

Concerning the Sciences  
Chapter 2: Concerning Logical Science.

by Dominicus Gundisalvus,  
based on al-Farabi's De ortu scientiarum.

together with  
parallel sections from  
Dominicus Gundisalvus's  
On the Division of the Sciences

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## Concerning the Sciences<sup>1</sup>

### Chapter 2: Concerning logical science

1. "Now the art of logic gives rules by which we grasp the truth of speech, either among ourselves or with others, or others with us or among themselves." Now we do not need the rules of logic to verify every speech. Of those which we use in argument, there are some that do not need proof, for instance, that "Every whole is greater than its part," and "Every three is an odd number," in which no one can be in error. And there are some that need proof, since we can be deceived in them.

But those for which proof arises, are two, namely speech (sermo) and reason (ratio), speech in utterance, reason in the mind. But interpretation arises in both. For that which is interpretation is exterior speech and reason with utterance. Hence that with which someone verifies his opinion by himself is speech (logos) fixed in the mind, but that with which he verifies it with another is external speech in utterance. But that speech (logos) by which an opinion is verified the ancients called syllogism, whether it was fixed in the mind or external and with utterance.

For although grammar and logic agree in this, that both give rules for linguistic expressions (dictionibus), they differ in this, that grammar gives no rules except those concerning the linguistic expressions of one people alone, but logic gives rules for linguistic expressions only when the linguistic expressions of all peoples agree in them. Still, many peoples agree also in the rules of the grammatical art, for instance, in this, that of linguistic expressions some are taken hold of, others produced, and some are simple, others composite, and of the simple some are names, some verbs, and some prepositions. Now the grammatical science in each language does not attend <to these rules> except in so far as they belong to the language. It does not care whether it agrees with another people, or not. But logic only gives rules concerning such expressions (dictionibus) inasmuch as all peoples agree in these expressions.

2. But the interpretation of logic is taken from its highest intention. For logic is said from "logos," according to three meanings (intentiones): "'Logos' in Greek is interpreted as 'ratio' in Latin." But one sort of "ratio" is external with utterance, by which what is in the soul is interpreted through language. And another sort is "ratio" fixed in the soul, which is called a conception of the mind, which linguistic expressions signify. "Hence there is on the one hand signifying <"ratio"> and on the other <"ratio"> that is signified." The third sort is a power created in man, by which one discriminates good and bad, and grasps the arts and sciences. And this is in every man, but in infants and some adults it is weak, not being strong enough to perfect its actions, just as the foot of an infant is too weak for walking, and a small fire for burning a great mass of wood, and so it is even in those who are drunk or possessed by demons.

Therefore, since this science gives rules concerning external speech (logos), and concerning internal speech, by which it certified in each of these the presence of the third "logos," which is in a man from the creator, and directs him to a comprehension of what is more correct, for this reason it is called logic, a name derived from "logos" in accord with these three ways <of interpreting that term>. Now although many sciences that give rules concerning external speech, for instance, the grammatical science, might be called by the name of logic, still this one, what directs us to what is necessary in every manner of speech (logos) is more worthy of this name.

3. Now those by which an opinion is verified are five, namely Demonstrative Science, Topics, Sophistic, Rhetoric, and Poetics.

Now it is proper to the demonstrative science to give the most certain knowledge concerning a proposed question, whether considered by oneself or with others, the contrary to which is impossible, and in which there can be no fallacy.

It is proper to topics to produce belief concerning doubtful things by probable arguments, whether true or like the truth.

It is proper to sophistic to imitate and dissimulate, and make one regard as true what is not true, and conversely. And sophistic is the name of a power through which a man knows how to deceive another and lead him into error, when that other would have remained good, left to himself. This name, sophistic, is composed in Greek from "sophos," that is, "wisdom," and "istos," that is, "deception." Therefore sophistic is called the deceiver wisdom, and a sophist is a wise deceiver. And everyone in whom this sort of power resides for deceiving and leading into error, if he uses his art well, can be rightly called a sophist. And his power is sophistic. And his operation, proceeding from this power, is called sophistic work.

Now it is proper to rhetoric to move with its persuasive speech the soul of the hearer and incline it to what the rhetorician wishes, so that the hearer's soul believes him who speaks, and it produces in the hearer a cognition near to certitude.

It is proper to poetics in its speech to make one imagine something beautiful or ugly that, as the hearer thinks, is not so, and to make him abhor or desire it. Even though we might be certain that it is not thus in truth, still our souls rise up to shrink from or desire what is imagined by us. For imagination sometimes operates more in a man than knowledge or thought (cogitatio). For often a man's cognition or knowledge is contrary to his imagination, and the man then operates in accord with what he imagines, not in accord with what he knows or thinks.

These, then, are the species of syllogisms and of the syllogistic art, and the species of expressions which men use to make something certain in these things. But these five can also be named by these names, "Certificative," "Putative," "Errative," "Sufficient," and "Imaginative." And each of these has its proper <characteristics>, and common <characteristics> which they share with the others.

4. And syllogistic discourse (sermones syllogistici) is indeed either fixed in the soul or put together outside the soul with the voice. But there are many concepts fixed, tied together, and ordered in the soul, helping it to verify a reality. And there are extrinsic <sylogisms> with the voice from many expressions tied together and ordered, and signifying those concepts; and they are made equivalent to them, and through being made equivalent, they help them to verify something with the hearing. But in external discourse, those that are less <? prior, that is, the premisses?> are composed from two expressions. And in those fixed in the soul, those that are less <? the premisses?> are composed from two simple concepts. But in composite syllogistic discourse <? syllogism involving both discourse within the soul and external discourse?>, those that are less <? the premisses?> are established from two simples. But those from several are indefinite.<sup>2</sup>

"But, since a certain cognition of the truth is not possessed except through demonstration, therefore it was necessary to compose the book that taught how and

from what demonstration arises. And on this account the book that is called the Posterior Analytics, or the Book of Demonstration, was composed. But, since demonstration does not arise except through syllogism, and syllogism is established from propositions, therefore a book was necessary in which it was taught from how many and what sort of propositions, and how in accord with mode and figure, syllogism is put together. And because of this the Prior Analytics was made. But, since the propositions composing syllogisms must be composed first themselves from their terms, a book was necessary that taught from which and from how many terms a proposition was established. And that is taught fully in the book that is called the Liber Perihermeneias. But since a proposition is never well composed from terms, unless the signification of each term is first cognized, there the Book of Categories was established, to teach how many genera there are of terms and what the signification of each of them is."

5. "Therefore there are eight parts of logic: Categories, Perihermeneias, Prior Analytics, Posterior Analytics, Topics, Sophistic, Rhetoric, and Poetics. The names of these books are proposed for the names of the sciences that are contained in them, and each of these parts has its own <subject> which it treats and aims at (de quo agit et quod intendit), and a way in which it treats it, and a utility to which it attains."

But since the fourth part is of greater power in proof, therefore it exceeds them all in sublimity and worth; for in the whole of logic nothing is the principal aim except the fourth part, and the rest of the parts were only invented on account of the fourth.

Hence the three parts <of logic> that come before it in the order of teaching are nothing but preparations for it and introduction to it. And the rest that follow it have been discovered for two reasons. One is, that, since each is as it were an instrument for the fourth part, some are a completion, support and assistance to that other, namely, so that in the probable and the persuadable they move some to become accustomed little by little, who, ignorant of the necessity of demonstration, are bent <to the truth>, although for some they are of greater assistance, and for some of less.

But the second reason is on account of caution. For if the parts are not distinguished among themselves by their own names and rules and goals, it is possible once one has learned it, even though the man wishes by proofs to grasp the truth and certitude of some reality, that the more ignorant will use Topics or Rhetoric or Sophistic or some such, which will rather produce error, or will at least produce no certitude, but instead belief or imagination. And thus deceived, he will believe himself to perceive certitude. And so, though seeking the truth, he would fall into error and doubt.

Hence the four <parts of logic> after this were invented, so that the properties of of their rules and goals might be distinguished, and, since some might wish to make a topical or sophistical <sylllogism>, or some some other sort <of syllogism>, so that they might know by what rules this is done well, and so that they might tell one art from another, and know from which one arises certitude, and from which belief or opinion.

### Gundisalvus's De Divisione Philosophiae<sup>3</sup>

Concerning the art of logic, too, the same things are to be sought out: what it is, what its genus is, what is its matter, what are its parts, what is its species, what is its function,

what is its end, what instrument, who is the artisan, why is it so-called, what is its utility, in what order is it to be learned and taught. Now let us pursue each of these in order:

What it is is defined thus: logic is reason at work in discourse, that is, the whole science of disputation. Now that it is at work is relevant to the difference between invention and judgment. Invention is a science of discourse, and similarly judgment, but by themselves neither does any work; but logic, since it makes use of both, is justly called the science at work in disputation, that is, the whole of that science, because neither invention nor judgment seem to be lacking in it.

Now the genus of logic is, that it is both a part and an instrument of philosophy. Which is shown thus: reality is said in two ways, sensibly, namely as it falls under the senses, and intelligibly, as it is conceived by the mind. Now to realities as they are understood there belongs (accidit) universality, being a genus (generalitas), being a species, being an accident, and the like, and because of this realities as they are understood are genera, species and accidents and so on. But in sensibles there are none of these. Now when we wish to prove or disprove something of sensibles or intelligibles, it is necessary that logic come back to those things that belong to concepts (ad hec que intellectibus accidunt), namely genera and species and the rest, so that we can prove through them what we intend. Since, then, every proof and disproof in every philosophical art arises through what belongs to logic alone (per hec que solius logice sunt), therefore according to those who hold that philosophy treats of nothing except those two genera of realities, namely sensibles and intelligibles, logic will be an instrument. But according to those who hold that philosophy treats also in a third way of what belongs to concepts, logic will be a part as well as an instrument in the other arts. But since it seems to be about things that are outside our work, therefore it will pertain to part of practical philosophy, civil reason.

The matter, then, of this art, is what belongs to concepts (accidens intellectibus), or intentions in the understanding in the second place (intenciones intellecte secundo), which belong to intentions of the understanding in the first place (que apponuntur intencionibus primo intellectis) considered as one moves (pervenitur) through them in a proof from the known to the unknown. In the first place I sense a man under accidents, then I understand (intelligo) man without accidents, as it is defined. And since the concept <or act of understanding, intellectus> of man agrees with many differing in number, being a species belongs to it and it becomes a species. Universality, therefore, which belongs to understood realities, is the matter of this art. For the logician treats of it by dividing it into its species, saying that some universals are essential, and some accidental.

Now of the essential, some are genus, some species, and some difference. Of the accidental some are proper, some common. The posit (thesis) is not the matter of this art, as some think. For Aristotle says in the Analytics that no science proves its own matter. But logic proves every posit. Therefore the posit is not its matter. That no art proves its own matter is proved in this way: every art has its principles that it does not prove, but by which it proves the other things in the art. If it proved its principles, then those by which it proved them would be better known, and so the principles of the art would not any longer be principles. Hence in every art certain principles are assumed, which are granted, and afterwards, in another art, are proved, and so no art proves its own principles. But its matter is one of its principles, so that no art proves its own matter. Therefore posit is not the matter of logic.<sup>4</sup>

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But the species of this art are the three kinds of questions: namely, moral, natural and rational. And these are called species of it since all of logic is exercised in each.

The functions of this art, as it is theoretical, are discovery and judgment. Discovery is the true thinking out of arguments (rationum) by which one disputes. Judgment is the discernment of arguments. As it is practical, the functions of logic are division, definition and reasoning. Division is of something or some things through a distribution. Definition is the whole demonstration of the being of a reality. Argument (rationatio) is a proof or disproof of something doubtful. Now the former functions belong to speculative <science>, since they seem to look only to the speculation of the soul. The latter functions belong to active science, since they are turned toward acting and speaking. But the latter and the former include and are included by one another. For division and definition and reasoning are discovered, and judgment arises concerning division, argument is defined, and, on the other hand, discovery is divided as well as judgment. And each is defined, and we argue concerning each. Now division and definition have many species, about which something will be said elsewhere. Argument has three species, namely, dialectical, which is for bringing together knowledge through what is probable; demonstrative, which is for bringing together knowledge known per se; and sophistical, which is for bringing together knowledge through those that seem to be, but are not.

Now each of these has its principles, for the principles of division are dividing differences, whether substantial or accidental, by which realities differ among themselves. The principles of definition are genus and difference. There are different principles of reasoning, according to the different species. The principles of dialectical reasoning are the response and concession of the adversary. For from the concession of the adversary, as it were from a certain principle, the dialectician proceeds. Hence dialectic is so-called from "lexis," that is, the speech of two persons. But the principles of demonstrative argument are known per se. The sophist, since he sometimes pretends to be a practitioner of the Topics, and sometimes a demonstrator, takes his principles sometimes from those that seem to be probable but are not, and sometimes from those that seem to be necessary, but are not.

Concerning the end, in whatever way to execute what has been proposed.

The principal instruments of this art are two, namely syllogism and induction. There are two secondary instruments that descend from these by subtraction of one part or several, which are enthymeme and example. Definitions of these four will be assigned elsewhere.

The artificer of this art is the disputant, who either through topics, or demonstratively, or sophistically, exercises his art concerning either general questions, or moral, natural, or rational questions. The logician is he who teaches the logical art, but the disputant is he who exercises it. Sometimes it happens that the logician and the disputant are the same, and sometimes that they are not.<sup>5</sup>

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This art is of the greatest utility, for since the perfection of man, considered as man, is to cognize the true and the good both for the sake of producing and acquiring it; but human reason alone and by itself is not strong enough to arrive <at this aim> without inquiry and acquisition.<sup>6</sup> Now acquisition of the unknown does not occur except through

what is <already> cognized, and logic teaches how to arrive at the unknown through the known. Logic, then, is of the greatest utility, for it alone is our way and the instrument for laying hold of what is true and good in every affair. Now realities are cognized in two ways, namely by imagination and belief, by imagination as from the signification of its name, as when "man" or "animal" is said, and by belief as when it is said "man is an animal." Imagination necessarily precedes belief. For unless you cognize beforehand the signification of the this name "man," or "animal," you will not believe what was said, that "man is an animal."<sup>7</sup>

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Now imagination is sometimes received without proof, for instance, being, reality, and the like, and sometimes with proof, as in soul, angel, and God.<sup>8</sup> In the same way belief is sometimes received immediately, without proof, for instance, "every whole is greater than its part," and the like, and sometimes not without proof, for instance, in "the world had a beginning." Now whatever cannot be imagined without proof, cannot be grasped without definition.<sup>9</sup> And what cannot be believed without proof, cannot be grasped without argument. That, then, that leads us to cognize imaginative knowledge, is called definition, and what leads us to the knowledge of belief, is called argumentation. Now definition and argumentation are sometimes correct, and by them the truth is acquired, and sometimes they are not correct. And since the science of logic gives a rule, whereby one can tell true definition and true argument from what is not true, therefore logic is of great power.<sup>10</sup>

Now logic is in the middle between the sciences of eloquence and wisdom. Although grammar is placed first due to the necessity of speaking, after grammar follows, for the sake of delight, poetics, and this having been accomplished, just as after poetics rhetoric is studied for the sake of persuading, so after rhetoric there follows logic from the necessity of cognizing.<sup>11</sup> For since speech (*locutio*) is given to man for this end, that through it he should indicate his thought to others, and thus unite the soul of others to himself, for this reason he must first learn to speak correctly, lest he be held back in speaking, then to delight in speaking, or to accomplish that he be heard more attentively, and afterwards to persuade by his expression and move the hearer, then to produce trust so that he might be believed, and at last to convince by arguments and come to know most certainly. By these steps, then, he will arrive at the end chosen, since after correct speech there follows delight, after delight persuasion, after persuasion belief, after belief the cognition of the truth. But since grammar teaches correct speech, poetics delight, rhetoric persuasion, poetics the production of belief, demonstration the production of certainty, therefore this is the natural order of the sciences of eloquence. But since after logic comes natural science, after natural science mathematics, and after mathematics it is necessary, as has been said, that the divine science should follow, it is established that logic lies between the sciences of eloquence and wisdom, indeed, it is the fourth from the first science of eloquence, and from the last of wisdom. Nor is this unmerited, for since logic is the instrument of philosophy, by which the truth is proved in all the arts, it must rightly be the middle, so that, when it is necessary to prove or disprove something in some faculty, it will, as it were, be at hand.<sup>12</sup>

After rhetoric, then, logic is to be read, but in this order: For since the duty of logic is to divide, define, and prove, but proof does not arise without syllogism, and syllogism is established from propositions, propositions from terms, and terms from expressions signifying some simple concept, it is necessary to cognize the simples before what is composed from them, therefore in the order of logic the science of terms is naturally first, which is taught in the book of Categories. Therefore it is proposed that this book be

read first, in which the doctrine of simple words, which are the simple terms of a statement, is treated fully. But since Porphyry's introductory book is necessary for the understanding of the categories, therefore it is to be read before the Categories. But since it remains to know, after the cognition of terms, how the composition of propositions arises from these, therefore immediately after the categories the book of the Perihermeneias is to be read, in which it is taught how a simple statement is constituted from terms. But since after we learn how propositions are composed from terms, it is necessary that we compose syllogism from them according to mode and figure, therefore after the Perihermeneias we ought to read the Prior Analytics, in which we are taught how syllogism is composed from propositions. But since syllogism has three species, namely dialectical, demonstrative and sophistical syllogism, therefore because of dialectical syllogism the Topics, because of the demonstrative, the Posterior Analytics, and because of the sophistical, the Elenchi are seen to be read. In this order logic is to be learned and taught, or so teaches its author, Aristotle.<sup>13</sup>



## NOTES

<sup>1</sup>Gundisalvus's chief work, the De divisione philosophiae (ed. Bauer) depends closely on Al Farabi's De ortu scientiarum, which Gundissalinus translates (in a rather free abbreviation with many of his own additions) in his De scientiis (ed. Alonso). Later, al-Farabi's work was translated in a much fuller and more accurate version by Gerard of Cremona (edited by Angel Gonzales Palencia, along with al-Farabi's Arabic, in Alfarabi. Catalogo de las Ciencias. Edicion y Traducccion Castellana... (Madrid: 1932; 2d ed. 1954).)

<sup>2</sup>As the editor notes, the text seems to be corrupt in the latter part of this paragraph. I don't even have a guess as to the meaning of the last sentence.

<sup>3</sup>On the Division of the Sciences usually treated as Dominicus Gundisalvus's own work, repeats, sometimes almost word for word, the material translated above from his On the Sciences. I add here translations of those paragraphs that go beyond On the Sciences, and omit those portions that repeat what is there.

<sup>4</sup>Cf. Aristotle, Posterior Analytics I 1, 71a1-11. Up to here we have the beginning of the treatise, Baur, pp. 69-71. The next section, on the parts and their properties, repeats the material given above in the translation of al-Farabi, sections 5 and 3 (in that order), and I do not repeat it here.

<sup>5</sup>Baur, pp. 75-77. The discussion following, why the science of logic is called "logic," is drawn from al-Farabi, sections 2, 1 and 4 (in that order) translated above, and I do not repeat it here.

<sup>6</sup>Cf. Aristotle, Posterior Analytics I.1, 71a1-2. Human beings, unlike angels and other eternal beings, must acquire knowledge in time, so that there is a beginning to their knowledge, and this through inquiry.

<sup>7</sup>Baur, p. 80. Cf. Avicenna, Logicae, the first part of the Sufficiantiae, translated by Gundisalvus and Ibn David (Avendeath), Venice 1508, 2ra. This translation included only the part of Avicenna's logic on the Isagoge, and no other part of Avicenna's logic was available in the Middle Ages.

<sup>8</sup>Perhaps the point is that the first set of examples are all understood by everyone, without the necessity of any experience or argumentation to establish the concept or the existence of things falling under it. The second set of notions are all of things that one might suppose did not exist at all.

<sup>9</sup>A most interesting remark. Presumably what is grasped immediately in the intellect, first notions such as being, needs no definition. What about concepts that are grasped directly through the senses (of which no examples are given here!)? Perhaps they, too, could be grasped without definition.

<sup>10</sup>Baur, pp.80-81; cf. al-Ghazali, Logic, Proemium (ed. C.H. Lohr, Traditio 21 (1965) 223-290).

<sup>11</sup>Emending cogendi to cognoscendi.

<sup>12</sup>Baur, pp. 81-82; these remarks seem to be Gundisalvus's own, not derived from some other source.

<sup>13</sup>Baur, pp. 82-83.