

GALEN'S
Institutio Logica

*English Translation,
Introduction, and Commentary*

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the aeriform sense of hearing, so also the nature of all things (*hē tōn holōn phusis*) ought to be apprehended by its kindred reason (*tou logou*)."

If this quotation is authentic it goes far in explaining the phrase "by force of an axiom." The ground of logical validity is found in nature, the nature of the soul and its kinship with the nature of the universe. Of course, since the sentence is quoted from an exposition of Plato's *Timaeus*, it may represent Posidonius's interpretation of Platonic doctrine and not his own. Still it is not out of keeping with what we know of Posidonius's opinions and interests.

There is a little more to the quotation. Since it is embedded in a passage about Pythagoreans it may be that Sextus felt that Posidonius's views on number were similar to the Pythagoreans' views. If so, the largely numerical cast of Galen's chapters on relational syllogisms might stem directly from Posidonius.

This alternative conclusion would leave Galen in his role as organizer of a scientific curriculum for his age and posterity. It would attach him closely to the Posidonian tradition and help light some corners of that tradition.

Translation of Galen, Institutio Logica

Chapter I*

- 1* As human beings, we all know one kind of evident things through sense perception and another through sole intellectual intuition; and these we know without demonstration; but things known neither by sense perception nor by intellectual intuition, we know through demonstration.
- 2 The finding of things known through demonstration has to come from things already known, but not just simply so, from any chance prior knowledge, but from knowledge of things that are proper to what is sought to be demonstrated; since indeed, in any subject under discussion, we can, on the basis of some appropriate argument, persuade a man who can be compelled to agree to this argument; for example, if we happen to agree that Theon is equal to Dion and that Philon is equal to the same Dion; obviously, it will follow from these premisses that Theon is equal to Philon, through the proposition that things equal to the same thing are also equal to one another.
- 3 This demonstration, you see, consists of three parts; first, the first thing said, which was: "Theon is equal to Dion"; second, the following statement: "Philon is equal to Dion"; and third, in addition to these: "Things equal to the same thing are also equal to one another"; and it will be concluded from them that Theon is equal to Philon.
- 4 This latter is what is called a "conclusion"; but those sentences from which, on their being assumed, this is concluded are each called an "assumption"; and the entire form of speech through which, when

* Chapter and section numbers follow Kalbfleisch's edition.

certain things are agreed to, a conclusion is inferred, is itself called both a "conclusion" and a "syllogism"; but notice that one may properly disregard those who call the conclusion in the strict sense a syllogism.

- 5 If, moreover, having some prior knowledge, either through perception or demonstration, we propose some statement about the nature of things, let this statement be called a "premiss"; for this was the usual term among the ancients; but if it is a proposition carrying conviction of itself to the intellect, they gave it the name "axiom"; e.g., "Things equal to the same thing are also equal to one another." You must not quarrel with those who name all declarative sentences of every kind "axioms," but, having learned their custom, accept them as speaking in the way they wish.

Chapter II

- I Some premisses make statements about simple existence, as when you say, "There is Providence," "There is no centaur"; or they make statements about substance, as in the following examples: "The air is a body," "The air is not a body"; and about magnitude: "The sun is a foot wide"; "The sun is not a foot wide"; some concerning quality: "The sun is hot by nature"; "The sun is not hot by nature"; and some about relation: "The sun is larger than the moon"; "The sun is not larger than the moon"; and some about time: "Hippocrates lived at the time of the Peloponnesian War"; "Hippocrates did not live at the time of the Peloponnesian War"; and some about place: "The sun is second from the earth"; "The sun is not second from the earth"; and some about position: "The statue of Zeus at Olympia is seated"; "The statue of Zeus at Olympia is not seated"; and some about state: "The statue of Zeus is shod"; "The statue of Zeus is not shod"; and some about action: "Rose-water heats"; "Rose-water does not heat"; and some about passion: "We are naturally heated by rose-water"; "We are not naturally heated by rose-water."
- 2 Now, for clear and concise exposition, we call all premisses of this kind categorical, and following the custom of old, we call the parts they are composed of terms; for example, in "Dion is walking," "Dion" and "walking"; we take "Dion" as the subject term and "walking" as the predicate.
- 3 Whenever, then, the premiss is composed of a noun and a verb, the terms must be analyzed in this way; but when it is composed of nouns and a verb, as in "Dion is a man," we shall say that "Dion" is subject, "man" is predicate and that there is additionally predicated externally an auxiliary indicating the communion of the terms.

- 4 Now, whenever we predicate something of Dion, it is not possible to say either "all" or "some"; but whenever we make a predication of something else that can be divided, as of "man" or "tree," it is necessary to distinguish in the statement whether the predicate is asserted of all or some, and likewise if it is denied of all or some.
- 5 And so, let the premisses that are said with an "all" be called universally affirmative, as when we say, "Every man is an animal"; "Every sycamore is a tree"; and let the denials predicated of a whole class be termed negative or privative universally, as when we say, "No man is a *painting*"; and let all that neither affirm nor deny of the whole class be called particular; for example, among particulars the affirmatives are of this sort: "Some man is an animal"; negatives of this sort: "Some man is not an animal"; an equivalent to the last premiss is the following: "Not every man is an animal"; this, too, we call a particular negative.
- 6 Whenever we predicate something of a substance that is defined not only according to species but also according to number, then it is no longer possible to say either "all" or "some" or "not all" or "none"; thus in "Dion is a man" none of the words mentioned can be added.

Chapter III

- I Another kind of premisses is of those by means of which we make assertion not about the being of things, but in the form, "if one thing is, another is," or, "if one thing is not, another is"; let such propositions be called "hypothetical"; one class of these, "the hypothetical by connection," whenever one says, "if some other thing is, necessarily this thing is"; the other class, the "separative," whenever, if one thing is not, another is, or, if one thing is, another is not.
- 2 For all Greeks, of the present or the past, saying "be" or "exist" implies no difference of meaning; and neither does "subsist"; for in modern usage this latter word, too, is used for the same conception; when we have memories of perceptible things, whenever we call them up in connection with motions, as of Athenians, let this action be called "thought," but when they are at rest, "conception"; there are also other such conceptions, not derived from memory of perceptions, but existing naturally in all men, and the ancient philosophers call them, when they are expressed in language, "axiom"; often, however, the Greeks call conception, "thought."
- 3 To return to the subject, whenever something is accepted as existing because something else exists, or (as we said "by connection"), the statement is called hypothetical by the ancient philosophers; and, by

the same token [the statement is called hypothetical], whenever we understand that because one thing does not exist another does, e.g., "because it is not night, it is day"; but, to repeat, they call the latter statement "separative," although it is also called a "disjunctive axiom" by some of the newer philosophers; just as the former species of hypothetical premisses, which we said were named "by connection," is called "conditional"; the more fitting form of expression for the propositions, those, namely, which we said were called separative premisses, is that with the conjunction "or" (*ētoi*)—it makes no difference whether we say "or" in one syllable or two (i.e., *ē* or *ētoi*)—while for the conditionals, the more fitting form is that with "if" or "if haply" (*ei* or *eiper*), if haply these conjunctions have the same meaning.

- 4 So it is possible to name the following statement: "If it is day, the sun is above the earth," a conditional proposition, in the fashion of the newer philosophers, but in the fashion of the ancients, a hypothetical premiss by connection; but those of the following sort: "Either it is day or it is night," a disjunctive proposition with the newer, but a hypothetical by separation with the ancients.
- 5 The separative proposition is equivalent to this sort of statement: "If it is not day, it is night," which all those who attend to the words alone call a conditional, because it is expressed in the conditional form of speech, but those who attend to the nature of the facts call it disjunctive; likewise, in this form of speech: "If it is not night, it is day," is a disjunctive proposition by the very nature of the case, but it has in expression the form of a conditional.

Chapter IV

- 1 Now this state of affairs is a sign of complete conflict; but the other, as in, "If Dion is at Athens, he is not on the Isthmus," shows incomplete conflict.
- 2 For conflict has in common that the facts in conflict cannot exist together; it is differentiated, however, in that some conflicting facts, in addition to not existing together, cannot both be non-existent at the same time; while others can be in this state; whenever, therefore, they have only the property of not existing together, there is incomplete conflict, but whenever they have also the property of not being non-existent at the same time, there is complete conflict; for of facts of this kind it is necessary that one or the other do not exist.
- 3 Therefore, for the latter kind there is a double scheme of argument: (1) if the additional premiss that it is day be assumed, concluding that

it is not night; or again, (2) premissing that it is not day, concluding that it is night; but for incomplete conflict there is only one possibility, to premiss one of the things in conflict and thus to destroy the other (whatever premiss is so assumed, is with good reason called an "assumption").

- 4 Now in the case of incomplete conflict, it is customary for the Greeks to speak in the following way: "Dion is not both at Athens and on the Isthmus," and all sets of facts that share in incomplete conflict will be signified by an expression of this form; but if facts which have neither consequence nor conflict with each other should be stated in paired clauses, we shall call such a sentence "conjunctive," as in the example, "Dion is walking and Theon is talking"; for these facts, having neither consequence nor conflict, are understood as in conjunction.
- 5 Wherefore also, whenever we deny them [i.e., conjunctions], we shall say that that statement is either a "negative conjunction" or "conjunctive"; for it makes no difference to our present purpose to say "negative conjunctive" or "negative conjunction," since your object in every form of expression is to show clearly to your audience whatever you have in mind.
- 6 But here too the school of Chrysippus, paying attention to verbal expression rather than to the facts, calls all sentences composed by means of the conjunctive particles, even if derived from things in conflict or consequence, "conjunctives"; using names carelessly in matters in which accuracy of expression is important, but in matters in which the words have no difference of meaning, legislating for themselves private meanings; they would not use names in this way if they wished to speak Greek and to be clear to their hearers.
- 7 As a matter of fact, it will make no difference if you use the term "consequent" as it has just been used, or the term "following" or "conjoint"; for all such terms are said by a transfer [metaphor] of names from what in daily life is called "tied together" or "conjoined"; this (sc. consequence) occurs in many ways, which it is the function of the theory of proof to investigate, just as conflict, too, occurs in many ways.

Chapter V

- 1 But now let us assign their names to these propositions: so then, for clear and concise exposition, nothing prevents our calling propositions with complete conflict "disjunctives," and those of incomplete conflict "quasi-disjunctives"; let there be no quibble over whether to say "quasi" or "like-disjunctives"; but in some propositions it is possible

for more than one or for all the members to be true, and necessary for one to be true; some call propositions of this sort "paradisjunctives," since the disjunctives have one member only true, whether they be composed of two simple propositions or of more than two.

- 2 For "Dion is walking" is one simple proposition, and so also, "Dion is sitting"; and "Dion is lying down" is one proposition, and so, too, "He is running," and "He is standing still," but out of all of them is made a disjunctive proposition, as follows: "Dion either is walking or is sitting or is lying down or is running or is standing still"; whenever a proposition is composed in this way any one member is in incomplete conflict with each of the other members, but taken all together they are in complete conflict with one another, since it is necessary that one of them must be true and the others not.
- 3 In the case of complete conflict two syllogisms can be constructed if we take as an additional premiss that one of the members is true, or on the contrary is not true, and infer that the second is not true when the first one is, or is true when the first is not; but for incomplete conflict there is but one additional premiss, that one of the members is true, and but one conclusion, that the remaining member is not true.
- 4 It is this way when the conflict consists of two members; when there are more than two conflicting members, in the case of complete conflict, we can, either asserting one member to be true, deny all the rest, or denying all the rest, assert the one member to be true; it is not possible, however, by denying the one, to allow the rest to be true, or, asserting the rest, to deny that the one is true; on the other hand, in the case of incomplete conflict, by asserting some one member, we can deny the remaining number, but we will have no other additional premiss suitable for producing a syllogism.
- 5 In the case of the proposition hypothetical by connection, which Chrysippus and his school call a conditional axiom, if we take the antecedent as an additional premiss, we shall get the consequent as a conclusion, and, if we take the contradictory of the consequent as an additional premiss, we shall get the contradictory of the antecedent as a conclusion; but note that neither by taking the consequent as an additional premiss nor the contradictory of the antecedent can we get a conclusion.

Chapter VI

- 1 We call one argument or one proposition a contradictory of another when there is complete conflict between them, and it is absolutely necessary that one of them be true and the other not.

- 2 For hypothetical propositions the one [of the pair of contradictories] has the negative particle attached to it; for categoricals, (1) where the word "all" is attached, we shall prefix the negative to this; (2) in "Socrates is walking" we shall prefix the negative to the predicate, so as to make the sentence read: "Socrates is not walking"; we shall not need to prefix a negative to the universal negative proposition, since we have the particular affirmative contradictory to it, and likewise the universal negative is contradictory to this kind of affirmative proposition.
- 3 All such propositions are called coterminous because they share terms with one another; they invert with one another by interchanging the verbal expression of their terms, whenever the subject becomes predicate and the predicate subject; but they convert when, together with such an interchange, they are true together, the universal negative with itself, and likewise the particular affirmative with the particular, while the remaining particular negative converts with no proposition.
- 4 In the hypothetical propositions, inversion occurs when the verbal expression of the terms [i.e., members] is interchanged, conversion with the members then being contradicted; for, "If it is day, it is light" is inverted to "If it is light, it is day," and is converted to "If it is not light, it is also not day."
- 5 Such then is conversion of propositions; syllogisms with two premisses are convertible with one another when one premiss is common and the second premiss of one of them is the contradictory of the conclusion of the other; of syllogisms having more than two premisses we shall say not simply "one premiss" but shall add to it "or more," making the whole statement read as follows: "an argument is the converse of an argument when, having one or more premisses common, the remaining premiss of the one is the contradictory of the conclusion of the other."
- 6 And the case is similar with the "modes" (logicians call the schemata of arguments by the name "mode"): for example, in the argument composed from a conditional and the antecedent, concluding the consequent, which Chrysippus calls the first indemonstrable, the following is the mode: "If the 1st, the 2nd; but the 1st; therefore the 2nd"; for that composed of a conditional and the contradictory of the consequent, inferring the contradictory of the antecedent, which Chrysippus also names the second indemonstrable, it is as follows: "If the 1st, the 2nd; but not the 2nd; therefore not the 1st"; just as for his third, which from a negative conjunctive and one of its members, gives the contradictory of the other member, the mode is as follows: "Not both the 1st and the 2nd; but the 1st; therefore, not the 2nd"; likewise also for the fourth in his listing, which from a disjunctive and one of its members, infers the contradictory of the remaining member,

the mode is as follows: "Either the 1st or the 2nd; but the 1st; therefore, not the 2nd"; and then for the fifth, which, from a disjunctive and the contradictory of one of its members, infers the other member, the mode is as follows: "Either the 1st or the 2nd; but not the 1st; therefore, the 2nd"; and so then, just as premisses in converse relation are true together, so it is a property of true arguments and modes to be syllogistic, so that the converse to a syllogistic mode is itself syllogistic also.

- 7 Now the way in which syllogisms are generated by hypothetical propositions has been shown except for one mode, the paradisjunctive, for which there is a double distinction of minor premisses; for, either, assuming all but one of the members not to be true, we can affirm that one, or, if one should assume the one member not to be true, the majority would remain, and give a disjunctive conclusion.

Chapter VII

- 1 In syllogisms of this sort the major premisses determine the minor; for, neither in the disjunctive do more than two additional premisses occur nor in the conditional, while in the case of incomplete conflict it is possible to make one additional assumption only; wherefore Chrysippus and his followers call propositions of this sort not only determinative but also "tropic," the whole syllogism being pegged upon them as the timbers on the keel of a ship.
- 2 Moreover, some of the Peripatetics, as well as Boethos, call syllogisms from determinative premisses not only indemonstrable, but also primary; and they no longer allow all the indemonstrable syllogisms from categorical premisses to be called primary; and yet, in another sense, such syllogisms are prior to the hypotheticals, if at least it is granted that the propositions of which they are composed are certainly prior; for no one will doubt that the simple is prior to the composite.
- 3 But about such disputes it is not important whether you try to solve them or to ignore them; for it is necessary to know both branches of the syllogisms, and this is the useful thing, but to call one kind prior to the other and to teach so, is as each man pleases; but it is not fitting to ignore them.
- 4 Now, as we have seen, all the hypothetical syllogisms have their minor premisses necessarily fixed, but the categoricals have not; for he who says, "Every noble thing is choiceworthy," finds, to be sure, that to produce a syllogism, he must carry either "noble" or "choiceworthy" into the second premiss, but not carry along the identical premiss, and he is not required either to affirm or deny [but may do

either], or to carry over one member only, as in the hypothetical, but he may combine the repeated term with whatever else he wishes.

- 5 For, on the one hand, he can make a syllogism by adding this kind of premiss to the former, "Every choiceworthy thing is good"; for the syllogism will be: "Every noble thing is choiceworthy; every choiceworthy thing is good; therefore, every noble thing is good"; on the other hand it is possible for him to predicate universally anything else and construct a syllogism of these terms; so indeed, by making another term subject to one of those terms, e.g., "noble," it is possible to make a syllogism; for example, thus, "Justice is noble; the noble is choiceworthy; therefore, justice is choiceworthy."
- 6 Now, by adding the second premiss in this way to the first you will construe the term common to both premisses as subject in the one and predicate in the other; it is also possible so to combine the premisses that the common term is predicated of both the other terms, as it is in syllogisms of the following sort: "Every noble thing is choiceworthy; not every pleasure is choiceworthy; therefore not every pleasure is a noble thing"; or also thus, so as to predicate both terms of the common term, as in the following: "Every noble thing is choiceworthy; every noble thing is praiseworthy; therefore, some praiseworthy thing is choiceworthy."
- 7 Now the old philosophers called that the "first figure" of the categorical syllogism in which the common term was subject to one of the extremes and predicate of the other; "second" in which it is predicate of both extremes, and "third" in which it is subject.
- 8 "Choiceworthy" is predicated of "noble" in this sort of premiss: "The noble is choiceworthy"; and noble is its subject, a term of which it is natural for choiceworthy to be predicated; among them [i.e., the "old philosophers"] to affirm does not signify the same thing as to predicate; for he, also, who denies, predicates.
- 9 Let it accordingly be said, in regard to "The noble is not a thing to be avoided," that "noble" is subject, and "thing to be avoided" is predicated negatively of it, while in "The noble is to be avoided," "to be avoided" is predicated of it affirmatively; and, since custom has prevailed, they call both the aforesaid premisses categorical, and on their account the syllogisms categorical also; both, however, are not affirmative, but are as they have been oppositely defined.

Chapter VIII

- 1 Now, there being three figures in the categorical premisses, in each of them occur more than one syllogism, just as among the hypotheticals, some indemonstrable and primary and some requiring demonstration.

- 2 Among the hypothetical propositions, however, all the others previously mentioned are indemonstrable and primary except that one that assumes the contradictory of the consequent and affirms the contradictory of the antecedent.
- 3 In the case of the categoricals, there are four indemonstrables in the first figure; the first, inferring from two universal affirmative propositions a universal affirmative conclusion—it is obvious that the conclusion is a proposition so-called from its position in relation to the premisses—the second, the one inferring from a proposition universally negative toward the major term and one universally affirmative towards the minor, a universally negative conclusion; the third, one having a particular affirmative conclusion from a universally affirmative major and a particular affirmative minor; and last, one inferring from a universally negative and a particular affirmative, a particular negative conclusion; of the others, no one hereafter is indemonstrable or self-evident.
- 4 The syllogisms in the other figures are demonstrated from the aforesaid; in the second figure there are four syllogisms, and in the third, six.

Chapter IX

- 1 But the first syllogism in the second figure, having the premiss of the major term universally negative and the other universally affirmative, is reduced, by conversion of the major premiss, to the second syllogism in the first figure, drawing a universally negative conclusion.
- 2 Next in order to this is the one somehow equivalent to it, having a universally affirmative premiss of the major term and the second premiss universally negative, by conversion of two propositions, the universally negative premiss and the conclusion, which is itself universally negative, has its reduction to the forementioned second syllogism in the first figure, with a universally negative conclusion.
- 3 The third among them, from a universally negative and a particular affirmative concludes a particular negative, being reduced by some people, through conversion of the universal premiss, to the fourth syllogism in the first figure.
- 4 The remaining syllogism of those in the second figure, the fourth, from a universal affirmative and a particular negative concludes a particular negative, receiving its proof both by reduction to the impossible and by the method named by Aristotle "exposition."
- 5 Now reduction to an impossible—it is also called a showing of an impossible—is as follows: let the first be predicated of all the second,

and not of some of the third; I say that the conclusion follows that the second is not predicated of some of the third; suppose this is not the case, but if possible, on the contrary let the contradictory conclusion be drawn, that the second is predicated of all the third; but, in fact, the first was said of all the second; therefore, the first will have been shown predicated of all the third, which is absurd; therefore, the second is not predicated of all the third, but of some of it.

- 6 The method of exposition is the following: since the first is not predicated of some of the third, let that part of the third it is not predicated of be taken and let it be the fourth; therefore, the first is predicated of none of the fourth, but also it is predicated of all of the second; therefore, the second is predicated not at all of the fourth; but the fourth is some of the third; therefore, the second is not predicated of some of the third.

Chapter X

- 1 Of the syllogisms in the third figure, the first, formed of two universally affirmative premisses, has a particular affirmative conclusion, being reduced by conversion of the minor premiss to the third syllogism in the first figure.
- 2 The second, from a universally negative major premiss and the other a universally affirmative, has a particular negative conclusion, having a reduction to the fourth syllogism in the first figure by conversion of the minor premiss.
- 3 The third, from a particular affirmative and a universal affirmative, has a particular affirmative conclusion, being reduced to the third syllogism in the first figure through conversion of the particular premiss and also of the conclusion.
- 4 The fourth, from a universal affirmative and a particular affirmative, signifies a particular affirmative, the minor premiss being converted.
- 5 The fifth, from a universal negative and a particular affirmative, has a reduction to the fourth syllogism in the first figure by converting the particular, making a particular negative conclusion.
- 6 The remaining sixth syllogism, from a particular negative and a universal affirmative, concludes a particular negative, being demonstrated through reduction to an impossible and through exposition, in the way shown in the case of the fourth syllogism of the second figure.
- 7 Through reduction to an impossible thus: let the first be denied of some of the third; and let the second be predicated of all the third: I say that the first will not be predicated of some of the second; for

suppose this is not true, but, if it be possible, let it be predicated of all; but the second was also predicated of all the third; consequently, the first will also be predicated of all the third; but by hypothesis it was not predicated of some; therefore, it will not be predicated of all the second; therefore, it will be denied of some.

- 8 The same thing can be shown through exposition, in this way: since the first is not predicated of some of the third, let that of which it is not predicated be taken and let it be the fourth; therefore, the first will be said of none of the fourth; but since the fourth is some of the third, the third will have been predicated of all of it; but also, the second is predicated of all the third, consequently it will also have been predicated of all the fourth; but also the first is predicated of none of the fourth; therefore, the first will not be predicated of some of the second.

Chapter XI

- I All the other combinations of premisses in each of the figures are invalid and no syllogism arises from them because nothing is concluded necessarily, either dialectically or through demonstration; for men call "indication" the discovery of the truth about the thing in question arising out of the nature of the thing and made through following out the clues given by what is clearly observable; but an argument reaching a conclusion through true premisses they call "demonstration."
- 2 In each figure there occur sixteen couplings of premisses, because there are four types of premiss in each, two universal and two particular; they are apparently more numerous because of different forms of expression; one should train himself in those and recognize them, as has been set forth in my writing *On the Equivalent Propositions*; for the present work is an outline of logical study, not a detailed manual of instruction.
- 3 With the fourteen defined syllogisms, each having its proper conclusion, certain other propositions also coincide in truth, some of these being contained in the conclusions, others of necessity coinciding in truth with them; the corresponding particular propositions are contained in the universal conclusions, and with the universal affirmative propositions as conclusions other particulars follow by conversion and coincide in truth.
- 4 And for this reason, in the syllogisms of the first figure, having universal conclusions, namely, the first and the second, to the first the particular affirmative, to the second the particular negative [. .].
- 5 And as a matter of fact, for some of the invalid couplings, though a conclusion does not follow straightway, as for the mentioned fourteen

that produce syllogisms, nevertheless, a conclusion does follow when the premisses are converted.

- 6 To be specific, in the first figure, if the premiss with the major term is affirmative, whether particular or universal, and the premiss with the minor is a universally negative proposition, there is no direct syllogism of the major term to the minor, but upon the premisses being converted a valid conclusion occurs, showing the minor predicated of the major, in the manner of the fourth syllogism in the same figure.
- 7 In the second and third figures nothing of this sort occurs by conversion of premisses; it does, however, occur in the third figure, in the third syllogism only, from the conversion of the conclusion; for the first two syllogisms of the second figure are converse to one another in the conclusion; and also the third and fourth in the third figure; and furthermore, just as in the first two syllogisms of the first and second figures the particular conclusions are embraced in the universal, so it is in the syllogisms in this figure.

Chapter XII

- I These syllogisms are called categorical, as I have said, and it is not possible to construct them in more than the three mentioned figures or in any other number in each figure; for this has been shown in my treatise *On Demonstration*; and we use them in the demonstrations in which there is a question about the magnitude of one of the things that exist, or what sort it is, or where it is situated or some similar question about things under the other categories.
- 2 For in investigating whether Eratosthenes correctly showed the greatest circle in the earth to measure 252,000 stades, the question is about the size of the circle, or its magnitude, or its quantity, or however you wish to name it, as also whenever one questions how many stades is either of the tropics on the earth, and, in each of the inhabited zones how large is the circle called Arctic and the one called Antarctic, and for each zone how many degrees it is from the north.
- 3 The astronomers have sought for and demonstrated the magnitude of both the sun and the moon and of their distances, as also the magnitude of eclipses, whenever they are not total, but are a half or a third or some other fraction of the eclipsed bodies; and moreover the magnitude of the days in each of the inhabited zones has been sought and discovered, just as the other questions mentioned.
- 4 For it is common knowledge that, on the one hand, the magnitude of each day in the whole year has been discovered by the agency of clepsydras and water clocks, and sundials also and, on the other hand,

by the predictions of eclipses the size of sun and star and earth and how distant they are from our region, and such questions have been solved; and, in sum, whatever the methods are that investigate and prove the size of each of the things mentioned they use for the most part the categorical syllogisms of the first figure; for indeed all the enunciations about each of their investigations can be found demonstrated by them in universal terms.

- 5 And since these propositions can be in more or less general form, and some one of them, in relation to its most general class, seems to be stated particularly, for this reason, in such a case, some propositions and proofs appear particular; thus in relation to the proposition and proof about every triangle, that it has its three angles equal to two right angles, a proposition saying, not that every triangle, but that some, have their base angles equal to each other, would seem to be said particularly.
- 6 Now, stated thus, its enunciation and proof is not definite and scientific, but in the following way it is both scientific and universal: "Every isosceles triangle has its base angles equal to each other."
- 7 Both the expression indicating universality by prefixing numbers and the form without these is customary among the Greeks: for it is equally meaningful to say "Every isosceles triangle has its base angles equal to each other," and "The isosceles triangles have their base angles equal to each other."
- 8 And actually it is also a custom for the Greeks to express such statements in the singular number, and there is no difference in meaning if they say "All isosceles triangles have their base angles equal," or, "The isosceles triangle"; for looking at the species that belongs to all the particular, they rightly make the enunciation as if about one thing; for as species, it is one.
- 9 I say, "as species," since with respect to existence they are as many in number as there are particular bodies; but of such a species itself there is a single nature at which men look and say, e.g., that the weevil is a destructive animal, or the eagle feathered, or the bear savage.

Chapter XIII

- I Accordingly, the first syllogism of the first figure is the most appropriate to scientific demonstrations, being expressed by the Greeks in two forms, sometimes, as we have just said, "Man is an animal, animal is a substance, man is a substance"; and sometimes with "every": "Every man is an animal, every animal is a substance, every man is a substance."

- 2 Next in value is the second of the first figure, and in the second figure the first two sometimes become useful for demonstrations, since the universal affirmative is mingled in them.
- 3 And indeed, the third syllogism of the first figure, as was said a little before this, sometimes becomes useful for proofs, as when a triangle is isosceles, and further—for it has been shown—also the isosceles triangle has its base angles equal, from these facts it can be concluded that some triangle has its base angles equal.
- 4 There are some syllogisms in the third figure, as has been said before, that demonstrate the particular affirmative; and a particular negative is at times demonstrated in the three figures, as: "Every good thing is choiceworthy, the pleasure of the ignoble is not choiceworthy; therefore, the pleasure of the ignoble is not good."
- 5 Now in this expression pleasure specifically defined has been taken for the demonstration; in the following type it is more indefinite: "Every good is choiceworthy; some pleasure is not choiceworthy; therefore, some pleasure is not good"; in the following form of expression, also, a more indefinite statement occurs: "Every good is choiceworthy; not every pleasure is choiceworthy; therefore, not every pleasure is good."
- 6 It is clear that in a demonstration of this sort it is not magnitude, as in the aforementioned cases, but the quality of the thing that is demonstrated; for what sort of thing pleasure is, whether good, bad, or intermediate, is considered under the genus of quality; just as the equality of the base angles of an isosceles triangle is studied under relation.
- 7 He who shows that the earth is arranged at the center of the universe makes his study in the category of "where situated," just as he who shows that Hippocrates and Democritus did not live at the same time makes his demonstration in the category of "when they were born."
- 8 The one, however, who studies whether the earth is spherical makes his demonstration in the category of quality, as to express it differently, he who asserts that it is spherical has asserted a quality of the earth.
- 9 The questions of causes occur in the categories of action and passion; in medicine, e.g., from what causes come voice and breathing and nourishment and digestion; in philosophy, e.g., earthquake, thunderbolt, lightning, and thunder.
- 10 In the category of state the type of question is, who is the rich man, who is the poor man, who is the well-off, who is the beggar?
- 11 He who investigates how one weaves a cloak or plaits a net or makes a box or a bed, investigates "composition," a category passed over by Aristotle in his study of the ten categories, as I have shown in my commentary on that book.
- 12 There is another kind of category which Aristotle himself called

"position," that is, lying or sitting; for in "position" he says that those things are said which indicate the postures of the parts of the body that come about by their spatial relations to each other; and under this category are Hippocrates's studies of what posture is best for a broken leg or hand and for each of the other parts, and likewise the best posture for the patient while the surgeon is treating collapses or staunching hemorrhages or doing anything else of this sort.

Chapter XIV

- I What is most important and primary in regard to anything that is not apparent to perception is the question of its existence or being; in this respect the following kind of problems arise: "Does Fate exist?," "Is there Providence?," "Do the gods exist?," "Is there a void?"
- 2 In these problems we use the hypothetical propositions, which the ancients divided into those by connection and those by separation; the Stoics call the connectives conditional axioms, the separatives, disjunctive, and we agree with them at least that there are two syllogisms of the conditional axiom and two of the disjunctive.
- 3 But that there is not even one syllogism useful for demonstration constructed from a negative conjunctive, as also that there is not a sixth or 7th or 8th or 9th or other syllogism (in their sense of the term), has been demonstrated elsewhere; but for the present it is proposed to list only the useful ones, omitting the refutation of those superfluously set up.
- 4 Chrysippus's school, believing there is a third indemonstrable syllogism concluding from a negative conjunctive and one of its members the contradictory of the remaining member, as in the following example: "Dion is not both at Athens and on the Isthmus" [. . .] to be useful for many demonstrations in all departments of daily life, even including the law courts.
- 5 Since some of the facts and statements that conflict with one another have their conflict whole and complete, being able neither to exist or be true together, nor be non-existent or false together, while some have a halfway conflict, not being able to be true together, but being able to be false together, for this reason I have thought it right to call the complete conflict by the name "disjunctive" and incomplete by the name "conflict" simply, or, with an added adjective, "incomplete conflict."
- 6 Under these conditions the said syllogism is useful, using the same form of expression Chrysippus does, but not, however, being grounded on the conjunctive, but on the conflicting things; for him many differences are collected under the one form of the conjunctive.

- 7 For since there are three different relations between facts, one, conflict, of things that never occur together, the second, consequence, of things that always occur together, and third, things that sometimes occur together and sometimes do not, all those facts that have neither necessary consequence nor conflict give material for the conjunctive proposition; e.g., "Dion is walking and Theon is talking"; it is clear that the negation of this will be: "It is not the case both that Dion is walking and Theon is talking."
- 8 The additional assumption is, "But in fact Dion is walking," or "But Theon is talking," and the conclusion in the case of the first assumption "Therefore, Theon is not talking," in the second case, "Therefore Dion is not walking"; such material has been shown to be absolutely useless for demonstration.
- 9 This matter has been discussed for the sake of clarity, at greater length, perhaps, than necessary in view of our purpose of brevity, but let us return to the subject, as if none of these side remarks had been made.
- 10 The syllogisms that arise from hypothetical propositions are brought to completion by a progression from one thing to another through consequence or conflict, either complete or incomplete; and besides these there is no third kind of progression from one thing to another that is useful for demonstration.
- 11 There will be two syllogisms deriving from complete consequence, and another two from complete conflict, and let those from consequence be called first and second, and those from conflict, fourth and fifth, since Chrysippus put it so; but the third, in expression the same as Chrysippus's, but according to the nature of the things postulated, is not the same; for its genesis is not, as he thought, from a negative conjunctive, but from deficient conflict, and it has one affirmative, additional assumption, not two, as does either of those kinds derived from complete consequence and complete conflict.

Chapter XV

- I Since, as we have shown, there is deficient consequence expressed in the propositions called paradisjunctives, these, too, will give rise to two syllogisms; first: "The distribution of nourishment from the belly to the whole body occurs, either by the food being carried along of its own motion, or by being digested by the stomach, or by being attracted by the parts of the body, or by being conducted by the veins."
- 2 (Let it be granted that all these actions could occur together; for in fact, this is possible, and the paradisjunctive differed from the disjunctive in just this respect; in the latter, one member always was true

and none of the others, but in the former, one member always is true, but one of the others, or even all of those comprehended, may be true at the same time.)

- 3 These propositions have two possible additional assumptions: an outright denial of one or two only of the members; denying one, for example: "Distribution of nourishment from the belly into the whole body occurs either by the belly squeezing, or by the veins conducting, or by the parts attracting, or by the nourishment moving under its own power; but in fact the stomach does not squeeze; therefore, the nourishment is carried either by the veins conducting it, or by the parts attracting, or by its own power."
- 4 Obviously this conclusion will be a paradisjunctive also, of three members, as it would, too, if another member had been denied, as "the stomach squeezing" was in this example; for the remaining three make the conclusion one composed in the manner of a paradisjunctive proposition.
- 5 A second form of additional assumption will be one by which we shall say, "Neither does the belly send the nourishment, nor the veins conduct it, nor is it moved by itself," or we can premiss the denial in another combination of any three member propositions; for it can be done in many ways.
- 6 And if three are not the case, the fourth remains to be concluded, affirmatively and definitely; for as long as only one or two of the four are taken, the conclusion is a paradisjunctive.
- 7 This kind of syllogism will seem to admit of being the same as the following: "If nourishment is distributed from the belly to the whole body, either it undergoes this through self-motion or by being sent by the stomach, or by being attracted by the parts, or conducted by the veins"; but it is not the same.
- 8 But the latter has the same force as the first indemonstrable syllogism of the hypotheticals, the distribution of nourishment being by hypothesis antecedent, and what was said next following as consequent, and it makes no difference whether the inferred conclusion is, in respect to its material, disjunctive or paradisjunctive; for the force of the first indemonstrable is consistent with either of the forms, since it is as follows: "If the first, either the second or the third or the fourth or the fifth"; then the minor premiss, "but the first; therefore, either the 2nd or the 3rd or the 4th or the 5th"; a second minor premiss, in the manner of the second of the indemonstrables is the following: "But neither the 2nd nor the 3rd nor the 4th nor the 5th; therefore, not the 1st."
- 9 The syllogism I spoke of a little earlier is constructed on the paradisjunctive major, when the facts are admittedly to be construed paradisjunctively, and it takes a minor premiss as if it were a disjunctive,

as in the following case: "Nourishment is either distributed by itself, or it was sent by the stomach, or it is conducted by the veins, or it is attracted by the parts of the body"; the syllogisms in the disjunctive mode have two minors, that is, either one member exists, or all but one do not.

- 10 That syllogisms of this sort are useful for demonstration Plato, also, shows in the *Alcibiades*, having made use, in effect, of the second of the hypotheticals, where he says, "If Alcibiades knows justice, he either learned it from another or knows it by having discovered it himself"; then, having shown that he neither had learned it from another nor had discovered it himself, he draws the conclusion that Alcibiades does not know justice.
- 11 By the simple paradisjunctive the question would have been treated in the following way: "Alcibiades knows justice either by having learned it or by having discovered it himself; but he does not know it through having learned it; therefore, he knows it through having himself discovered it."

Chapter XVI

- 1 There is also another species of syllogisms, a third, which I call relational, but the disciples of Aristotle try to force them into the number of the categorical syllogisms; they are of no little use to "skeptics" and arithmeticians and calculators, in arguments such as these: "Theon has twice as much as Dion, but Philon in turn has twice as much as Theon; therefore, Philon possesses four times as much as Dion."
- 2 And stated conversely the argument, the same in effect, will proceed in this way: "Dion possesses half as much as Theon; but Theon has half as much as Philon; therefore, Dion possesses a fourth part of the amount of Philon's property."
- 3 A syllogism will proceed demonstratively in this way also concerning any other multiple ratio; for if a given number should be triple another, and again, another triple that triple, the greatest number would be nine times the least, and conversely, the least will be the ninth part of the greatest.
- 4 So also in addition and subtraction; for if a first number is equal to a second, and another equal number is added to each, the sum of one addition will be equal to the other sum, and if equals are subtracted from each of two equals, the remainder of the one will also be equal to the other remainder.
- 5 As I have said, there is a great number of such syllogisms, both in arithmetic and in reckoning, all having in common the fact that they

have the cause of their structure derived from certain axioms; keeping these axioms in mind in connection with the given arguments, we shall be able to begin again more clearly and reduce such syllogisms to the categorical form.

- 6 For since there is this self-evident axiom, "Things equal to the same thing are also equal to one another," it is possible to reason and demonstrate as Euclid made his demonstration in his first theorem showing that the sides of the triangle are equal; for since things equal to the same thing are also equal to one another, and the first and second have been shown equal to the third, the first would thus be equal to each of them.
- 7 Again, since there is this self-evident axiom, "If equals be added to equals the sums are also equal," if, assuming the first and second equal to each other, an equal be added to each of the equals, one sum will also be equal to the other sum, and we can state it thus: "Since the first is equal to the second, and the 3rd is added to the first and the 4th to the second, these also being equals, the one sum will be equal to the other."
- 8 In like manner, whenever equals are subtracted from any equals, we shall be able to say, "Since the sum is equal to the sum, and from each of them these equals are subtracted, the one remainder is also equal to the other remainder."
- 9 So also, the double of the double will be quadruple; that is, if a double be taken of something else, and again the double of it be taken, the 3rd will be quadruple the 1st.
- 10 Similarly, in all other cases the structure of the demonstrative syllogism will be by virtue of a conjoined axiom, both for numbers and for other things that themselves belong also to the category of relation; for also in these cases the syllogism will depend on one of the axioms, e.g., "If Sophroniscus is the father of Socrates, Socrates is the son of Sophroniscus," and conversely, "If Socrates is the son of Sophroniscus, Sophroniscus is the father of Socrates."
- 11 The minor premisses to the propositions stated are obvious; this syllogism will proceed hypothetically thus: "If Socrates is the son of Sophroniscus, Sophroniscus is the father of Socrates; but Socrates is the son of Sophroniscus; therefore, Sophroniscus is the father of Socrates"; the structure of the reasoning will be more forced in categorical propositions; clearly, in this case too, a certain general axiom being premissed, to wit: "The man whom someone has as father, of him he is the son; Lamprocles has Socrates as father; therefore, Lamprocles is the son of Socrates."
- 12 Similarly, syllogisms used in the discussion of any form of relation will get the credibility of their structure and their demonstrative force by means of a general axiom; as for example, those arguments involving

"the more," since it is clear that these too are of the same kind as those constructed in the category of relation; examples of these have been given (using the word "more") in the commentaries about these arguments; the following kind of syllogism is expressed without the word "more" but with its force, e.g., "The virtue of the better is worthier of choice; soul is better than body; therefore, the virtue of the soul is worthier of choice than the virtue of the body."

- 13 Similar to these is this kind of syllogism: "The good of the better is worthier of choice; soul is better than body; therefore, that of the soul is worthier of choice than that of the body."

Chapter XVII

- 1 Nearly all the syllogisms get their structure through the cogency of the universal axioms that are set over them; since it was only later that I understood this, it is not written either in my commentaries *On Demonstration* or in *On the Number of the Syllogisms*.
- 2 And yet we knew relational syllogisms even at the time of those studies, having discovered the manner of their structure and validity; but that all demonstrative syllogisms are such through the cogency of universal axioms can be learned more clearly by all those who have examined such arguments in whatever way they have been worked out; for instance: "You say, 'It is day'; but you are also telling the truth; therefore, it is day."
- 3 Such a syllogism, too, is demonstrative, because the universal axiom it falls under is true, being as follows: "What a man who tells the truth says is so; someone, say Theon, says, 'It is day,' and Theon always tells the truth; therefore, it is day"; this is also said more clearly thus: [...] "therefore it is day."
- 4 For he who says that this thing is says the same as one who says that there is something among existing things and that this thing is, just as he who says that this thing exists says the same as he who says this is; and, moreover, he who says, "It is true that it is day," says the same as he who says, "It is day."
- 5 And for this reason you must be trained in exercises on equivalent propositions; at times it is possible to discern propositions that are different from each other but say in effect the same thing, while in other cases they do not say the same thing but obviously have opposite meanings, as for example, if something, on the one hand bears fruit and another having long [...].
- 6 The question of meanings often intrudes into a discussion of this sort; some claiming that the word signifies many meanings and needs

distinguishing marks of its different senses, and not a few failing completely to note what is often signified by it, though that is most clear and known to all Greeks, as we have shown in the case of the word "to tell the truth"; for all the Greeks say that he tells the truth who reveals things that are or were, as they are or were, just as he tells a lie who says that things that are not are, or that things that are, are not.

- 7 One who is reasoning and demonstrating must pay heed to two primary and important points: (1) to hear what is signified by the word according to the custom of the Greeks; and (2) to note whether the premiss assumed carries conviction as falling under a universal axiom and through that very fact, or through some other reason—for most of the things men reason about and demonstrate are said by force of an axiom—keeping in our minds also the meaning of the word axiom; for we laid it down that in the present exposition we give this name to a proposition that is self-evident.
- 8 This kind of argument is often involved with the meaning of a word, as indeed, in the very argument just mentioned, which I called the one through the thing defined, one might more clearly argue as follows: "Truth is a statement expressing existing things; Dion always speaks the truth; but he says that there is such a thing as divination; therefore, there is such a thing as divination; for if Dion always speaks the truth, obviously he speaks this thing truly, that divination exists; if that divination exists is true, divination exists."
- 9 For in this argument, that "A proposition expressive of existing things" is signified by the word truth, is an explanation of what is meant by the word "truth," and the statement that Dion always tells the truth has been substituted for the universal axiom, but the conclusion is the following: "If Dion always tells the truth, and one of the things he says is that divination exists, this, too, is true."

Chapter XVIII

- 1 About this topic what has been said will suffice for the present, but let us pass on to another point, to wit: since, as there are relational syllogisms dealing with "more and less," so there are those dealing with "likewise" or proportion, we must examine whether the validity of the latter, too, is derived from universal axioms; let it make no difference whether we say "likewise" or "equally" or "similarly."
- 2 This type of argument is that of Plato as written in the *Republic*; for Socrates maintains that as a city becomes just and is called so, so also does a soul become just and so-called, likewise, both action and law, and anything whatever of the things called just, are so called according to the same meaning.

- 3 For the Idea of justice, from which all particular just things receive their name, is the same in all; but if there is one same thing, to whatever one of the particulars it may be clearly attributed, from this it can also be transferred to the others, since we know that the same Idea does not appear with equal clarity in all cases, but in some cases it appears more clearly, in others more confusedly.
- 4 And for this reason, having first exercised the young men who share the conversation with him in a discussion about the just city, he then passes over to the soul and demonstrates that this, too, is called just in the same way as the city, so as to make the following syllogism: "In like manner are city and soul called just and are just; a city is said to be just through each of its parts doing its own business; a soul, therefore, will be called just, too, by this principle."
- 5 Since many things are demonstrated by arithmeticians and geometers in the same form of argument, and it can be clearly and naturally apparent to all men that whatever is so demonstrated is convincing, I have, for this reason, written about this syllogism also in my study of the syllogisms; for those inexpert in arithmetic and geometry let the following be a paradigm of the concept: "As the 1st is to the 2nd, so also the 3rd to the 4th."
- 6 In arguments of this sort everyone understands and believes the following general axiom: "Things which are in general in the same ratio, are also in the same particular ratio"; and so he who posits that the 1st is in the same ratio to the 2nd as the 3rd to the 4th, and that the ratio of the 1st to the 2nd is the double, will not deny that the ratio of the 3rd to the 4th is double, just as if the ratio of the 1st to the 2nd is the triple, he will say that that of the 3rd to the 4th is triple also, or if quadruple or fivefold or however he reckons the 1st to the 2nd, it will be apparent that the 3rd to the 4th is also quadruple or fivefold.
- 7 For if, in the universal, the same ratio holds between the first and the 2nd as between the 3rd and the 4th, there will also be the same ratio in the particular ratios; and one of the particular ratios is the fivefold; therefore, this is the ratio of the 3rd to the 4th.
- 8 All these syllogisms, indeed, must be said to belong, first to the genus of relational syllogisms, but secondly, in species they are constructed according to the force of an axiom; as Posidonius also says they are called "conclusive by force of axiom."

Chapter XIX

- 1 Since the members of the Peripatetic school have written about the syllogisms called "by added assumption" as useful, (but they seem to

me to be superfluous, as I have shown in my treatise *On Demonstration*), it would seem proper to say something about them.

- 2 How many and what they are, it is not necessary to detail completely here, since I have spoken about them in those commentaries; but what sort of thing their species is, will be said here in two examples.
- 3 One kind is of this sort: "Of what this is predicated, this too is predicated; but this of this; therefore, this also of this"; or in names: "Of what tree, also plant; but tree of sycamore; therefore, plant of sycamore"; obviously, one must understand in addition to what is put in words the verb "is predicated" or "is said of," so as to make the complete expression, "Of what tree is predicated, plant is predicated; but tree is predicated of sycamore; therefore, plant will be predicated of sycamore."
- 4 Another kind of syllogism by added assumption is, "What of this, of this also; but this of this; therefore, also of this"; in words: "What of tree, of sycamore; but plant of tree; therefore, plant of sycamore."
- 5 That such syllogisms are compends of categoricals, not another kind of them, has been shown in the commentaries mentioned above and I need speak no more of them here; for in introductory treatments of syllogisms none of the useful ones should be omitted, but it is not necessary to give refutations of the superfluous ones.
- 6 For this reason, then, I need not show that the syllogisms constructed by Chrysippus in his three books of *Syllogistics* are useless: for I have shown this elsewhere, as well as concerning the ones he calls "perantic"; for some of these were shown not to be a special kind of syllogism, but syllogisms expressed in a tortured form of speech, at times by transposition of consequence [...] but those called subsyllogistic being stated in expressions equivalent to the syllogistic; superfluous, moreover, are those, finally, that they call "unmethodical," by which one must reason when there is no orderly argument at all.

Commentary

CHAPTER I

Section I

The first sentence of the section is mutilated by the obliteration of a few words in the MS. Kalbfleisch conjectures and prints as the beginning of the sentence the words: *tôn phainomenôn ta men aisthêsei gigno*—. He supports his conjecture by reference to two passages in *De Temperamentis* (Kuehn, I, 587, 590) and two in *De Methodo Medendi* (Kuehn, X, 36, 38). In these passages the two kinds of immediate knowledge, sense perception and intellectual intuition (*noêsis*), are asserted. In the first passage of the *De Methodo Medendi* the usage of the "old philosophers" in setting up two classes of *phainomena*, those discerned by sense and those falling under intellectual intuition by "a first indemonstrable apprehension," is explicitly distinguished from the view of the empirics, who recognize sense alone. Therefore, there is Galenic authority for the conjecture of the word *phainomenon* in this place, and for the doctrine of the clause.

That this way of knowing is a universal human attribute is emphasized in the words, *gignôskomen hapantes anthropoi*. There may be a conscious echo of the first sentence of Aristotle's *Metaphysics*. Since the doctrine of the first chapter is derived from Aristotle, this would not seem unlikely. At any rate, Galen's interest in logic is directed toward its usefulness for demonstration rather than toward the theoretical question of the reasons for the validity of logical forms. Validity of the valid forms he takes for granted. His criterion is what forms are useful for demonstration. Thus the first chapter remarks on the place of demonstration in relation to the acquisition of knowledge, before the analysis of the forms of reasoning is taken up.

The teaching that sense perception and intellectual intuition each give a kind of immediate knowledge, the one of universal concepts, the other of the principles of demonstration, is contained in the last chapter of the *Posterior Analytics*, as Ernst Kapp (*Greek Foundations of Traditional*