

The place of analysis (*taḥlīl*) in the logic of Ibn Sīnā

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Ibn Sīnā's writings on logic

Šifā', about 2000 pages,
including 580 pages of the central volume *Qiyās*.

The surviving logic section of *Easterners*.

The Persian *Dāneš-Nāmeḥ*.

Also important but less characteristic works *Najāt* and *Išārāt wa-Tanbīhāt*.



Most modern specialist studies concentrate on Ibn Sīnā's 'syllogistic', i.e. the argument forms that Ibn Sīnā accepted and justified.

A totally legitimate subject,
and an application to Ibn Sīnā's logic of the methodology proposed by Łukasiewicz (1951) for studying Aristotle's logic.

But there are signs that this concentration distorts Ibn Sīnā's approach to logic, particularly modal logic. For example:



1. In the surviving 80-or-so pages of *Easterners* there is no syllogistic at all.

In *Dāneš-Nāmeḥ* there are only the basics about syllogisms, and no modal syllogisms.



2. In *Qiyās*, many indications that the justification of modal principles doesn't belong to logic.

For example in *Qiyās* section 1.5:

*It's plausible that it is not correct to say that
'Something which is contingent for each individual
could fail to be true of any one of them'. ...
It is not for the logician as a logician to know the
truth about this.*

3. Ibn Sīnā's advice to his students
(reported by one of them in *Mubāḥatāt*):

*In analysis, do not spend too much time taking into
account the forms of syllogisms
for that's one of the easy parts and a sound instinct
rarely makes a mistake about it;
you should rather practice examining in detail the
matters [of syllogisms].*

Analysis (*taḥlīl*)

I.e. validation of raw natural language arguments.

A debater needs from logic

*analysis of definitions and syllogisms down to the
principles and bases through practical application of
the book 'Analytics'. (Jadal)*

Qiyās Book 9 has four chapters devoted to analysis.

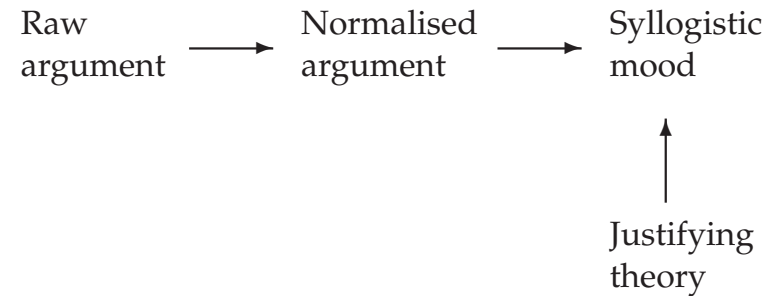
In the first of these chapters,
Ibn Sīnā gives the first ever proof search algorithm, and
possibly the first search algorithm in Arabic mathematics.

Wilfrid Hodges, 'Ibn Sīnā on analysis: 1. Proof search.
Or: Abstract state machines as a tool for history of logic',
Fields of Logic and Computation, ed. A. Blass et al.,
Lecture Notes in Computer Science 6300,
Springer, Berlin 2010, pp. 354–404.

From *Qiyās* Book 9:

Sometimes a person is addressed with a well-crafted and definitive syllogism, or he finds such a syllogism written in a book. ... [But] sometimes it is jumbled out of its natural order, or missing a piece, or with a piece added. ... If we don't have rules to guide us, ... so that we can analyse the syllogism into a group of premises, put them in the natural order, strip off defects and add any part that is missing, reducing the syllogism to the syllogistic figure that produces it — then the new information that the syllogism provides will escape us.

Ibn Sīnā's schema

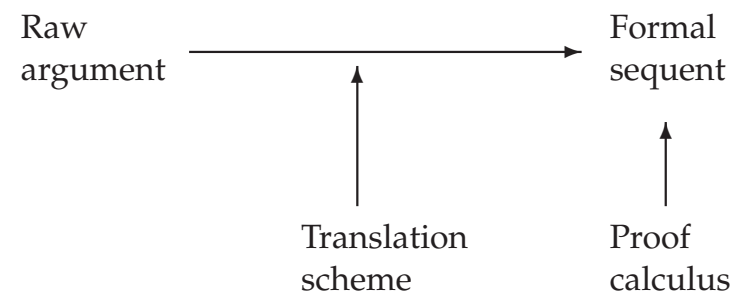


For Ibn Sīnā the main steps in analysis are:

- ▶ Break down the argument into separate steps.
- ▶ Add new steps if needed.
- ▶ In each step, find the terms so that the step becomes one of Aristotle's listed syllogistic moods.
- ▶ Rewrite the syllogism into a (topic-comment) form that makes clear what the terms are.
- ▶ If you want to, name the relevant syllogistic mood. (Ibn Sīnā expects his students to have these by heart.)

Ibn Sīnā's chapters in *Qiyās* 9 explain how to do all this.

Modern schema, for comparison



Note first the breaking down of the argument into steps.
There is a lot to be said about this, but not here.

Ibn Sīnā's Autobiography:

*I compiled a set of files for myself,
and for each argument that I examined,
I recorded the syllogistic premises it contained,
the way in which they were composed,
and the conclusions which they might yield,
and I would also take into account the conditions
of its premises.*

Note second the finding of terms.

In *Dāneš-Nāmeḥ* several sections are entitled 'Finding'
(*payda kardan*) verb, proposition, etc.

Achena and Massé translate 'Examen', but it makes more
sense to think of 'finding' these items in raw arguments.

The surviving pages of *Easterners* are almost entirely
semantic, about the construction of meaningful
expressions.

Example

The example is not Ibn Sīnā's.

It is from Fakhr-al-Dīn Rāzī's *Mantiq al-Mulakkaṣ*,
recently discussed by Khaled El-Rouayheb in
Relational Syllogisms and the History of Arabic Logic,
900–1900.

We will follow Ibn Sīnā's instructions from *Qiyās*.

It will illustrate the difference between Ibn Sīnā's
approach and Rāzī's.

- ▶ The body has a blackness. (*al-jism fīḥ sawād*)
- ▶ Every blackness is a colour. (*kull sawādin lawn*)
- ▶ Therefore: The body has a colour (*al-jism fīḥ lawn*)

- ▶ Every blackness is a colour.
- ▶ A blackness is in the body.
- ▶ Therefore: A colour is in the body.

This is a syllogism in mood Disamis:

Every A is a B , some A is a C , therefore some B is a C .

(4th mood of 3rd figure)



Rāzī's comment: This is a new kind of syllogism where a term ('has a blackness') is not repeated in full.

So for Rāzī no analysis is needed; and Rāzī's book says almost nothing about analysis.

My comment: If we don't analyse to a standard form, we should say what this new argument form is. Otherwise we have done nothing to validate the argument.

Rāzī didn't do this, but some of his successors did, creating many new forms of syllogism.



Some of the most characteristic features of Ibn Sīnā's logic come to light only in his analyses, not in his syllogistic.

Among other examples:

- (A) Use of parameters.
- (B) The causes of error.
- (C) Absence of any notion of scope.



(A) Use of parameters

Ibn Sīnā's Autobiography:

As for the Elements of Euclid, I read the first five or six propositions with [my tutor], and thereafter undertook on my own the analysis (ḥall) of the entire remainder of the book.

And from *Qiyās* book 9:

*You could object that we have sometimes seen **syllogistic discourse** in which a proof is devised which has a single goal but more than two premises in it. There are demonstrations of this kind in the Book of Elements in geometry, and elsewhere.*



Euclid's geometry is 'syllogistic discourse'.

But Euclid's argument forms are a million miles from Aristotle's, as noted by Galen and Alexander of Aphrodisias in the 2nd century AD.

So industrial-strength analysis is needed.

Probably the key tool is the use of parameters, allowing us to handle relations. This is a constant theme in Ibn Sīnā's analysis of terms.

(B) Causes of error

Aristotelian logicians regularly claimed to help to remove errors in reasoning.

The claim was fraudulent. It rested on classifying types of error without any check whether the classification was related to causes of error. (We know now that it wasn't.)

Ibn Sīnā is a startling exception, who studies how errors do in fact arise. He has many subtle examples of deceptiveness (*ihām*) in arguments, without attempting a general theory.

(C) No notion of scope

Ibn Sīnā has no notion of scope of negation or scopes of quantifiers.

Not an accident. For him, compounds of meanings are not linearly ordered, because different languages use different orders.

Modern analyses of his own examples would use scope. What he does instead is very interesting for a historian of logic. (But time is up.)

