And in this case Ibn Sīnā offers a deeper analysis that includes a further existential quantification: 'There was an occasion on which he begat ...'.) But Ibn Sīnā himself remarks that usage doesn't always go along with this; for example we would never say 'He is walking' and intend 'Someone is walking somewhere' (*ʿIbāra* 21.17–22.1). In cases like 'Every animal breathes' he suggests a meaning 'For every animal there is a time in its life at which the animal breathes'. This is not very convincing, but I don't believe I can offer anything better using only temporal quantification; I suppose one needs to refer to the regular functioning of an organism.

Comment. Again these are factual observations about actual usage. Ibn Sīnā is not well served by translations like 'Every animal is breathing' in

place of 'Every animal breathes'. Granted, there are cases (particularly involving negations) where it is rather obscure what usage he thinks he is reporting.

3 The modal syllogisms in *Qiyās* Chs. iii, iv

Zayd is white.
Everything white is necessarily of a colour dispersed for vision. (126.11) (9)

Every colour in the shade is necessarily black.
No colour of a heavenly body is black. (133.1) (10)

No animal is human.
Everything rational is human necessarily. (142.2) (11)

Every A is necessarily an actual laugher.
Every actual laugher is human. (143.3) (12)

Everything that rises moves.
Everything that moves is necessarily a body. (149.1) (13)

Necessarily not every white thing is an animal.
Every human is an animal. (151.12) (14)

Everything that breathes is an animal necessarily.
Every human breathes not necessarily. (156.12) (15)

Every horse is an animal.
No horse sleeps necessarily. (157.6) (16)

Every animal wakes.
Some animals have two legs necessarily. (158.5) (17)

Necessarily every human is an animal.
Not every human wakes. (159.2) (18)

Everything with two legs is an animal.
Necessarily not everything with two legs moves. (159.7) (19)

Every human can be white.
Some white thing can be an animal. (188.11) (20)

It's possible that every human is white.
It's possible that every white thing is a horse. (189.9) (21)

Every moving thing is a human.
Every horse can be moving. (193.12) (22)

Every human can write.
Every human touches the paper with his pen. (196.16) (23)

Every human can meditate.
No meditator is a crow. (197.10) (24)

Every human can move.
Every moving thing is a body necessarily. (203.11) (25)

Every phoenix is white necessarily.
Every human is possibly not white. (217.13) (26)

Everything that wakes moves necessarily.
Every animal can move. (222.11) (27)

Išārāt vii has two example syllogisms, but neither of them is modal.

4 From Al-Nayrizī's edition of Euclid *Elements* 1

In Proposition 6:

> If it is possible to have two angles [of a triangle] equal but their sides not equal, let the side AB be greater than the side AG.

In Proposition 7:

> I say that it is not possible to have a line from point A that is equal to the line AG and a line from the point B that is equal to the line BG, such that the two lines coincide at their other end in a point distinct from G. If it is possible, let them be drawn and let them be AD and BD.

In Proposition 8:

> If it is possible to translate one [triangle] onto the other so that their bases coincide but their sides do not, let us do that.

In Proposition 14:

> For if it is possible for us to draw a line other than BD to the point B so that the two lines join to make a straight line, let this line be BE.

For this mathematical style of possibility, which is just as common in modern university texts as it was in Euclid, see Hodges, 'Modality in mathematics', *Logique et Analyse* (forthcoming).