the intellect to things that are known, inasmuch as they are known, as the relation of genus and of species ; for these relations the reason finds by considering the order of that which is in the intellect to the things which are outside it, or even the order of the things known amongst themselves.

Secondly, according as such relations are consequent upon the mode of knowing, that is, according as the intellect understands something in an order to something else: although the intellect does not actually discover that order, but rather it [the order] follows of necessity our mode of understanding. And this kind of relations the intellect does not attribute to that which is in the intellect itself, but to that which is in reality (1).

It is to be remarked that the relations of reason described in the first paragraph also are consequent to the mode of knowing, for they are a result of abstraction. However, in this case, it is not a question of considering an absolute object as though it were relative but of finding certain relations between objects which in their status of being in the mind are truly related to one another. The relativity, therefore, does not consist uniquely in our manner of considering the thing, although it is a result of our particular mode of knowing inasmuch as abstraction makes relative the concepts

(1) - "... Sicut realis relatio consistit in ordine rei ad rem, ita relatio rationis consistit in ordine intellectuum; quod quidem dupliciter potest contingere. Uno modo secundum quod iste ordo est adinventus per intellectum, et attributus ei quod relative dicitur; et hujusmodi sunt relationes quae attribuuntur ab intellectu rebus intellectis, prout sunt intellectae, sicut relatio generis et speciei: has enim relationes ratio adinvenit considerando ordinem eius quod est in intellectu ad res quae sunt extra, vel etiam ordinem intellectuum ad invicem. Alio modo secundum quod huiusmodi relationes consequuntur modum intelligendi, videlicet quod intellectus intelligit aliquid in ordine ad aliud; licet illum ordinem intellectus non adinveniat, sed magis ex quadam necessitate consequatur modum intelligendi. Et huiusmodi relationes intellectus non attribuit ei quod est in intellectu, sed ei quod est in re" (Q. D. de Potentia, q. 7, a. 11).

of things which in themselves are not relative. Because of this, only the relations described in the second paragraph are characterized as those which are consequent upon our mode of knowing, while the others are distinguished as those which the intellect discovers among its concepts.

Obviously, it is the relations of reason which the intellect finds amongst its concepts that constitute the subject of consideration in logic. These are the intentions of which St. Thomas speaks in the De Trinitate (1). The term comes from "tendere in" and designates these relations of reason inasmuch as they are objects towards which the intellect tends in its act of knowledge. But since, as properties of concepts, they presuppose the presence in the mind of objects known, and since these latter can also be called intentions inasmuch as they are the terms of a previous intellection, because of this, the logical relations of reason often go by the name of second intentions (2).

(1) - Supra, p. 3.

(2) - "Prima enim intellecta sunt res extra animam, in quae primo intellectus intelligenda fertur. Secunda autem intellecta dicuntur intentiones consequentes modum intelligendi : hoc enim secundo intellectus intelligit in quantum reflectitur supra se ipsum, intelligens se intelligere et modum quo intelligit" (Q. D. de Potentia, q. 7, a. 9). — "Ex hoc enim quod intellectus in se ipsum reflectitur. sicut intelligit res existentes extra animam, ita intelligit eas esse intellectas : et sic, sicut est quaedam conceptio intellectus vel ratio — cui respondet res ipsa quae est extra animam — ita est quaedam conceptio vel ratio, cui respondet res intellecta secundum quod huiusmodi; sicut rationi hominis vel conceptioni hominis respondet res extra animam; rationi vero vel conceptioni generis aut speciei, respondet solum res intellecta (Ibid., q. 7, a. 6).

Before concluding, let us note that, although second intentions cannot be in reality, it does not follow that they are independent of reality. For instance, the intention of species is formed by comparing individuals as to what they have in common. Second intentions are of necessity based, though more or less determinately, on first intentions. That is why we cannot agree with Kant when he says that general logic "makes abstraction of all content and cognition. that is, of all relation of cognition to its object, and regards only the logical form in the relations of cognitions to each other, that is, the form of thought in general" (1).

In conclusion, then, it is the relations of reason which the intellect finds among its concepts, and only these (contrary to the opinion of most contemporaries), that constitute the intentions which form the subject of the science of logic. For it is by the establishment of these relations that the concepts are ordered and the rational work formed by the art of logic.

(1) - Critique of Pure Reason, Part II, sect. 2; The World's Great Classics, New York, 1899, p. 47.

CHAPTER III.

THE FIRST TYPE OF RATIONAL PROCESS AND ONE WAY IN WHICH LOGIC CAN BE USED IN ANOTHER SCIENCE.

We have seen that logic, by considering the second intentions, establishes the order that must exist among our concepts, and thus teaches (hence logica docens) the general rules of reasoning which should be observed in all the sciences. Insomuch as the other sciences have recourse to these rules, they use logic. In this respect, since the object of logic is considered not for its own sake but for the purpose of the other sciences, logic is not so much a science as an instrument of science.

> . . . The speculative sciences, as it is clear in the beginning of the Metaphysics, are concerned with those things of which knowledge is sought for their own sake. We seek to know the things which concern logic not for their own sake, but as a certain aid for the other sciences. And thus logic is not contained under speculative philosophy as a principal part. but as something reduced to speculative philosophy, according as it provides speculation with its instruments. namely, syllogisms and definitions and other such things, which we need in speculative sciences. Hence, according to Boethius in his Commentary on Porphyrius, it is not so much a science as an instrument of science (1).

(1) - "Dicendum quod scientiae speculativae, ut patet in principio Metaphysicae, sunt de illis, quorum cognitio quaeritur seipsa. Res autem de quibus est logica, non quaeruntur ad cognoscendum propter seipsas, sed ut adminiculum quoddam ad alias scientias. Et ideo logica non continetur sub speculativa philosophia quasi principalis pars, sed sicut quoddam reductum ad philosophiam speculativam, prout ministrat speculationi sua instrumenta. scilicet syllogismos et definitiones et alia huiusmodi, quibus in scientiis speculativis indigemus. Unde secundum Boethium in Comm. super Porphyrium non tam est scientia, quam scientiae instrumentum" (De Trinitate, q. 5, a. 1, ad 2).

The use of logic as the general method of proceeding in a science is not, however, the use to which St. Thomas refers in the passage under consideration, where logic is described as giving not the mode of reasoning, but propositions to serve as principles of argumentation. In this second case, logic is used as another science rather than as an instrument of science. Although logic is understood to be an instrument of science inasmuch as its subject is sought not for its own sake but for the benefit of the sciences that concern reality, still, from another point of view, inasmuch as — though quite dependent upon reality and its differences — it has a subject sui generis, logic can be taken as a science in its own right. That logic can lend propositions to another science implies that it has propositions of its own; this in turn indicates that it is understood as having its own formal subject by which the propositions are characterized as logical, which finally leads us to infer that in this context logic must be considered as a science sui generis. Therefore, when another science makes use of logical propositions, it uses logic considered as a science.

This second use consists in the appropriation of the mode that is proper to logic. Every science has, besides the general mode provided by logic, a particular mode determined by its own formal subject. In this respect, logic is no exception. Its proper mode is called rational because of the intentional character of its formal subject. When a science turns its consideration to logical propositions, to the examination of the subject of logic, it adopts the particular mode that is proper to the science of logic. And the process of reasoning that results is termed rational.

This rational process, however, cannot belong properly to all sciences. In such a process, a science uses propositions that are proper to logic, not principally for the purpose of learning something further about second intentions, but in view of establishing something concerning its own subject. There must therefore exist between the second intention and the subject of the other science an affinity such that a consideration of the former could, first, in some way attain the latter and, secondly, lead to a better understanding of it. And if the process is to belong properly to a science, in fulfilling this purpose it must not include anything that is contrary to the rules of scientific argument.

These conditions are found to hold true for metaphysics. First of all, considerations proper to logic can be of interest in a metaphysical problem for the reason that, because both sciences are equally common, they have in a certain sense the same subject. That the span of logic is coextensive to that of metaphysics can be seen from the following passage :

> Such intelligible intentions equal the beings of nature, because all beings of nature fall under the consideration of reason. And thus the subject of logic extends to all things of which being of nature is predicated. Hence . . . the subject of logic is equal to the subject of philosophy, which is being of nature (1).

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(1) - "Hujusmodi autem intentiones intelligibiles, entibus naturae aequiparantur, eo quod omnia entia naturae sub consideratione rationis cadunt. Et ideo subjectum logicae ad omnia se extendit, de quibus ens naturae praedicatur. Unde concludit, quod subjectum logicae aequiparatur subjecto philosophiae, quod est ens naturae" (In IV Metaph., lect. 4, n. 574).

At bottom, the equal universality of the two sciences is due to the fact that, on the one hand, logic directs the mind which extends to being in all its universality; being, on the other, is the subject of metaphysics.

Since both sciences are common, they have in some respect the same subject. Being is the subject of metaphysics; but being is also the object of the mind; and the different modes of being account for the different ways in which the mind conceives its object, and they found the different second intentions. For example, metaphysics studies substance, the first analogate of being; whereas logic is concerned with substance as known inasmuch as it founds the second intention of first subject of predication. The formal subject of such a logical consideration, then, would be substance as known, but the material subject would be substance, simply, which is that on which the second intention is remotely founded. Insofar as something which is included in the subject of metaphysics is the foundation of a second intention. it can be a material subject of logical speculation, and, in this precise respect, both sciences are said to have the same subject.

No such affinity can be found between logic and any of the particular sciences. For these latter are concerned with questions about what is proper to a particular type of being, such as quantified being as such, or mobile being qua mobile, or the living body as such. Such particularities lie beyond the range of a general consideration of what is common. And since logic treats of the second intentions which are common, based as they are upon the com-

mon differences of being, the conclusions of this science cannot reach the subject of a particular science as to what is proper to it. Mobile being, for instance, does not found the second intention of first subject inasmuch as it is mobile but inasmuch as it is a substance and then it falls under the consideration of metaphysics. Likewise, animal in relation to man is a genus. But a consideration of animal as a genus would not touch upon anything that is proper to the nature animal in itself. It would not even concern the intentional relationship of animal to man as to anything it might have that is proper to it. Such a consideration could instruct us only about the common relation of genus, and, in a certain respect, about the foundation that this second intention has in reality, namely a universal nature, which also is included within the sphere of the communia. In other words, it could tell us nothing about this universal nature, namely animal, as to what makes it such a nature and not another; just as an examination of mobile being as first subject reveals nothing that is proper to mobile being as this kind of substance but only what it has in common with other substances.

Were we to use logical propositions in a particular science, then, we should most certainly be at fault. Instead of basing our proof on proper or appropriate principles as the rules of scientific argument require, we should be appealing to something that is merely a common, extrinsic condition of the subject. We could, however, use logical propositions in a particular science for the sake of probable argument, but then we would pass from the

sphere of science into that of dialectic. This rational mode, therefore, cannot properly belong to the particular sciences, that is to say, it cannot belong to them inasmuch as they are sciences, but only insofar as any science can use dialectic.

We must remark that the use of logical propositions can be proper in metaphysics only because they can somehow attain the subject of first philosophy without a passage from one subject genus to another. The whole process remains within the sphere of the second intention, but inasmuch as the second intention, which is common, is founded upon a common reality, the subject of metaphysics is concerned in the logical argument. If, however, in our argumentation, we should pass from the logical to the real considered as real, if, for instance, we were to conclude from the logical definition of substance that in reality substance must be that which is in itself and not in another, we should be using propositions that are extrinsic to the subject and the predicate of the conclusion. We should again have left the sphere of science for that of dialectic by engaging in a process that can be legitimately used by metaphysics but cannot properly belong to it.

It is because both sciences have in a certain respect the same subject that the teachings of logic can be used appropriately in metaphysics. Yet, a study of the second intention would still be of no advantage to first philosophy if it did not throw some light on the object of metaphysical research. And this brings us to the second condition : not only must logical propositions concern the subject of metaphysics, but they must lead to a better understanding of it. And this they can do precisely because the second intention is remotely founded upon and corresponds to something in reality. Hence it can serve as an indication of what that reality is. For example, the logical property that substance assumes when known, namely, that of being the subject of which everything is predicated and which cannot be predicated of anything but of itself, corresponds to the fact that in reality substance is that which is in itself and not in another as an accident is.

It may be objected that the knowledge of reality precedes that of the second intentions rather than the reverse — a thing must first be conceived before we can consider it qua conceived. To this we must reply, first, that the formation of a second intention requires merely a confused knowledge of reality. For example, in order to form the second intention of first subject of predication, it is not necessary to know what substance is in reality, it is enough to distinguish it even confusedly from accident, to know, for instance, that man is different from white. And, secondly, a distinct knowledge of what the second intention consists in can be had even when the thing upon which it is remotely founded is still known only in a confused fashion. Indeed, to reach a distinct knowledge of the "what it is" of a second intention, it is sufficient to examine the nature of the object qua known, which is the proximate foundation of the logical relation of reason; it is not necessary to have a perfect understanding of the reality upon which it is remotely founded. Before we know, for example, what substance is in reality, we can understand that substance as known is that of which

everything is predicated and which is predicated of nothing but of itself. Thus, when our knowledge of reality is still confused, the distinct notion of the second intention can serve to enlighten our understanding of the reality upon which it is remotely founded. In this way logical knowledge can precede and prepare the way for metaphysical research (1).

It is true, however, that a distinct notion of the reality to which the second intention remotely corresponds can provide a certain explanation of the subject of logic by exposing the foundation that it has in reality. For example, when we know that substance is that which exists in itself and not in another, we can see why we conceive substance as that of which everything is predicated and which is predicated of nothing but of itself. But this knowledge comes much later in the order of learning than does the use of logic in metaphysics. It is this latter use which concerns us here.

It must not be supposed that an examination of the second intention alone will give us the solution of the metaphysical problem (2). It can serve only as a preparation or an introduction to

(1) - This process can, to a certain extent, be likened to that by which we go from a consideration of a word to the study of the reality that it signifies.

(2) - In his commentary on Book VII of the Metaphysics, St. Thomas explains : "Et quia posset alicui videri, quod ex quo Philosophus ponit omnes modos, quibus dicitur substantia, quod hoc sufficeret ad sciendum quid est substantia; ideo subjungit dicens, quod nunc dictum est quid sit substantia "solum typo", idest dictum est solum in universali, quod substantia est illud, quod non dicitur de subjecto, sed de quo dicuntur alia: sed oportet non solum ita cognoscere substantiam et alias res, scilicet per definitionem universalem et logicam : hoc enim non est sufficiens ad cognoscendum naturam rei, quia hoc ipsum quod assignatur pro definitione

a properly metaphysical consideration. The logical relation of reason is but a sort of common condition of the thing, a condition that remains totally extrinsic to it, that does not affect in any way its proper principles. The rational process which belongs properly to first philosophy touches upon the object of metaphysical study only as upon the remote foundation of the second intention. As we have said, it makes no affirmation concerning the thing as it is in reality. Should it do so, it would take on the characteristics of another type of rational process, the dialectic or probable argument, described in the paragraph following that which constitutes the object of this article.

There is one other point to be considered, so important that, if it were lacking, the logical approach would be in vain. Not only can the second intentions be distinctly known independently of a distinct knowledge of the reality upon which they are remotely founded, they can, besides, be known more easily than the objects of metaphysical enquiry. If this were not so, the logical introduction to a metaphysical study would be contrary to the order of learning. The second intentions can be more readily understood than the subject of metaphysics for two reasons : First, because they are formed by ourselves, by our own mind in the act of abstraction; and, since scientific knowledge consists in the analysis of a thing into its

tali, est manifestum. Non enim hujusmodi definitione tanguntur principia rei, ex quibus cognitio rei dependet; sed tangitur aliqua communis conditio rei per quam talis notificatio datur" (Lect. 2, n. 1280). ?

principles, it is easier for us to know what is composed by ourselves than what is composed by nature. Secondly, the nature of a second intention, though wholly immaterial, can be perfectly attained, albeit indirectly, through the sole knowledge of sensible things.

> But there are certain invisible things of which the essence ('quidditas' i. e. "what it is") and nature is perfectly expressed through the essences known of sensible things, and of these intelligible things also we can know the "what it is", ('quid est'), but mediately, as from the fact that we know what is man and what is animal, we come to know sufficiently the relation of one to the other, and from this we know what is a genus and what is a species (1).

Not only, then, is it fitting to go from logical to metaphysical considerations, it is even indispensable, since we have no other alternative than to proceed from the better known to the less known. It is worthy of note that this method is followed by Aristotle, who devotes the seventh book of the Metaphysics to such logical speculations in preparation to Book VIII where he studies sensible substance according to its proper principles (2). It is

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(1) - "Sed quaedam invisibilia sunt, quorum quidditas et natura perfecte exprimitur ex quidditatibus rerum sensibilium notis, et de his etiam intelligibilibus possumus scire 'quid est', sed mediate, sicut ex hoc quod scitur quid est homo et quid est animal, sufficientur innotescit habitudo unius ad alterum, et ex hoc scitur quid est genus et quid est species" (De Trinitate, q. 6, a. 3).

(2) - In VIII Metaph., lect. 1, n. 1681. — In lesson 3 of Book VII (n. 1303) he explains that the Philosopher here "dicit ergo primo, quod de substantiis sensibilibus primo dicendum est, et ostendendum est in eis quod quid erat esse : ideo primum dicemus de eo quod est quod quid erat esse quaedam logice. Sicut enim supra dictum est, haec scientia habet quamdam affinitatem cum logica propter utriusque communitatem. Et ideo modus logicus huic scientiae proprius est, et ab eo convenienter incipit. Magis autem logice dicit se de eo quod quid est dicturum, inquantum investigat quid sit quod quid erat esse ex modo praedicandi. Hoc enim ad logicum proprie pertinet".

when we overlook the necessity of this logical introduction that we are likely to fall into the error of confusing the real with the logical, for we are likely to believe that we are engaged in metaphysics when actually, though unwittingly, we are carrying on a discussion on a logical plane — and a warped one at that, if not sophistical, for appearing to be what it is not.

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In résumé, then, our interpretation of the passage from the De Trinitate would be as follows : We have seen in the first two chapters of this article that the science which performs the work of an art by establishing the order of our concepts, has as its subject this purely intentional or rational order otherwise known as the logical relations of reason or second intentions. When propositions that have been established in this rational science serve to elucidate the subject of another science, the process involved is called rational, and constitutes a particular use of logic. Inasmuch as this use consists in providing scientific knowledge, logic is said to be used according as it teaches in another science. However, although any particular science can use logical propositions in this way, since they are not appropriate to the more limited subject, they cannot provide the certitude of science, for what is logically common does not actually contain what is really distinct and particular. The process which starts from second intentions is of course proper to logic, but it is also appropriate to metaphysics, for metaphysics and logic are both common and deal with

common things — the logical communia being founded on the real communia — and thus they somehow have the same subject.

PART II.

The second process is denominated rational from the point of view of the term. Because it proceeds from inadequate principles, viz. propositions that are no more than probable, this process cannot reach what constitutes the term of a truly conclusive argumentation, that is, the evidence of a first principle and the judgment of the intellect's conformity with reality. Consequently, the process can go on indefinitely, always tending towards reality, but never actually attaining it. And so it is forced to remain forever within the limits of the reason.

Alio modo dicitur processus rationalis ex termino, in quo sistitur procedendo. Ultimus enim terminus, ad quem rationis inquisitio perducere debet, est intellectus principiorum, in quae resolvendo iudicamus; quod quidem quando fit, non dicitur processus vel probatio rationabilis, sed demonstratio. Quandoque autem inquisitio rationis non potest usque ad ultimum terminum perduci, sed sistitur in ipsa inquisitione, quando scilicet inquirenti adhuc manet via ad utrumlibet: et hoc contingit, quando per probabiles rationes proceditur, quae natae sunt facere opinionem vel fidem, non scientiam. et sic rationabilis processus dividitur contra demonstrativum. Et hoc modo rationabiliter procedi potest in qualibet scientia, ut ex probabilibus paretur via ad necessarias probationes. Et hic est alius modus, quo logica utimur in scientiis demonstrativis, non quidem ut est docens, sed ut est utens. Et his duobus modis denominatur processus rationalis a scientia rationali; his enim modis usitatur

In another way, a process receives the name rational from the term, when that term is itself still a process of reasoning. Indeed, the ultimate term which the enquiry of reason should reach is the intellection of the principles, by resolving into which it judges; and, when this happens, it [the process] is not called a rational process or proof, but demonstration. Sometimes, however, the enquiry of reason cannot be brought to the ultimate term, but remains in the very enquiry, namely, when to the enquirer there remains open a way to both sides of the contradictory; and this happens when we proceed by probable reasons which, by their very nature, cannot produce more than opinion or belief, not science; and thus this rational process is opposed to the demonstrative. And, in this way, we can proceed according to a rational modo in any science, inasmuch as from probabilities we can see

logica. quae rationalis scientia dicitur, in scientiis demonstrativis (1).

the way to necessary proofs. And this is the other way in which we use logic in the demonstrative sciences, not according as it teaches but according as it uses [the second intentions] And in these two ways a process is denominated rational because of the rational science; for in these two ways we use logic, which is called the rational science, in the demonstrative sciences.

This sort of argumentation, inasmuch as it engenders opinion, however highly probable, but not science. is obviously opposed to demonstration as the imperfect to the perfect. To understand its nature, it would be helpful to see how it falls short of the most perfect form of reasoning. The first task before us, then, is to examine the nature of demonstration, after which we shall turn to the study of probable reasoning or dialectic.

(1) - De Trinitate, q. 6, a. 1.

CHAPTER I.

DEMONSTRATION.

1. - Demonstration in the strict sense.

For a full treatment of demonstration, we have but to turn to the Posterior Analytics. We shall touch only upon the points which bring into relief the differences that exist between demonstration and dialectic. In chapter two of Book I (1), we find demonstration defined as a syllogism which produces science. A syllogism, we know, is a discourse in which certain things being stated. something other than what is stated follows of necessity from their being so (2). But what is science ? In the present context. the term is to be understood in the strict sense, meaning, not merely the type of knowledge, usually probable, gained through observation, experimentation, the generalization of facts, etc., as is found in physics. chemistry and the other experimental sciences, which today are considered as having an almost exclusive claim to the title of science; but rather certain knowledge through the cause, obtained by means of a necessary inference, such as is usual in geometry. Take, for example, the proof that the angles of a triangle are equal to two right-angles : A plane figure composed of three straight lines the sum of whose exterior angles equals the sum of the two interior opposite angles, has angles equal to two

(1) - 71b20; St. Thomas, lect. 4, n. 9.
(2) - Prior Analytics, Bk I, ch. 1, 24b20.

right-angles; and, since the triangle is such a figure, it follows of necessity that the triangle has angles which equal two right-angles. This proof concludes that a certain property (having angles equal to two right-angles) is necessarily found in a certain subject (triangle) and it gives as the necessary cause the nature of the subject. It is to this sort of knowledge that the term science refers in the definition of demonstration.

What, then, are the requirements of science ? First of all, we must exclude the per accidens type of knowledge. We do not have scientific knowledge when we know a part in a whole (as, when we know the house, in a certain way, we also know the door), or an accident in a subject (as, knowing Socrates, we know some one who is seated), or an effect in a cause (as, when we know the nature of triangle, we know virtually that the angles of a triangle are equal to two right-angles); rather, in such a case, we know in an accidental way, for we know the thing only inasmuch as it is somehow connected with what we know per se. Therefore, to know a thing, in an unqualified sense, is to know it in itself and not in another (1). But, to know a thing scientifically, three other conditions must be fulfilled (2) : First, we must know its cause, for the principles of the being of a thing are also the principles of its truth, and science is a perfect apprehension of the truth of a thing. When a thing is not, all by itself, the reason why it is

(1) - St Thomas, In I Post. Anal., lect. 4, n. 4.
(2) - Aristotle, Post. Anal., Bk I, ch. 2, 71b10; St. Thomas, lect. 4, n. 5.

what it is, or of the fact that it is, unless we know this reason or cause, our knowledge is not scientific in the strict sense of this term. Secondly, we must know the application of the cause to the effect: we must know the cause as the cause of this thing, which is to know the thing in its cause, since the knowledge of the cause alone would furnish only a virtual knowledge of the thing. For example, we can know the nature of triangle without actually knowing that its angles are equal to two right-angles. Thirdly, the object known (i. e. what is expressed in the conclusion of the syllogism, not just a simple nature as triangle, but a complex thing such as a triangle has angles equal to two right-angles) must be such that it cannot be otherwise than it is, i. e., it must be necessary. Indeed, if it were contingent, the contradictory could be true, and the knowledge of the object could not be certain, since certitude implies a firm adhesion to one side of a contradiction and the rejection of the other as impossible. In short, then, science is the certain knowledge of a thing through its cause, and demonstration is a syllogism which produces such knowledge. (We shall see later on that there is also a broader sense of science and consequently of demonstration as well).

If a syllogism is to have science as its end, and if science is what it was said to be, then this syllogism must proceed from premisses that are true, primary, immediate, better known than and prior to the conclusion, of which they are the cause (1).

(1) - Aristotle, Post. Anal., Bk I, ch. 2, 71b20.

We see that the formulation of the material conditions constitutes a second definition, which finds its reason in the definition taken from the end (1).

Further on (2), we are given the reasons why the principles of demonstration must be of such a sort. Let us touch upon them briefly. First of all, to explain why the premisses must be true, Aristotle has recourse to the cause of formal truth — transcendental or ontological truth which is convertible with being. That which is not, cannot be known, he says — we cannot know, for example, that the diameter of a quadrangle is commensurate with the sides. Our knowledge, therefore, must represent something that is, and hence it must be true, according to formal truth which is the conformity of the intellect with what is. Thus, being, inasmuch as it is the object of the intellect, that is, inasmuch as it is ontological truth, is that which causes truth in the intellect. If our knowledge is to be true, the propositions from which we infer it must also be true, for we cannot know the true through the false, although the true can be inferred from the false.

In the second place, the premisses must be primary and immediate, that is, their truth must be immediate; the connexion between subject and predicate must have no other cause than the notions of the terms. Such are the propositions A whole is greater than its part and Reasoning animal is able to laugh. These truths can be

(1) - St. Thomas, In I Post. Anal., lect. 4, n. 2.
(2) - Aristotle, Post. Anal., Bk I, ch. 2, 71b25 et sqq.; St. Thomas, lect. 4, nn. 13, 14, 15, 16.

known by virtue of themselves since they can be perfectly understood by a knowledge of the terms. In other words, they are indemonstrable, for there is no cause exterior to the terms themselves which could be assigned as the middle term of demonstration. And inasmuch as they are the cause of other truths but are themselves without a prior cause, they are primary. Scientific knowledge requires premisses that are primary and immediate, for, otherwise, these premisses would be themselves demonstrable and would depend on others to be known, and these on others, and so on. Now if the causal regress did not end with a premisse whose subject and predicate are by their very nature the cause of their own connexion, but went on forever, none of the premisses and consequently none of the conclusions could be known, and there could be no scientific knowledge.

Finally, the premisses of demonstration must be the cause of the conclusion, prior to and better known than it. They must be the cause, for have we not said that science is knowledge through the cause ? And it must be understood that the cause in question here is the cause of the reality expressed in the conclusion, and not merely the cause of our knowledge of the conclusion (as it is when we conclude that man must be a reasoning animal because he is able to laugh — his ability to laugh is not the cause of his being a reasoning animal, although it is the cause of our knowing this fact). The premisses, moreover, must be prior inasmuch as they are the cause. They must be prior also from the point of view of knowledge, for, in any process of reasoning, we

must go from what is more known to what is less known. Better known, however, can refer either to what is better known for us or to what is more intelligible in itself. — Indeed, the two are not convertible; what is more knowable to us is usually less intelligible in itself. What is more easily grasped by us are the sense-perceptible, contingent, singular things, and only on the basis of these can we rise to the knowledge of what is necessary and universal. On the intellectual plane, we attain more easily to what is common and confused and only with effort can we reach what is less common and more distinct. The reason why our mind moves from what is less intelligible in itself (but more knowable to us) to what is more intelligible in itself (but less knowable to us) is to be found in its potentiality. In fact, the mind must proceed from what is less in act to what is more in act, and a thing is intelligible inasmuch as it is act (1). Only in mathematics, where we prescind from all contingency and movement, is the more intelligible (absolutely speaking) more knowable to us. — In demonstration, the premisses must not only be more easily knowable for us, which is required in all syllogisms, but, in addition, since they contain the cause, they must be more intelligible according to their very nature.

Aristotle concludes his explanation of the definition (2) with the remark that, since the premisses are primary, they are proper principles. And the reason is given by St. Thomas (3) : What is primary in any genus is the principle or cause of all that is contained in that genus. Of this we shall have more to say later on.

(1) - Cf. In VII Metaph., lect. 2, nn. 1300-1306.
(2) - Aristotle, Post. Anal., Bk I, ch. 2, 72b5.
(3) - In I Post. Anal., lect. 4, n. 16.

We may note further that the sole fact that the premisses must be primary can be understood to mean that they must be immediate, cause, prior and better known (at least absolutely speaking, and, since it is a question of syllogistic premisses, it is understood that they must also be more known to us). All the conditions required of the premisses, then, are implied in the two words : true and primary.

We have pointed out that demonstration, inasmuch as it is productive of scientific knowledge, requires : (1) that the object be necessary — and we may add that, in order for the conclusion to be seen as necessary, the premisses, also, must be not only true, but necessary; (2) that the premisses are first in the same genus as the conclusion and are therefore primary and proper principles. Since it is with respect to these necessary, proper and first principles that dialectical argument is deficient, we shall develope these points somewhat further.

We have said that, since the aim of demonstration is science, its object must be something necessary. From this we can conclude that demonstration must proceed from principles that also are necessary, for, although the necessary can be syllogized from the contingent, it cannot be demonstrated from it, since it cannot be known as necessary unless seen through necessary principles (1). In other words, if the middle is contingently linked with one or both of the extremes, the connexion between the extremes, even

(1) - Aristotle, Post. Anal., Bk I, ch. 4, 73a20-25; St-Thomas, lect. 9, n. 2. For the proof, see ch. 6, 74b5 - 75a35, and the commentary of St. Thomas, lect. 13.

though in fact it is necessary, cannot be known as necessary. On the other hand, if the middle is necessarily linked with the extremes, the conclusion cannot be otherwise than necessary.

The necessity required by a principle of demonstration is of the strictest kind. It calls for three things : the predicate must be attributed (1) to all that is contained under the subject (dici de omni), (2) of itself or essentially (per se), and (3) primarily or universally or according as the subject is what it is (secundum quod ipsum subjectum est)(1).

In demonstration the dici de omni principle must be such that not only the predicate be attributable to all the subjective parts of the subject, that is, to all the inferiors contained under it, but that it be so at all times, as in the proposition Every white thing is a body. There must be universality not only with regard to the parts but even with regard to time. The first condition must be satisfied in any type of syllogism (2) and need not involve necessity (for example, the proposition All the people in this room are sitting is not necessary). The second is proper to demonstration and implies necessity (3).

But a predicate can be said of all the parts of the subject and at all times without being related to it by a per se connexion (4). The preposition per or by usually signifies a causal

(1) - Ibid., ch. 4, 73a25; St. Thomas, lect. 9, n. 3.
(2) - Aristotle, Prior Analytics, Bk I, ch. 1, 24b25.
(3) - Aristotle, Post. Anal., Bk I, ch. 4, 73a25; St. Thomas, lect. 9, n. 4, 5, 6.
(4) - For an explanation of per se predication, see Ibid., 73a35; St. Thomas, lect. 10.

relationship and, when it refers to predication, per se or by itself indicates that the cause of the connexion of the predicate to the subject is to be found, not in something extrinsic, but in the subject or predicate itself. This happens, first, when the predicate denotes the form of the subject, that is, when it constitutes the definition or part of the definition of the subject, as in the propositions Man is an animal, A triangle is composed of lines. Secondly, there is per se predication when the subject is the material cause of the predicate, that is, when it is its proper matter or subject. In this case, it is the subject that is placed in the definition of the predicate, for an accident cannot be understood without reference to its subject since its esse is an esse in a substance. For example, snub is predicated per se of nose which is its proper subject and which is placed in its definition; similarly able to laugh is predicated per se of man. In the case of the third mode, the per refers to position rather than to cause and per se designates that something is alone. Thus white or walking are not alone, as though existing by themselves, for they connote a substance in which they exist. But an individual thing, a first substance, such as Socrates, exists by itself and not in and by another. Although this third mode is a mode of existence, it can refer to predication and therefore to demonstration, inasmuch as a subject immediately and by itself is the subject of its property and not by reason of something else, as the triangle is of itself the subject of the property. To have angles equal to two right-angles, and not inasmuch as it is a figure or an isosceles trian-

gle (1). But it is the modes of predication per se which most directly concern the necessity of demonstration. The fourth mode occurs when the predicate is linked to the subject according to another sort of causality, especially efficient, inasmuch as the subject is what it is. for example, the builder builds because he is a builder, but, when the builder dances, it is not inasmuch as he is a builder.

Let us see how the necessity found in demonstration is a per se necessity. The demonstrative argument concludes by uniting a property with its subject, and the necessity of this conclusion springs from the fact that the subject is the necessary cause of

(1) - St. Albert explains the similarity and the difference between the second and the third modes thus : "... In veritate secundus modus et tertius conveniunt in hoc quod uterque dicit causam per se inhaerentiae praedicati in subjecto sed converso modo. Quia secundus dicit qualiter per se praedicato inest subjectum per id quod subjectum est principium praedicati. Tertius autem modus dicit causam propter quam subjectum non alii substat, quam praedicato, non ex ratione subjecti, sed ex ratione praedicati, in cujus diffinitione cadit hoc non aliud subjectum sive superius sive inferius acceptum, et sic conveniunt in causa inhaerentiae quae est per se inhaerentia : uterque enim dicitur ideo modus inhaerendi per se, quia per se praedicatum est in subjecto : et ideo modus secundus non excluditur a tertio quantum ad hoc. — Sed est notandum quod secundus modus dicitur per se secundum quod opponitur per se et id quod est per accidens. ... In tertio autem modo est per se secundum quod per se est primo esse. ... Et totum hoc quod dictum est, consistit in hoc. quod in secundo modo inest passio non per accidens. sed per se. In tertio autem modo subjectum est per se, ita quod non per aliud subjectum. quamvis illud subjectum non sit per accidens" (Post. Anal., Liber I, tract. 2, caput 9).

the property, such that, once the subject is posited, the property necessarily follows (1). Thus, the medium of demonstration is the necessary cause of the union of subject and property, that is, the definition of the subject. Therefore, the necessity of demonstration is a per se necessity, since the conclusion is an example of the second and fourth modes (e. g., man is able to laugh), and, in the first figure, the major proposition includes the second mode (e. g., a reasoning animal is able to laugh) and the minor employs the first (e. g., man is a reasoning animal). This per se necessity is especially evident in the demonstrations of geometry, as in the example given at the beginning of this chapter : A plane figure composed of three straight lines, the sum of whose exterior angles equals the sum of the interior opposite angles. has angles which are equal to two right-angles: the triangle is such a figure; therefore, the triangle has angles which equal two right-angles.

The final requirement of demonstrative necessity is the universal predicate (2). The universal, as understood here, is not the universal defined as one predicated of many. The term is used rather to designate a certain convertibility between subject and predicate, such that the whole predicate according to everything that it is, is predicated of the whole subject, according to all that this latter is. One is not found without the other. For example, equal to two right-angles is predicated of triangle qua triangle; it can also be predicated of figure or isosceles

(1) - Cf. Aristotle, Post. Anal., Bk I, ch. 6, 75a30 et sqq. St. Thomas, lect. 14.
(2) - Ibid., ch. 4, 73b25; St. Thomas, lect. 11.

triangle, not, however, qua figure or qua isosceles triangle, but inasmuch as the figure in question or the isosceles triangle is a triangle. Having angles equal to two right-angles is said first of triangle. There is no triangle that is not equal to two right-angles and whatever is equal to two right-angles is a triangle. There is nothing implied in triangle which would be the cause of something other than equal to two right angles (as there is in isosceles triangle); and having angles equal to two right-angles is attributed to no wider and more general subject than triangle (as to figure, for example). The predicate, then, is universal when it is attributed to a subject such that it is neither in more nor in less than that subject. Since demonstration combines a property with its proper subject through the medium of the cause of the inherence, which is the definition of the subject, there is perfect convertibility of predicate and subject both in the conclusion and in the premisses. Therefore, the predicate of a demonstrative proposition is universal and attributed to the subject secundum quod ipsum subjectum est.

Such then is the rigour of demonstrative necessity. And in the measure in which the syllogistic argument declines from this necessity, it falls short of the first and most primary sense of demonstration.

Also inseparably linked with the notion of demonstration is that of proper principles, as can be seen from what has already been said. First of all, that the premisses must contain the principle or the cause of the conclusion is required by the nature

of science and is explicitly stated in the second definition of demonstration, and that this cause must be the proper principle is explained by St. Thomas thus : Nam si propositiones demonstrationis sunt causae conclusionis, necesse est quod sint propria principia eius : oportet enim causas esse proportionatas affectibus (1). Moreover, when we say that the premisses must be first with respect to the conclusion, we imply that they must be in the same order and genus, and therefore proper or appropriate, that is, not extrinsic to the conclusion, for whatever is first in a genus is the cause of all that follows in the same genus.

Regarding the principle just stated, it is enlightening to consider the etymology of the latin word genus. It was first meant to signify a multitude whose members are related to one another and to one principle. (In this sense it can be compared to the English word kin, meaning a group of persons of the same stock, race, or family (2)). Then it designated the principle of the generation of the multitude; thirdly, the word genus was used to signify a second intention and referred to the definition of a thing which is a certain principle, so that all things having the same definition are in the same logical genus; finally, the logical signification was the basis for a new imposition used in philosophy of nature and metaphysics. In this last sense, genus signifies the principles of a thing, such as the matter and the form, so that all things having the same natural principles are of the same

(1) - In I Post. Anal., lect. 4, n. 11
(2) - Cf. Webster's Collegiate Dictionary, Third Edition of the Merriam Series, the word kin.

genus. It is in this last sense that we speak of the subject genus (2) (genus subjectum) of a science. All things having the subject as principle are of the same genus. For example man, as the first subject of able to laugh, is the principle and cause of this property, and is included in its definition. All properties having man as first subject are therefore of the same genus.

In the Metaphysics (1), we see the term genus explained in somewhat the same way, as meaning the proper subject, such as surface is the proper subject, and in this sense the genus, of all plane figures, as square and circle. In a demonstrative science, it is the subject that is the principle and genus of the properties whose inherence we prove. What is more, in as much as the object of demonstration is necessary, the subject is the necessary cause of the inherence of the property. And thus the subject constitutes a genus to which all conclusions are related as to a necessary principle. From this we can see how closely the principles of a science are connected with its subject.

That the principles of demonstration are of the same genus as the conclusion is evident from the fact that demonstration proceeds by per se predication. Indeed, seeing that the middle term signifies the formal principles of the subject of the conclusion and the proper subject of the predicate, there can be no doubt but that the premisses are of the same genus as the conclusion.

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(1) - Liber V, lect. 22, n. 1121.
(2) - In I Post. Anal., lect. 18, n. 9; see also lect. 41.

By per se and universal predication is fulfilled another characteristic of proper principles, namely, that they must be first and immediate, not so much in the sense that they are themselves without any cause other than the notion of the terms, as in the sense that between them and the conclusion there is no intermediary cause. For the per se predication results not only in an immediate connexion of terms in each proposition, but also in an immediate connexion between principles and conclusion, between cause and effect. The cause of the inherence of the property is the cause essentially and according to what it is. Just as the builder builds inasmuch as he is a builder, so reasoning animal is able to laugh because he is reasoning animal and man is the subject of this property because of his nature. The proper principle, therefore, is of the same genus of the subject and the proximate cause of the conclusion.

We can now see why demonstration cannot permit the use of extraneous or even of common principles. In any science, we have said, the subject is the principle of all the properties and per se accidents which are shown by demonstration. We should be resorting to extraneous principles if we tried to prove the inherence of a property in a subject by something other than the nature of the subject; for example, if we tried to prove that a triangle has three angles equal to two right-angles because it is made of bronze, or even that a triangle qua triangle is sonorous for the same reason. In both cases the medium is not of the subject genus and is accidentally linked with at least one of the extremes.

And thus, even when the conclusion is in fact necessary, it is not known as necessary (1).

It follows that we cannot use the principles of one science in that of another. To do so would be to attempt to prove the inherence of a property in one subject (e. g. magnitude) by means of the definition of another completely distinct subject (e. g. number), which obviously would be impossible. There is, of course, the exception of subalternated sciences, when the subject of one (geometry, for instance) is considered as contained under the subject of the other (arithmetic), in which case the principles of the subalternating science would not be extrinsic to the subject of the subalternated science (which, in the example given, would be magnitude considered as numbered (2)).

As for the common principles, although they have a certain bearing on the object, they are not essential to it. A common principle, which can be used in arguments concerning subjects of a different genus, cannot give scientific knowledge, for it cannot demonstrate something of a subject secundum quod ipsum est. An example would be the argument of Bryson, which concludes that a circle can equal a square and gives as a reason that in any genus where there is a plus and a minus there is also an equal. The middle term of this argument is common, for it is found in other things besides circle, and therefore it does not pertain to

(1) - Cf. Aristotle, Post Anal., Bk I, ch. 7, 75a35-75b20.
(2) - St. Thomas, lect. 15.
Ibid.

circle qua circle. The resulting knowledge could be no more than a common, per accidens knowledge. For we do not see equal to a square as inhering in circle according to what circle is in itself, but only according to something common which is not essentially connected with it. The use of common, as well as of extraneous principles, consequently, runs contrary to the strict necessity of demonstration. And, failing to give the proper cause, such principles cannot produce scientific knowledge, at least not in the strict sense of that term (1).

The principles of demonstration, then, must be necessary and proper. Viewed with respect to resolution, another aspect comes to view : they must be first. All demonstration is a resolution or analysis of an object into its first, per se nota principles, that is, into principles that have no cause outside the notion of the terms, that are immediate in the sense that they permit of no medium of demonstration, that are therefore indemonstrable. In demonstration, the inherence of a property is analysed into its proper cause : the definition of its subject, and, with that, the process has reached its term, for it would be senseless to ask the reason why the definition of a thing is such (2), why man, for example, is a rational animal. Such a proposition is explained by the sole notion of the terms; it is therefore self-evident. Thus, in order to reach its term, demonstration must re-

(1) - Aristotle, Post. Anal., Bk I, ch. 9, 75b35 - 76a5; St. Thomas, lect. 17, n. 2, 3.
(2) - Cf. Post. Anal., Bk II, ch. 4, 91a.

solve its object to what is not only the proximate but also the first cause in the same genus.

Because the proper principles of any science are first, they must be taken without demonstrative proof, for there is no cause prior to them upon which to base a demonstration (1). Just as a science presupposes its subject, so it accepts its principles which are rooted in the subject. The principles, however, of any particular science can be confirmed by the common principles, which express the same truth as the particular ones, but are better known to us because of the common terms. The manifestation of the proper principles, then, lies with the common science of metaphysics, to which the common principles are proper. Indeed, it is fitting that the science which establishes the quid est of the subject of any particular science should also manifest the principles of that science. As for first philosophy which considers the first causes of all, it, too, as a science, must accept its principles; nevertheless, the common principles do not go unconfirmed, for metaphysics has, not merely a scientific, but a sapiential role to play, and it is by exercising this latter function that it defends its own principles. Although the proper principles of a science can become the object of an argument ad hominem or ad impossibile. this does not lessen the fact that, first and immediate in themselves, they are the ultimate terms of resolution.

(1) - Ibid., ch. 10, 76a30 - 77a5; St. Thomas, lect. 18.

Needless to say, the common principles, not being appropriate to the subject, cannot be included as an integral part in the demonstrations of a particular science - unless, of course, they are adapted to the subject, as the common principle (1) Equals from equals leave equals, is adapted to geometry thus : Equal magnitudes subtracted from equal magnitudes have equal magnitudes. Nevertheless, the common principles are indispensable even to the particular sciences, not only for the establishment of their proper principles, but also for the confirmation of their arguments. For instance, the proof that man is able to laugh is based on the principle that man is a rational animal, the truth of which presupposes that a thing cannot be and not be at the same time and in the same respect. In this way, the common principle plays a necessary, though not an integral, part in the process of resolution.

As we have said, the first principles of any science, being indemonstrable, cannot be the object of science. They are, rather, the object of the intellect (intellectus as opposed to scientia). Indeed, by the very explanation of the terms, the truth of a first principle is immediately evident.

> "Accipitur autem hic intellectus non pro ipsa intellectiva potentia, sed pro habitu quodam quo homo ex virtute luminis intellectus agentis naturaliter cognoscit principia indemonstrabilia. Et satis congruit nomen. Huiusmodi enim principia statim cognoscuntur cognitis terminis. Cognito enim quid est totum et quid pars, statim scitur quod omne totum est maius sua parte. Dicitur autem intellectus ex eo quod intus legit in-

(1) - Ibid., ch. 10, 76a35-40; St. Thomas, lect. 18, n. 7, 8.