

Ibn Sīnā and Explicit Quantification¹

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(Talk based on the joint paper **Ibn Sīnā's Notion of Equality and Generalized Quantifiers**, with **Zaynab Salloum** (salloum@ul.edu.lb), STL, Lille3 and Université Libanaise, Faculté de Sciences, Section I, Département de Mathématiques, Beirut, Lebanon)

Extended abstract

Ibn Sīnā's notion of analysis (*taḥlīl*):

Inspired by Aristotle's reduction of all syllogistic forms to the first figure, Łukasiewicz [1951]² developed a formal reconstruction of the syllogistic in the shape of an axiomatic system. Further work such as that of J. Corcoran [1972] and that of T. Smiley [1973]³ provided other formalisms guided by a similar idea. In this setting, logic is linked to the development of some formal calculus understood as a set of expressions generated by some algorithmic inductive process. It seems that such kind of reconstructions are also possible for Ibn Sīnā's syllogistics (e.g. Thom [2003]).

It is certainly an important achievement to show that Ibn Sīnā's system contains the elements for such a formalization. However, it looks as if in Ibn Sīnā's own view, as pointed out by Wilfried Hodges [2010], the main role of the logician is not to develop some calculus but rather to deliver an analysis (*taḥlīl*) of natural language for the purposes of studying reasoning (understood as the logical concatenation of ideas) and to verify (*taḥqīq*) the product of such an analysis.⁴ Though the notion of *taḥlīl*⁵ is linked to Aristotle, it has its own specificity based on what Hodges calls *local formalization*. Local formalization requires:

- That each step of a reasoning process be paraphrased in order to fit some syllogistic type. Thus, the essence of analysis is a procedure for taking raw natural language arguments and relating them to valid argument.⁶ Moreover, each step of the local formalization is an isolated node and it might not be uniform in relation to the

¹ The main sources for Ibn Sīnā's logic are:

(a) The logic part of his encyclopedic book *Kitab al-Shifa'* (*The Book of Healing*). Ibn Sina's major work on philosophy. Written between 1014 and 1020. Critical editions of the Arabic text have been published in Cairo, 1952–83, originally under the supervision of I. Madkourā' (over 2000 pages). This part runs to over 2000 pages. It contains the book *Qiyās* (*Syllogism*, about 550 pages). (b) The logic part of a much shorter book *al-Mashriqiyyūn* (*the Easterners*). Al-Maktaba al-Salafiyya, Cairo 1910, and (c) *al-Isharat wa-'l-tanbihat* (*Remarks and Admonitions*), ed. S. Dunya, Cairo, 1960; parts translated by S.C. Inati, *Remarks and Admonitions, Part One: Logic*, Toronto, Ont.: Pontifical Institute for Mediaeval Studies, 1984, and Part 4: *Ibn Sina and Mysticism, Remarks and Admonitions*. London: Kegan Paul International, 1996.

² J. Łukasiewicz [1951]. *Aristotle's Syllogistic from the Standpoint of Modern Formal Logic*. Oxford: Clarendon Press.,

³ Corcoran [1972]. "Completeness of an ancient logic". *The journal of symbolic logic*, 37 (1972) 4, 696-702; T. Smiley, "What is a syllogism?", *Journal of Philosophical Logic* 2 (1973) 136–154

⁴ Hodges [2010], *Ibn Sīnā's view of the practice of logic*. In Wilfried Hodge's homepage.

⁵ Ibn Sīnā's's fullest treatment of *taḥlīl* is to be found in four sections of *Qiyās*, sections 9.6 to 9.9.

⁶ Hodges [2010], *Ibidem*.

formalization of a further step: e.g. change of domains from one step to the other might be introduced.

- That, each syllogistic sentence be parsed into a structure consisting of
 - two heads (roughly, subject and predicate) – he calls them ‘thing’ (šay’). The second head seems to be thought of as “dependent” upon the first;
 - some parts that are adjoined or added to each head – he calls them ‘addition’ (ziyāda), adjunct (lāḥiq) or condition (šarṭ). The adjunct that is added to the subject is a quantifier. These kind of adjuncts are sometime specified as "al-mahsurat al-kulliya" and "al-mahsurat al-juz'iyya", that is respectively "the universally quantified [or delimited] propositions" and "the particularly quantified [or delimited] propositions" (al-Shifa': al-‘Ibara, I, 10, p. 66, lines 6-7). The adjuncts that have the form of conditions establish modalities such as time-conditions (sometimes ...) or add some quality;
 - a negation that, when required, is added to a copula sometimes inserted in order to make the dependence explicit.

One of the main points of taḥlīl is to make explicit the structure heads+adjuncts. The “hidden” nature of the adjuncts might drive us to logical mistakes. From Ibn Sīnā’s viewpoint, once the analysis of each step is achieved one simply applies the syllogistic forms. This might explain Ibn Sīnā’s meticulous description of quantification of the predicate. Indeed, though according to the main studies of Ibn Sīnā’s quantification of the predicate it has a marginal role in his system (Sīnā himself calls such propositions *deviating* (*muḥarrafah*) propositions), if we link this study with the search of an explicitation process inherent to taḥlīl, then the interest in displaying quantification seems to follow naturally⁷.

The main aim of the talk is to suggest that Generalized Quantifiers provide a reconstruction of the syllogistic forms which follow quite closely Ibn Sīnā’s own analysis and which might do justice to some of his major tenets, including his understanding of the existential as coupled with a universal quantifier and the qualifications of the heads. Certainly some assumptions of this reconstruction, such as the notion of scope, stretch the technical tools of our author to the limits.

Furthermore, I will point out that all this suggests that Ibn Sīnā’s system of analysis contains the elements for implementing in his syllogistic his metaphysical theory of equality. Indeed, our author makes use of syllogism involving identity and equivalence relations in the Quiyās.⁸ However – so far as I know - there is no explicit theory of equality in his logical writings.

⁷ Quantification of the predicate can also be linked to Ibn Sīnā’s understanding of the existential quantifier

⁸ There seem to be several syllogisms in Ibn Sina's work in logic involving identity. They have not all been compiled yet but let us quote some examples:

(1) Ibn Sina dicusses transitivity of equality in Qiyās i.6 (translation by W. Hodges):

Thus when you say C is equal to B and B is equal to D, so C is equal to D.

(2) At Qiyās 472.15f we find

Zayd is this person sitting down, and
this person sitting down is white
So, Zayd is white.

(3) The syllogism discussed at Qiyās 488.10 is probably intended to be read with identities too:

So one way to see the approach developed in the present paper, is that we make use of the theory of equality displayed in the *Metaphysics* and apply it to Ibn Sīna's use of syllogisms with equality assuming the quantification of the predicate. In fact, it is like completing Ibn Sīna's own (local) formalization programme.

Pleasure is B.
B is the good.
Therefore pleasure is the good.

Moreover, in his *Autobiography* our author claims that he has reconstructed all the inference steps of the Euclides geometry.⁸ This certainly requires an extensive use of the logic of equality: *Sirat al-shaykh al-ra'is (The Life of Ibn Sina)*, ed. and trans. WE. Gohlman, Albany, NY: State University of New York Press, 1974. I made use of D. Gutas more recent translation in, *Avicenna and the Aristotelian Tradition: Introduction to Reading Avicenna's Philosophical Works*, Leiden: Brill, 1988. pp. 26–28.