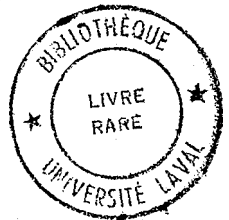# A THOMISTIC THEORY

of the

LIBERAL ARTS

Presented in partial fulfill-
ment of the requirements for
the doctorate in philosophy

by

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PROPOSITIONES

1. Logica dividitur in materialem et formalem .

2. Logica est ars liberalis.

3. Fortuna est causa per accidens in his quae fiunt secundum propositum propter finem in minori parte.

4. Finis ultimus hominis consistit in operatio propria secundum virtutem in vita perfecta.

5. Anima est actus primus corporis physici organici.

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CHAPTER ONE

THE LIBERAL ARTS - DEFINITION and DIVISION.

In the first book of the _Metaphysics_ Aristotle uses the term art in a very wide sense to mean any universal judgment bearing on a large number of objects of our experience. (1) Is it possible for us to make such a judgment because we have memory which enables us to grasp a number of experiences as one and so prepare them for the universalizing judgment of art? Taken in this broad sense art includes not only habits like the doctor's ability to cure and the architect's skill, but also speculative skills like mathematics and logic. (2) In St. Thomas's commentary this general use is clear.

> "Cum igitur plures artes sint repertae quantum and utilitatem, quarum quaedam sunt ad vitae necessitatem, sicut mechanicae; quaedam vero ad introductionem in aliis scientiis, sicut scientiae logicales: illi artifices dicendisunt sapientiores, quorum scientiae non sunt ad utilitatem inventae, sed propter ipsum scire, cujusmodi sunt scientiae speculativae."

But immediately thereafter, as St. Thomas again points out, Aristotle, by referring to the _Ethics_, takes care to distinguish what properly belongs to the notion of science from the proper ratio of art.

> "Sed quia usus nomine artis fuerat et sapientiae et scientiae quasi indifferenter, ne aliquis putet haec omnia esse nomina synonyma idem penitus significantia, hanc opinionem removet, et remittit ad librum moralium, idest ad sextum _Ethicorum_, ubi dictum est, in quo differant scientia et ars et sapientia et prudentia et intellectus. Et ut breviter dicatur sapientia et scientia et intellectus sunt circa partem animae speculativam, quam ibi scientificum

animae appellat. Differunt autem, quia intellectus est habitus principiorum primorum demonstrationis. Scientia vero est conclusionis ex causis inferioribus. Sapientia vero considerat causas primas. Unde ibidem dicitur caput scientiarum. Prudentia vero et ars est circa animae partem practicam, quae est ratiocinativa de contingentibus operabilibus a nobis. Et differunt: nam prudentia dirigit in actionibus quae non transeunt ad exteriorem materiam, sed sunt perfectiones agentis: unde dicitur ibi quod prudentia est recta ratio agibilium. Ars vero dirigit in factionibus, quae in materiam exteriorem transeunt, sicut aedificare et secare: unde dicitur quod ars est recta ratio factibilium". (4)

In the _Ethics_, it is clearly stated that prudence and art (the two practical habits) bear upon the contingent, while science treats of the necessary.

"Est autem considerandum quod quia contingentium cognitio non potest habere certitudinem veritatis repellentem falsitatem, ideo quantum ad solam cognitionem pertinet, contingentia praetermittuntur ab intellectu qui perficitur per cognitionem veritatis. Est autem utilis contigentium cognitio secundum quod est directiva humanae operationis quae circa contingentia est: ideo contigentia divisit tractans de intellectualibus virtutibus solum secundum quod subjiciuntur humanae operationi. Unde et solum scientiae practicae sunt circa contingentia, inquantum contingentia sunt, scilicet in particulari. Scientiae autem speculativae non sunt circa contigentia nisi secundum rationes universales, ut supra dictum est. (5)
"Dicit ergo primo, quod manifestum potest esse quid sit scientia ex his quae dicuntur, si oportet per certitudinem scientiam cognoscere, et non sequi similitudines, secundum quas quandoque dicimur scire sensibilia de quibus certi sumus. Sed certa ratio scientiae hinc accipitur, quod omnes suspicamur de eo quod scimus quod non contingat illud aliter se habere: alioquin non esset certitudo scientis, sed dubitatio opinantis. Hujusmodi autem certitudo, quod scilicet non possit aliter se habere, non potest haberi circa contigentia aliter se habere. Tunc enim solum potest de eis certitudo haberi cum cadunt sub sensu. Sed quando fiut extra speculari, idest quando desinunt videri vel sentiri, tunc latet utrum sint vel non sint. Sicut patet circa hoc quod est Socratem sedere. Sic ergo patet quod omne scibile est ex necessitate. Ex quo concludit quod sic aeternum: quia omnia quae sunt simpliciter ex necessitate, sunt aeterna. Hujusmodi autem non generantur neque corrumpuntur. Talia ergo sunt de quibus est scientia." (6)

Once this distinction between art in the proper sense and
speculative habits is made. it may be an object of wonder that
some speculative disciplines should still be called arts.
Yet there is not only the whole weight of tradition from Roman
times to our own to justify calling certain disciplines like
logic and mathematics liberal arts, but there are examples of
such use by St. Thomas himself. Hence we may well ask why such
an appellation can be given to some of the sciences, after all
sciences have been sharply distinguished from art. St. Thomas
finds the reason ~~in the fact~~ that some speculative disciplines
have retained something of art in the fact that a certain con-
struction, a certain making, has been retained as a means of
manifesting their object.

> "Ad tertium dicendum, quod etiam in ipsis speculabilibus
> est aliquid per modum cujusdam operis; puta constructio,
> syllogismi, aut orationis congruae, aut opus numerandi,
> vel mensurandi; et ideo quicunque ad hujusmodi opera ra-
> tionis habitus speculativi ordinantur, dicuntur per quam-
> dam similitudinem artes, scilicet liberales, ad differen-
> tiam illarum artium, quae ordinantur ad opera corpus
> exercita, quae sunt quodammodo serviles; inquantum corpus
> serviliter subditur animae, et homo secundum animam est
> liber: illae vero scientiae, quae ad nullum hujusmodi
> opus ordinantur, simpliciter scientiae dicuntur, non autem
> artes: nec oportet, si liberales artes sunt nobiliores,
> quod magis eis conveniat ratio artis." (7)

It might be thought that the fact that some speculative dis-
ciplines are called arts is a reason for questioning the ordi-
nary definition of art as "recta ratio factibilium" (where it
is used properly as applying to physical making). Since what is
speculative is higher than the practical, would not the term
art be better used if it were defined primarily according to

its use as distinguishing certain speculative disciplines and as extending improperly and secondarily to physical making? On the contrary, it seems that the notion of art is analogous, and that to which it applies are the servile arts and only secondarily to the liberal arts.

What distinguishes servile arts from the speculative disciplines, it seems, then, is that art is essentially concerned with regulating the contingent and is transitive, while speculative habits are concerned with what is necessary, and they direct purely immanent actions. True as this general formula is, there is a considerable difficulty about applying it to some of the liberal arts, particularly music and even poetry and rhetoric where something physical enters essentially into the art. They are speculative habits, since they are intended to communicate something intelligible, yet they seem at least, partly to involve transitive action. It is obvious that music requires either the voice or some instrument, and poetry and rhetoric depend very greatly for their effect on precisely what is most physical in words, their sound and their quantity.

Before we answer this difficulty, it is necessary to distinguish the arts according to their end and according to their mode. Thus, if we list the arts as follows:

> arithmetic
> geometry
> astronomy
> demonstrative logic
> dialectic
> rhetoric
> poetry
> grammar
> music

        dance
        painting
        sculpture
        architecture

it will be possible to consider all of them, as far as
sculpture, as liberal in their end, inasmuch as they are
ordered to knowledge, but if we consider their mode of oper-
ation it will be clear that the first effect of painting is
to transform matter and secondarily to convey something to
one who sees the painting. Music, on the other hand, uses
the instrument or the voice but as a pure instrument some-
what like the philosopher uses words. It is obvious that
the philosopher uses words as pure instruments, and that
they are something more than that for the poet, and the
rhetor, and that the use of the musical instrument or the
voice by the musician likewise is important in what is pre-
cisely physical in them. Still the rhetor, the poet and the
musician uses what is physical transitively and temporarily
as a means of coveying something to a hearer. The sculptor
and the painter use their art primarily for transforming
something material. It is this transformed material in its
permanent physical state that is the first effect of art,
and only secondarily does it serve the end of knowledge.

    Two further difficulties may be raised concerning the
use of the term "art" in the liberal arts. It may be hard
to see (1) why the term is appropriate at all or (2) why, if
it is, the notion of art here   is not identical with that of
the several arts.

It is perhaps more difficult to see why arithmetic, geometry, and logic are arts at all than it is to see how poetry, rhetoric and music are liberal arts. St. Thomas speaks of all the liberal arts as being speculative essentially, but, since they include something per modum operis, they are called arts.

> "Ad tertium dicendum, quod omnis applicatio rationis
> rectae ad aliquid factibile pertinet ad artem: sed
> ad prudentiam non pertinet nisi applicatio rationis
> reotae ad ea, de quibus est consilium: et hujusmodi
> sunt, in quibus non sunt viae determinatae perven-
> iendi ad finem, ut dicitur in 3, Ethic. (cap.3.); quia
> ergo ratio speculativa quaedam facit; puta syllogismum,
> propositionem, et alia hujusmodi, in quibus proceditur
> secundum certas, et determinatas vias; inde est quod
> respectu horum potest salvari ratio artis, non autem
> aliqua prudentia." (8)

What is this "work" performed by the liberal arts? St. Thomas illustrates here by reference to the forming of a syllogism. Elsewhere, he speaks of measurement, the making of a correct sentence or measurement.

> "Vel ideo haec inter caeteras scientias, artes dicuntur,
> quia non solum habent cognitionem, sed opus aliquod,
> quod est immediate ipsius rationis, ut constructionem,
> syllogismum, et orationem formare, numerare, mensura,
> melodias formare, cursus siderum computare. Aliae vero
> scientiae vel non habent opus, sed cognitionem tantum,
> sicut scientia divina et naturalis, unde nomen artis
> habere non possunt, cum ars dicatur ratio factiva, ut
> dicitur VI Eth., vel habent opus corporale, sicut medi-
> cina, alchimia, et hujusmodi. Unde non possunt dici
> artes liberales, quia hujusmodi actus sunt hominis ex
> parte illa qua non est liber, scilicet ex parte cor-
> poris. Scientia vero moralis, quamvis sit propter
> operationem, tamen illa operatio non est actus scientiae,
> sed actus virtutis, ut patet V Ethic., unde non potest
> dici ars, sed magis in illis operationibus se habet
> virtus loco artis: et ideo veteres definierunt
> virtutem esse artem bene recteque vivendi, ut dicit
> August. X De Civit. Dei. (9)

What is meant seems to be that in order that we can

manifest, say, the properties of number, it is necessary to
measure one number by another, or in order, that we can demon-
strate the nature of a syllogism it is necessary for us first to
make one in order that we can reason about it. It is this
prior formation or this imaginative construction (in the case
of mathematics) that is of the nature of art.

Another characteristic shared by both liberal arts and
those concerned primarily with the transformation of matter
is that they proceed per vias determinatas, in contrast to
the mode of prudence which proceeds precisely per vias
indeterminatas through the maze of contingent circumstances
in which every human action is involved. Just as the sculp-
tor must find the precise way necessary to the making of a
statue he has conceived, so the logician or the mathematician
must proceed according to the order of the object of their
discipline if they are to demonstrate its properties.

From this similarity between art in its ordinary accep-
tation and the liberal arts some have wished to conclude that
the liberal arts are really not purely speculative at all but
that they are really practical like all the other arts. This
cannot be, since the objects of the logical disciplines are
beings of reason and hence are not operable. It might be
shown too that the objects of mathematics are conceived likewise
in a way that precludes existence, and hence they are not oper-
able either. A further reason for denying that liberal arts
are arts simpliciter is that the direction and the making of the
strictly logical arts (not rhetorica and poetíca utens) is

effected by reducing propositions to their principles after
the manner of speculative discourse, and not of composing the
constitutent parts of things in order to bring them into
existence. The logical arts tend to their object by a natural
and not an artificial likeness of their subject. Thus any
suggestion that the liberal arts are really arts in the servile
sense must be idealist, since it has to assume that the objects
are measured by the mind as they are in the non-speculative arts,
and not the mind measured by the object as it must be in any
speculative habit. It is in order that it may demonstrate that
the mind forms for itself proper representations of the objects
of the strictly logical arts and its direction in the case of
the logical arts consists in defining these natures and in demon-
strating the properties that belong to them in virtue of their
definitions.

In summary then, the liberal arts are speculative habits
concerned either with human discourse or with the fundamental
species of quantity either as they are in themselves or inasmuch
as they help to manifest the properties of natural being. They
are called arts because the mind must form within itself either
examples of discourse upon which to reason and discern the
various second intentions or figures and constructions that
will better manifest the properties of mathematical objects.
They differ from other arts in that they are purely speculative.
We must next discover which are arts of discourse, what their
order is, and then discuss briefly the arts of quantity.

In the commentary on the sixth book of the Ethics, St.

Thomas indicates the order of studies to be pursued by any one
who wishes to attain wisdom in the natural order.

> "Erit ergo congruus ordo addiscendi, ut primo quidem
> pueri logicalibus instruantur, quia logica docet modum
> totius philosophiae. Secundo autem instruendi sunt in
> mathematicis quae nec experientia indigent, nec imagin-
> ationem transcendunt. Tertio autem in naturalibus; quae
> etai non excedunt sensum et imaginationem, requirunt
> tamen experientiam. Quarto in moralibus quae requirunt
> experientiam et animum a passionibus liberum, ut in primo
> habitum est. Quinto autem in sapientialibus et divinis
> quae transcendunt imaginationem et requirunt validum
> intellectum." (11) ·

It is to be noted that the first two studies are none
other than logic and mathematics, or, in other words, at least
some of our liberal arts. In another passage, St. Thomas quotes
an objector who divides philosophy into rational philosophy
and mathematics (the two divisions of the liberal arts). In
his answer to this objection he does not object to calling
all the arts of the trivium rational philosophy, but merely
says that the division of disciplines into the trivium and
quadrivium is not an adequate division of philosophy. Speaking
of all the arts he says they are like paths whereby the enlivened
mind enters into the secrets of philosophy.

> "Ad tertium dicendum, quod septem liberales artes non
> sufficienter dividunt philosophiam theoricam, sed, ut dicit
> Hug. de St. Vict. in III sui Didascalon, praeter missis
> quibusdam aliis connumerantur, quia his primum erudiebantur,
> qui philosophiam discere volebant, et ideo in trivium et
> quadrivium distinguuntur, eo quod his quasi quibusdam viis
> vivax animus ad secreta philosophiae introeat. In hoc
> etiam consonat verbum Philos. qui dicit in II mets.
> quod modus scientiae debet quaeri ante scientias, et
> Commentator ibidem dicit, quod logicam quae docet modum
> omnium scientiarum, debet quis ante omnes alias scientias
> addiscere, ad quam pertinet trivium. Dicit etiam in VI
> Eth. quod mathematica potest sciri a pueris, non autem
> physica quae experimentum requirit, ex quo datur intelligi
> quod primo logica, deinde mathematica debet addisci, ad
> quam pertinet quadrivium, et ita his quasi quibusdam viis
> praeparatur animus ad alias physicas disciplinas.

From this it is fairly clear that when St. Thomas speaks of logic in the passage on the order of learning quoted from the commentary on the Ethics he is referring to all the arts of discourse. What makes this quite certain is a long passage from the biginning of the commentary on the Posterior Analytics. St. Thomas first points out the necessity of reason and art for the conduct of human life. What other animals accomplish by nature alone, we accomplish only by the exercise of our powers as perfected by a great number of habitus that allow us to accomplish our natural purposes by the appropriate means. Amongst the powers whose operation must be directed by the proper intellectual habitus is the reason itself. The intellect must reflect on itself in its pursuit of understanding and so discover the proper art whereby we can reason in an orderly, easy, and accurate manner. (13) This art that directs reason itself is logic or rational philosophy. (14) Ths divisions of logic will follow the divisions of the acts of reason. Directive of the first act of the reason is the first of the treatises of the Organon, the Categories. The second act is directed by the Peri Hermeneias. All the other logical treatises direct the third act of reason. (15) St. Thomas orders all these other logical treatises by means of a comparison with the operation of nature, which art, including logical art, imitates.

"Attendum est autem quod actus rationis similes sunt, quantum ad aliquid, actibus naturae. Unde et ars imitatur naturam in quantum potest. In actibus autem naturae invenitur triplex diversitas. In quibusdam enim natura ex necessitate agit, ita quod non potest deficere. In quibusdam vero natura ut frequentius operatur, licet quandoque possit deficere a proprio actu. Unde in his necesse est esse duplicem actum; unum, qui sit ut in pluribus,

sicut cum ex semine generatur animal perfectum; alium
vero quando natura deficit ab eo quod est sibi con-
veniens, sicut cum ex semine generatur aliquod monstrum
propter corruptionem alicuius principii. Et haec etiam
tria inveniuntur in actibus rationis. Est enim aliquis
rationis processus necessitatem inducens, in quo non est
possibile esse veritatis defectum; et per huiusmodi
rationis processum scientiae certitudo acquiritur. Est
autem alius rationis processus, in quo ut in pluribus verum
concluditur, non tamen necessitatem habens. Tertius
vero rationisprocessus est, in quo ratio a vero deficit
propter alicuius principii defectum; quod in ratiocinando
erat observandum." (16)

Once this comparison has been made, St. Thomas proceeds to
explain its application to all the books of logic.

"Pars autem Logicae, quae primo deservit processui, pars
Iudicativa dicitur, eo quod iudicium est cum certitudine
scientiae. Et quia iudicium certum de effectibus haberi
non potest nisi resolvendo in prima principia, ideo pars
haec _Analytica_ vocatur, idest resolutoria. Certitudo
autem iudicii, quae per resolutionem habetur, est, vel ex
ipsa _forma_ syllogismi tantum, et ad hoc ordinatur liber
Priorum analyticorum qui est de syllogismo simpliciter; vel
etiam cum hoc ex _materia_, quia sumuntur propositiones
per se et necessariae, et ad hoc ordinatur liber _Poster-
iorum Analyticorum_, qui est de syllogismo demonstrativo.
      Secundo autem rationis processui deservit alia pars
Logicae, quae dicitur _Inventiva_. Nam inventio non semper
est cum certitudine. Unde de his, quae inventa sunt,
iudicium requiritur, ad hoc quod certitudo habeatur.
Sicut autem in rebus naturalibus in his quae ut in plur-
ibus agunt, gradus quidam attenditur (quia quanto virtus
naturae est fortior, tanto rarius deficit a suo effectu),
ita et in processu rationis, qui non est cum omnimodo
certitudine, gradus aliquis invenitur, secundum quod magis
et minus ad perfectam certitudinem acceditur. Per
huiusmodi enim processum, quandoque quidem, etsi non fiat
scientia, fit tamen fides vel opinio propter probabilitatum
propositionum, ex quibus proceditur: quia ratio totaliter
declinat in unam partem contradictionis, licet cum formidine
alterius, et ad hoc ordinatur _Topica_ sive _Dialectica_. Nam
syllogismus dialectious ex probabilibus est, de quo agit
Aristoteles in libro Topicorum. Quandoque vero, non fit
complete fides vel opinio, sed _suspicio_ quaedam, quia non
totaliter declinatur ad unam partem contradictionis, licet
magis inclinetur in hanc quam in illam. Et ad hoc ordin-
atur _Rhetorica_. Quandoque vero sola existimatio declinat
in aliquam partem contradictionis propter aliquam repraes-
entationem, ad modum quo fit homini abominatio alicuius
cibi, si repraesentetur · sub similitudine alicuius

abominabilis. Et ad hoc ordinatur Poetica; nam poetae
est inducere ad aliquod virtuosum per aliquam decentem
repraesentationem. Omnia autem haec ad Rationalem
Philosophiam pertinent: inducere enim ex uno in aliud
rationis est." (18)

From this text and the one from De Trinitate (18), it is

clear that "rational philosophy" includes all the arts of

discourse, the artes sermocinales of the trivium. It is

this wide meaning of "logical arts" (logicalibus) that is

intended in the text from the commentary on the Ethics wherein

the order of learning is set forth. (11)

It is important next to make a few remarks on the order

of the arts.

In the long passage just quoted from the Commentary on

the Posteriora, St. Thomas orders the artes sermocinales accord-

ing to their perfection. The mind is determinedly in possession

of its good, the truth, when it has a certain knowledge through

causes of necessary things. It is only partially determined

when it knows through only probable premisses and it is still

less determined when the arguments used have to be based at least

partially on appeals to the passions. It is least of all de-

termined when the adherence of the intellect is secured through

the beauty of certain imitations. It is for this reason that St.

Thomas begins his list with demonstration and ends with poetry.

In the order of learning, however, the mind begins not with

demonstration but with grammar and poetry because of its lack

of formation and because of the strong imaginative element in

poetry. Only when it has been gradually awakened through poetry

and rhetoric can the mind enter seriously into dialectic; and

the sole gateway to demonstration, at least in philosophical matters, is dialectic. Since the main importance of the liberal arts is that they prepare the mind for wisdom, it is appropriate to consider them in the order of generation rather than in the order of perfection. It is this order that we shall follow throughout.

St. Thomas and Aristotle have pointed out in several passages quoted above that logic must precede the other sciences not because of its greater facility but because of its indispensability. However, if we remember that logic is arrived at through an investigation of the act or reason itself, that it deals with second intentions, it will become perfectly evident that it is impossible to acquire this art without some rather considerable acquaintance with the various kinds of human discourse. In other words the priority of logic is not a simple temporal one. It is impossible to possess the other sciences perfectly without logic, but it is not possible to possess logic without some experience of poetry, human affairs (as revealed by direct experience and by history) dialectical discourse and scientific reasoning. The acquiring of logic and of the experience on which it is based should proceed pari passu, with experience having the absolute priority in time, and with logic having a priority of act since the perfection of the other sciences and their critical defense and/or judgment depends on logic.

In more concrete terms, for instance, it is impossible to teach the _Posterior Analytics_ without a rather good idea of geometry or arithmetic. Once the _Posterior Analytics_ are known, one's understanding of Euclid would be deepened and made more perfect, since it would be more possible to defend objections against Euclidean geometry. In this sense mathematics comes after logic, but a fairly thorough study of mathematics may be supposed to have preceded a critical reappraisal by logic.

The reason the mathematical sciences are the first to be studied after logic is, as St. Thomas indicates, that they require little experience. Once they are learned, geometry and arithmetic can be used to study natural phenomena. It is this application that gives us the remaining two arts: astronomy and music, in the traditional sense of the theory of music.

CHAPTER TWO

GRAMMAR

The notion of grammar as expounded by most ancient writers

is extremely wide. They speak of it as the art of reading,

writing, and speaking correctly. For many of them the notion

of reading involves not only this ability taken in the ordin-

ary sense of the terms involved, but also the ability to judge

historians and poets. Fairly typical of such descriptions is

the one given by Dositheus.

> "Grammatica quid est? Scientia interpretandi poetas at-
> que historicos et recti scribendi loquendique ratio...."(1)

To this we should add the longer exposition given by Diomedes

in the third century.

> "Grammatica est specialiter scientia et expositio eorom
> quae apud poetas et scriptores dicuntur; apud poetas ut ordo
> servetur; apud scriptores ut ordo careat vitiis. Grammati-
> caepartes sunt duae, altera quae vocatur exegetice, altera
> horisice. Exegetice est ennarativa, quae pertinet ad officia
> lectionis: horistice est finitiva, quae praecepta demonstrat,
> cuius species sunt haec, partes orationis, vitia virtutesque.
> Tota autem grammatica consistit praecipue in intellectu
> poetarum et scriptorum et historiarum prompta expositione et
> in recte loquendi scribendique ratione." (2)

Some writers even went further and include in grammar, philoso-

phy, and whatever else is useful as a background for oratory.

Notable amongst those who held this view is Quintilian. (3)

All these descriptions of grammar are valid as describing

the educational practice of their time, but they do not give us

what is formally constitutive of grammar. In order to see this

clearly, it is necessary to distinguish a great number of
disciplines which share wholly or in part the same material
object as grammar but each of which view it under a different
formal light.

It is clear that grammar, poetry, rhetoric, philolo gy,
anthropology and logic all study words. If we distinguish
between what is entitative, material, physical in words, from
what is formal in them, we will see that all except logic are
concerned with the first aspect. Most of them are concerned
with what is formal, too, but mainly as a means of under-
standing what is entitative. Let us discuss the formal object
of each of these disciplines in order to see that this is true.

Grammar, by its etymology, is concerned mainly with letters,
what is necessary to write correctly. It classifies existing
ways of speaking and writing and distinguishes good usage from
poor. The basis of such classifications must remain practice.
The grammarian must always proceed a posteriori; he can never
go beyond the warrant of the best spoken and written language
he studies. This is evident in the fact that writers and
speakers sometimes invent usage and later the grammarians
accept it. It is also evident in the difficulties that arise
when something written in a language highly developed for the
use of abstract thought has to be translated into a language
that is not so developed. It is necessary to invent usage and
words on the spot, and it is not the grammarian who does it.

The grammarian must study not only what is material in
words, but also he must account for their differences through

the meanings that they are designed to express. The distinction between the subjunctive and the indicative mood is not understandable without reference to what is formal in words: their significance. Still, the grammarian does not study this a priori and then descend to what is material, the form that expresses these two moods. On the contrary, he starts with the fact of their distinction and explains the difference, when it exists. In languages where no such distinction is made, the grammarian has nothing to say about it.

The poet and the rhetor both must study words as they are used by their respective arts. Since they both aim to move the passions it is necessary that they consider not only the abstract significance of the words as symbols of an idea but they must also consider what is entitative and physical in them. It is these qualities that first strike the senses and rouse the asocciations evocatory of emotions. Many words have highly imitative structure. Their sound recalls the objects they signify. Their rythm and quantity suggest things in their concreteness. It is this physical echoing that is important to the poet and the rhetor. He must choose between various words that express the same fundamental idea but with different emotional connotations.

Philology studies words in their material aspect with little or no attention to their significance. Its intention is to lay bare the rules that govern the mutation of vowels and consonant sounds from one language to another or historically within the same language. Out of philology has arisen the

the anthropological investigation into the origins of language
and speculations as to whether all later languages have evolved
from one common form of speech. These investigations are part
of natural doctrine since they aim to study the phenomena of
human speech in order to discover the laws that have governed
its formation, as far as this can be traced in what is physical.
This procedure is very different from that of grammar where
the end is reached when there is a mere constatation of correct
usage.

Logic too must concern itself with words inasmuch as they
are the means of expression of the second intentions that are
its proper object. Aristotle speaks at length of noun and
verb at the beginning of the Peri Hermeneias. (4) In commenting
on this same treatise, St. Thomas says of words that they are
purely conventional signs of the ideas they represent. (5)
In saying this, St. Thomas as always is placing himself in the
formal viewpoint of the treatise under consideration. Logic
can neglect all that is natural in words: their onomotapoietic
character, their quantity and quality, their emotional overtones.
Hence it can regard words as pure signs ad placitum, which
found certain second intentions. It would be an error to ex-
tend this view to all considerations of the word, since thereby
poetry, rhetoric, and linguistics would be destroyed.

The ancients who made the study and interpretation of
poetry part of grammar were led to do this because of their
common material object. St. Thomas placed himself at the point
of view of the formal object and found poetry to be the art

of imitation in words just as rhetoric to be the art of persuasion in practical matters. Hence the study of the rules that govern poetry (and rhetoric) belongs to rational philosophy, "the inquisition that reason makes into its proper act" in order that it may proceed without error.

Another reason for this confusion of the ancients is that for many of them, particularly the Romans, rhetoric was the highest exercise of the human mind. All other disciplines prepared for it. Thus the reading that supplied vicarious experience and models of elegant language were all regarded as serving that end and so could be grouped under the single heading of the art that taught the fundamentals of reading and speaking. However as Aristotle points out man is not the highest thing in the universe, and so rhetoric, the instrument of politics, is of lesser importance than many other studies.

St. Thomas accepts and defends the Aristotelian view of the ordination of all practical concerns to contemplation and so all studies are ordered to wisdom. Grammar is a pure instrument necessary in order that we can communicate accurately. It is not even the proper instrument of reason that guides it in its own act. This belongs to arts that constitute rational philosophy: demonstrative logic, dialectics, rhetoric and poetry. All of the arts have a relatively humble role. Their end is not in themselves but to prepare the mind for philosophy, as St. Thomas, following Hugh of St. Victor realized. Amongst these arts the humblest is grammar. Logic at least can be scientific, since it can discover the necessary reasons that order human discourse; grammar can only order
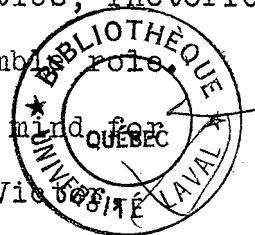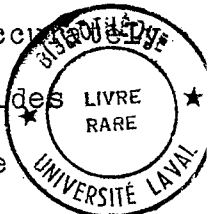
what is given, when it is given. Its reasons are always the contingent ones of use.

Even St. Augustine shared the notion of Quintillian that all the arts were ordered to eloquence rather than to science.(7) For him eloquence in view was sacred eloquence, and grammar, inclusive of all the other arts except rhetoric, was intended to make the reading of the text of the scriptures possible. It was because astronomy, poetry, and all the other arts could throw some light on obscure passages that they should be studied. This broad Augustinian notion of grammar as fundamental to the sacred sciences dominated most of the period between him and St. Thomas. (8) It was only the later adaptation of the Aristotelian notion of science to theology that enabled scholars in the Thomistic tradition to order all the arts to philosophy and philosophy itself to theology.

One way of expressing the Augustinian notion of grammar is to say that it is the art of reading signs. It calls to its aid all the other arts, and even philosophy, in its effort to penetrate the obscurity of some of the signs in sacred scripture that contain God's revelation. It is perhaps a mistaken continuation of an aspect of this tradition that is responsible for the proliferation of "speculative grammars" in the middle ages. (9) These treatises attempt to find necessary reasons for the facts of morphology and syntax of Latin grammar. It is obvious that there are possible a certain number of forms of expressing things. This eternal possibility founds not grammar but the science of second intentions, logic. In attempting to

make this necessity inhere in the works of the latin language
as it had developed, they ignored the purely contingent and
historical character of language and submerged grammar in
logic.

CHAPTER THREE

POETRY

Poetry is defined by Aristotle as the art of imitating
human actions in words. (1)

Imitation is an extremely complex notion, defined generally
as similitude expressed from something else. (2) By simili-
tude is meant sameness with respect to quality, just as identity
is sameness of substance and equality is sameness in quantity.
Imitation is not mere similitude, however. Two eggs may be
similar, in shape, but one is not an imitation of the other.
To have an imitation we must have a similarity that comes by
way of origination from an exemplar. (3) The quality of an
original must be the source of the likeness in the imitation.(4)

Action,which poetry imitates principally, is not itself
a quality if we consider it as influencing its term. A quality
is that which modifies either by ennobling or deforming, a
subject. Since an action in its transitive aspect tends to
modify something outside the subject, it belongs to another
category than that of quality. If, however, we consider the
action in its principle, as something produced by a power and
not only a power, but by a more or less permanently disposed
power, which in action is brought to a new kind of actuality,
it becomes plain that action is reducable to habit or disposi-

tion. This is the first species of quality. The interest we find in all human actions is attributed to the fact of this reducibility of the transitive to an immanent principle. Mere physical action is not interesting, but we are always intrigued by any manifestation of the inner determination of a will and of the mind that directs it or of the turbulence of the passions aa they play their obligato of accord and discord alongside our rational processes.

It may seem strange to insist that poetry deals with human actions. We are accustomed to think of poetry as rivalling philosophy in the breadth and profundity of its subject matter. There are, or seem to be, poems dealing with nearly all subjects, including God. Dante has written an epic that conveys a great deal of Scholastic theology; Chaucer has written profoundly of free-will and Lucretius has written a passionate plea for atheism. Would not all these profound themes show that poetry is not confined to an imitation of human action? Beside this there are poems about nature and about animals. Thus it seems that poetry not only imitates man's actions, but what is above and below him.

This objection seems stronger than it is. The first thing to remark is that poetry treats of all objects, man's actions and the things above and below him in the poetic mode and not the scientific one. What this poetic mode is will be explained shortly. Later chapters will make it possible to compare other kinds of doctrine with the poetic. Secondly, poetry

tends to treat of nature and animals as having qualities that are properly human or as affecting somehow or other man's feelings or causing him to make some decision. In other words what is treated is human action or passion in its cause. Even when treating of God or free-will or atheism the great poets succeed in relating them personally to the individual so that what is uppermost is the determinations of an individual's destiny by ultimate reality. What is conveyed is not theology, but an imaginative presentation of the effect of certain truths in their application to individuals in their temporal existence. St. Thomas has an importat text wherein he says that poetry uses images essentially[because of the weakness of the objects portrayed, whereas theology uses them incidentally because of the weakness of our minds. What is weak and uncertain is the destiny of the individual even as determined by grace. The individual is subject to contingency. Hence, about him there can be no science. There can and should be poetry. This will become more evident if we investigate the meaning of the scholastic dictum that poetry is an _infima doctrina_.

If we take a statement like "every tringle has its angles equal to two right angles", we have a truth that can be seen upon evidence. By making certain constructions it will be seen that the other two angles are precisely equal to the complement of the third angle. The constructions have served to manifest this as a property of the nature of triangle. In view of the nature thus manifest, we see that it must be so.

In other words, we have seen the evidence for the statement and our adherence is compelled. As we shall see it is the various ways of causing our adherence to a proposition that distinguishes the kinds of doctrine.

Poetry, unlike geometry, does not present the mind with evidence that compels the assent. The poet does, far more than the geometer, make constructions. In fact he constructs his whole subject. It is essential to him to proceed by fictions. It is not things as they are in the ordinary world that are poetic. A bird considered biologically or taxonomically is an exceedingly prosaic thing. It is not thus that the poet presents him. His lark at Heaven's gate arises, or his raven croaks everlastingly on top of battlements as a symbol of despair. Men too as they appear in poetry appear only as interesting beings - either as attractive or repulsive, or pitiable, but never merely neutral as in the statement that in man the cogitative sense is the basis of induction. The reason for this is that poetry essentially requires the adherence of our appetite to make us accept the truth of its fictions. It is this adherence of the appetite that serves in lieu of evidence. It is for this reason also, that poetry is called infima doctrina. Because, adherence of the mind solely because the appetite is attracted is the lowest kind of adherence in a scale that has as its natural summit adherence because of the perfect possession of evidence.

If the motive for our adherence causes poetry to be the lowest of the intellectual disciplines, it causes it to be

very important indeed in the list of things that dispose us for
the moral life. Poetry is an imitation of human actions, an ·
imitation that is an ·imaginative representation that allows us
to become aware of them in their sensible character. We become
aware of struggle, effort, achievement or frustration as it is
for some character envisioning his own ends. The fact that
actions are so imaginatively presented makes it possible for
the representation to engage the sense appetites. We see a
character whom we admire achieving a certain success or suffer-
ing frustration, and so we are moved to joy or to pity, or we
see some one we disapprove failing or succeeding and so we are
moved contrariwise. This is to say that our sense appetites
are moved in a way conformable to reason. St. Thomas following
St. John Damascene, defines the passions as the movement of
the sense appetites according to a suspicion of good or evil.(5)
The good or evil spoken of is the good of the appetite, Such a
movement is morally good when it follows the judgement of reason
and evil if counter to reason. Poetry is precisely a means of
exciting us to appropriate feelings. This is the primary sense
in which poetry is said to lead toward virtue.

The importance of this function can be seen from some of
the things that St. Thomas says about the role of passions in
the moral life. He speaks of the fact that temperance cannot be
attained except in a certain mean of feeling about the objects
of the concupiscible appetite. (6) Insensitivity is a vice ·
also just as over-indulgence in sense pleasures. (7) To rejoice
with those that rejoice and to mourn with those that mourn is

a christian formula, but it is also an essential constituent
of friendship which is an important and necessary virtue for
the social life. (8) St. Thomas also says that anger is im-
portant for the acquiring and preserving of virtue, and hope
and boldness are obviously needed. (9) Boldness is so im-
portant that fortitude is actually denominated from it as the
principle constituent of the irascible appetite.

Negatively too, ·this same importance of the passions can
be shown. The effects of lust in obstructing all the essential
acts of prudence have been noted by St. Thomas. (10) The same
is true of the effects of _accidia_. (11) The list could be
prolonged until all the vices contrary to either temperance or
fortitude have been mentioned. This is not necessary. The
point that·is important now is that poetry portrays the object
in such a way that passions are aroused conformably to reason
and the constriction of the appetite to a single customary
aspect of an object can thus be obviated. This is the true
sense of catharsis.

Poetry cannot certainly engender virtue. Only a repetition
of voluntary acts performed under varying circumstances can be
the proper cause of natural virtues. (12) It can however,
arouse our sense appetites with respect to certain objects
by introducing a special kind of order into their objects and
so render these appetites themselves less gross and less in-
discriminate. The discovery of alternate objects causes them to
be less determined to one thing as they are in the case of
animals.

One special kind of poetry, the fable, conduces toward virtue in another way, that is by directly preaching it. The manner of preaching remains poetic. Good conduct is portrayed as essentially desirable and evil as unpleasant or foolish.

It may be objected that there is bad poetry as well as good poetry. Pornography too may be beautiful and there can be poetry leading to hate. The list can be multiplied.

The essential principal to be kept in mind is that poetry is a doctrine, a means of leading people to the truth. Its means is not evidence, but beauty in representation. The appetite leads us to adhere because the representation is beautiful. If poetry can remain poetry and yet cause us to adhere to something as good when that thing is essentially evil, then poetry becomes sophistry. It is the sophist whose role it is to lead to error by artful processes. True poetry is always distinguished from sophistry by Aristotle and St. Thomas. Perhaps there might be a distinction within sophistry of deception effected by means of a misuse of discourse and deception effected by a false use of imitation.

Further, it ought to be pointed out that the effect of poetry upon appetite depends in large measure upon the appetite. A consideration of the erotic, that might be a means of evil pleasure for a young man might lead to a purgation and release for another man more experienced or perhaps for one already given to vice.

Lastly, certain presentations of the object are so intense as to prevent the continued use of the intelligence and the

imagination. This is particularly true of pornographic writing. Such an excitation is contrary to the rational control of imagery that belongs to poetry.

If moral development, disposition toward virtue is the chief effect of poems - or poetica utens, to use the scholastic term, the importance of poetica docens is speculative. By poetica docens is meant the attempt to define and analyze poetry. In its more general consideration are found/a discussion of the nature of the poetic effect, and of the main kinds, indeed, the kind of language proper to poetry - in other words, such discussions as those of Aristotle in the Poetics.

Such considerations seem to be part of logic, because they are an analysis of second intentions in view of finding how the act of reason is directed. Along with the theoretical aspect of rhetoric, poetica docens has to borrow from ethics and psychology certain considerations of the passions since an essential aspect of both rhetoric and poetry is an appeal to the emotions. This borrowing from other disciplines does not mean that poetry in its scientific aspect is any the less logical. What is borrowed is not treated for its own sake, but is used only to reveal the nature of the act of reason in making poetry. In fact, the nature of the passions is never discussed formally in poetry. A nominal definition suffices, as it does in rhetoric.

The theoretical importance of poetical speculation is manifold. Positively, poetry terminates in science at least about certain definitions and certain fundamental demonstrations that

are reducible to these definitions. Furthermore reasoning about poetry is an excellent dialectical exercise, especially for the young who have little experience. Along with this there is the satisfaction of making valid judgments about poetry.

Negatively, speculation about poetry enables us to isolate poetical procedure from other ways of knowing and so enables us to be on our guard against using it where it has no place (in scientific discourse for instance). Not only will we learn to avoid this confusion ourselves, but we will be less exposed to being taken in by others who do so either knowingly or not.

The bad repute which theories of poetry have acquired may be ascribed to several causes. One of them is the illusion that they are proposed as guides to writing poetry. Like all parts of logic, poetry is a critique, something useful in judging an in- tellectual production after it has been made. It enables us to detect flaws and to recognize excellence, and guides the poet only remotely.

Another reason for the low opinion often held of poetical criticism is the confusion between certain propositions and demonstrations (usually very general) which are scientific, and dialectical considerations based upon the taste of a particular writer or a particular age. An example of the first sort of consideration is the Aristotelian consideration of tragedy; of the second, discussions of scenery and lighting.

It ought to be remarked also that _poetica utens_ has also considerable intellectual importance, both speculatively and

practically. In poetry there are collations of apparently

disparate facts in virtue of a relationship that might otherwise

not be noticed. This use of the imagination and its control by

the intelligence is fundamental in many types of investigation.

Not the least of these *are* is the dialectical considerations involved

in modern experimental research and in much practical thinking.

There can be little doubt upon the separateness of the habitus

of _poetica utens_ and _poetica docens_. The poet possesses as his

primary characteristic a great sensitivity. In his consciousness

his awareness of the affective qualities of things is given with

greater immediacy and vividness. On the one hand he has greatly

developed senses and on the other he is more conscious than most

of the relationship of the objects of his senses to his appetites.

By "developed senses" is meant particularly the internal senses,

imagination, memory and above all the cogitative. Through the

cogitative sense one is aware of the relationship of things to

one's welfare. It is this awareness of this connatural aspect of

things that allows the poet to seize upon apt means to "seduce the

intellect" into accepting his fictions.

This in no way denies the intellectual character of the poetic

work. Directing and coordinating all this awareness of sense

quality is the mind. Metaphor, the great resource of the poet,

involves an awareness of relation. This alone of all the categories

is purely intellectual. Even substance is a _sensible per_

accidens.(13) Furthermore, the fictions of the poet are not

confined in the haphazard of the "va-et-vient" of sense impressions,

but they are ordered in a highly rational and intelligent way.

In this connection, it may be interesting to note that the object as presented by the poet represents a special kind of universality that is to say a special kind of spirituality. Aristotle made the cryptic remark that poetry is more universal than history. (14) One of the reasons for this is that the event as recounted by the historian does not possess eminently the characteristics proper to objects that have been abstracted by the mind. The discussion of the battle of Waterloo does relate events that possess at least some of their unity from the mind, but"the Battle of Waterloo" isn't something whose nature I can state in an essential definition anymore than, "Napoleon" or King John" can so be defined short of losing their individuality in "Man".

The poetic object is not the abstract concept of speculative science either. Poetry dies when it strays too far in directions where imagination cannot follow. Yet the "Skylark" in the poem is not the "Skylark" in the fields, nor does "Ozymandias" refer to some individual tyrant. The "Battle of Waterloo" does designate, however confusedly some particular event in its particularity. The poetic object is the more intelligible object that the mind has invented. Poetry proceeds by fictions, and so it is inferior to sciences, which grasp the essences of things. For the very reason that it is, does proceed by fictions that is superior to a kind of discourse that designates vaguely things in their con- creteness. The fictions of poetry are intermediate between the facts of the historian and the concepts of the scientist. They

are fictions, but fictions that bear the marks of their origin in the mind. These mark a greater spirituality and, as a consequence, greater intelligibility and universality.

The hearing of poetry in childhood is an important step in the intellectual life. It excites wonder, disciplines the imagination and the passions. No less important in its way is the critism of poetry. The mind is therein exercised in arguments on familar subjects. Also in seeing the difference between poetry and the other modes of intellectual life we are freed from that evil tendency that wishes to see all thinking reduced to the poetic mode. This is the greatest service rendered by poetica utens.

CHAPTER FOUR

RHETORIC

"Rhetoric is the art of discovering the possible means of persuasion in reference to any subject whatever." (1) Just as in poetry there is a <u>poetica utens</u> and a <u>poetica docens</u>, so we may distinguish the actual practice of the rhetor and the critical work of evaluating this work. This last aspect, like <u>poetica docens</u> is part of logic. The liberal art of Rhetoric consists in both <u>habitus</u>.

In the first chapter of his treatise on the subject, Aristotle compares rhetoric to dialectic. They are both alike in not being confined to a single type of object. Geometry is concerned exclusively with extended quantity, and music is concerned only with passions, but rhetoric and dialectic are disciplines that enable one to discuss a very large number of matters. Indeed, in discussing both of them Aristotle says that they have a universal object. (2)

As we shall see in a later chapter dialectics is used in discussing anything inasmuch as it may be the object of speculative consideration. Rhetoric is a means of persuasion about everything that belongs to political life. Since everything that man knows is either ordered to political life or is the term to which political life is ordered, rhetoric has a truly universal object.

That Aristotle really considers the object of rhetoric to be _materia civilis_, the ensemble of subjects that belong to political life is abundantly evident from reading his treatise. He divides rhetoric into (1) deliberative, or the art of persuading about future events, (2) epideictic, the art that deals with praise and blame, and (3) forensic oratory, the art of sustaining accusations and defense. (3) It is evident that all of these matters belong to the practical life and not to the speculative.(4)

That St. Thomas accepts this view is clear from the meager references to rhetoric that he makes in various contexts. He speaks of it as being a means of persuasion and he says that the object of rhetoric is the singular actions of men. (5) Obviously, then rhetoric can not be a form of argument adopted to speculative science, since the singular as such is not the object of science. He also says that rhetorical argument leads to _suspicio_, (6), and in the treatise on prudence we see how closely this is bound to the moral choice that constitutes prudence. (7)

Rhetoric differs from poetry mainly by being an argument. Poetry seduces the intelligence by the beauty of its fictions.(7a) Rhetoric too depends upon the support of the emotions in order to persuade. The speaker must give his hearers confidence in him as being a morally good person, as being wise, and he must also attempt to enlist their emotions on the side he supports.(8) This, however, is not enough. The rhetor must engage in argument.

Rhetorical arguments consist mainly in enthymemes and in examples. The enthymeme is a syllogism that proceeds from signs and probabilities. (9) Signs belong to two great classes: necessary signs and what may be called simple signs.

Necessary signs are those wherein there is a necessary connection between the sign and the signified. Aristotle exemplifies this by saying that milk is a necessary sign of pregnancy. The two are invariably connected.

Simple signs imply no such necessary connection. Paleness may be a sign of pregnancy or it may not. That a man walks alone in the night may be a sign that he is a thief, or, it may not.

The first kind of sign is called by Aristotle <u>tekmarion</u> (10) and it can be used by the demonstrator, the dialectician and the rhetorician. The reason for this will appear from a consideration of the syllogistic form proper to an argument. If I say, for instance:

> Those that are pregnant have milk,
> X has milk.

the proper syllogistic form is lacking, for in the second figure, one premiss must be negative. (11) But since in necessary signs conversion is possible, I can rearrange the major so that the syllogism will be in the first figure thus:

> Those that have milk are pregnant;
>
> X has milk.

Thus the requisite form is present and the argument holds. Even the rhetorical syllogism, when it proceeds from such signs is unanswerable, (11a) except by denying the existence of the sign.

If we take simple signs though, the case is different. For instance, if I say:

> Those that have tuberculosis have fever;
>
> John has a fever.

it is impossible to get the true syllogistic form by conversion.
Hence the dialectician and the demonstrator cannot use simple
signs. The rhetor can and does use them very often, and hence
it is that St. Thomas says that the rhetorical enthymeme is a
syllogismus detruncatus. (12) He means that the proper syllo-
gistic form is lacking. The usual interpretation of this
mutilation is that the enthymeme is a syllogism where one of
the premisses is not expressed. It may very well happen that
the rhetor will say that "X is pregnant because she has milk",
or, "he is a robber because he walks by night", but the first
statement is capable of becoming a syllogism by a proper and
legitimate statement of the major, but the second is not. The
major there cannot become a universal proposition and so the
syllogism cannot conclude. This is the "mutilated syllogism"
that St. Thomas ascribes to the rhetor. If the rhetor uses a
necessary sign his argument is virtually a true syllogism and
can only be refuted by denying the existence of the sign. In
the rhetorical syllogism refutation is possible by ascribing
the sign paleness, walking by night, etc., to some other cause
than the one proposed.

The enthymeme is a syllogism that springs from signs or
probabilities. By probabilities are meant what appears to be
true to all, or some, or a few without the evidence being clear.
The probable is opposed to the certain, that is to what is known
to be true because one knows the proper cause of the inherence
of a predicate in a subject. I can know for instance that God
is eternal because He is immutable, and eternity is a species

of immutability. If I say that all mothers love their children, my statement is based on experience and is true, _ut in pluribus_, but it isn't certainly true, in advance of further experience, concerning any given mother. The mind possesses no evidence for the necessary and invariable connection of love of children and every mother. We will go into this question of probability at some length in the Chapter on "Dialectics". Suffice for the present to contrast the certainty of the evidence of propositions like "God is eternal" from things true _ut in pluribus_ and to this we should add that the rhetor can use arguments that are much weaker, much less probable than those used by the dialecticians, because of the less intellectual character of rhetoric. The rhetor very often says such things as "Surely she loves her, for, after all she is her mother". Here we have the same assumption of a major that is capable of being a universal proposition and hence of constituting a syllogism in which the necessary form is present. This summary discussion will be completed also in the Chapter on "Dialectics", when we treat of the use of insufficiently proved propositions. The enthymeme, whether springing from signs or from probable propositions is a _syllogismus detruncatus_.

The second form of argument proper to the Rhetor is the example. Just as the rhetorical enthymeme is an imperfect form of the syllogism, so the example is an imperfect form of induction. (13)

In induction we have some such argument as this.
Horse, man, mule, etc., are long lived.

Horse, man, mule, etc., have no bile.
Bileless animals are long lived.

It will be seen immediately that this argument is invalid
unless "Horse, mule, man, etc.," include all the animals that
have no bile. If this is so the minor premiss is convertible
and so we have a valid syllogism in the first figure. Another
way of saying that the minor premiss is convertible is to say
that there must be a complete enumeration of particulars.
Only through such an enumeration can the convertability of
bileless animals and "horse, mule, man, etc." be assured. (14)

Induction is of various kinds. There is a special form of
induction whereby we come to the knowledge of first principles.
This is an important instance of the principle that all our
knowledge comes through the senses. The various knotty problems
involved in discussion of this kind of induction are not
germane to a discussion of rhetoric, so we can leave them out
of the present considerations.

Still another use of induction is not precisely proper to
rhetoric. When the individuals to be enumerated are species,
say the kinds of triangles, for example, induction can very
easily become a strictly scientific instrument. Here the con-
version of the minor premiss is immediately possible and in-
duction is reducible to the syllogism.

Besides these forms there is another much commoner one
where the induction must cover a great number of sense parti-
culars. Here the enumeration can never be complete. We say,
for instance, that snow is white in view of a very great sense
experience. We cannot know with absolute certainty that this

is so unless we can extend our experience to cover all instances of snow past, present, and future; or, and this is another case, unless we can discover something about the nature of snow that guarantees that white would be an invariable predicate. In fact we have neither of these grounds for being sure that all snow is white. Hence this proposition is what St. Thomas calls an _universale ut nunc_. (15) This will be discussed in its proper place in the chapter on dialectics.

It is to this last kind of induction that the example used by the rhetorician bears the greatest resemblance. The use of the example may be illustrated simply. Suppose we wish to argue against a measure making illegal the use of mild narcotics like tea, coffee, and tobacco. We might argue thus:

> Prohibition of alcoholic beverages in the United
> States proved to be unenforcable. This prohibi-
> tion was an attempt on the part of the State to
> invade the field of strictly private morals.
> Prohibitions of tea, coffee and tobacco are like-
> wise in the field of private morals.
> Therefore, the prohibition of tea, coffee, and
> tobacco would be unenforcable.

Prohibition, of alcoholic drinks, here is chosen as an example of an unenforcable law. Its value as an example depends primarily on its being well known and admitted by all. It must be better known than the object of immediate concern - tea, coffee, and tobacco. (16) Because it was a failure and because a common predicate - namely belonging to the sphere

of private morals, attaches to it and to the object of present interest, we conclude that the prohibition of tea, coffee, and tobacco would be unenforcable.

The relationship of the example to induction is clear. In an induction we would have to say:

Prohibition of alcoholic beverages etc. was unenforcable.

Prohibition of alcoholic beverages etc. belongs to private morals.

Hence public prohibitions of what belongs to private morals are unenforcable. The value of this as an induction would depend either on the completeness of the enumeration of terms, indicated by the "etc." of the above example, or upon the discovering of a relationship between the major and minor terms. By this last phrase is meant that the induction might suggest a true middle term and then the argument would belong to the true syllogistic form and not to the inductive. Once established, the conclusion could serve as a major term of a new syllogism whose minor would be "the prohibition of tea, coffee, and tobacco belongs to private morals". From this the desired conclusion could be drawn.

The example uses one striking instance instead of the complete enumeration of particulars. We might call the example a very incomplet e induction.

These two arguments, enthymeme and example, constitute the proper mode of rhetorical argument. This is the core of rhetorical proof as we have seen. Associated with rhetorical arguments proper are attempts on the part of the speaker to cause the hearer to regard him as a reliable and just person.

the
Also there must be attempts to arouse/passions of the hearer
in a direction favorable to the pleader's cause. These three
attempts together - argument, establishment of the speaker's
trustworthiness, and the stirring of the hearers' emotions
are what are called artificial proofs. (17) They are arti-
ficial because they depend upon the work of the rhetor for
their existence. Unless he works them up they do not
necessarily exist. They are the proper object of the rhetor-
ical art.

Associated with these artificial proofs are natural ones
like the testimony of witnesses, mute evidences like blood-
stained garments etc. (18) These must be joined with the
artificial proofs and used skillfully by the rhetor to support
his case. The way these natural things are used belongs to the
rhetor's art. Their existence belongs to nature. They are
material for presentation in one form or another by the rhetor.(19)

Though rhetorical argument proper is the central part of
the rhetor's work, Aristotle insists very much on the importance
of those devices whereby a speaker can insinuate his own re-
liability and good will and a great deal of his treatise is
concerned also with the means of making a satisfactory emotional
appeal. The reasons for this are fairly obvious if we con-
sider either the nature of rhetoric or the nature of rhetorical
argument proper.

Rhetoric is the art of persuading any hearer, including
even an uninstructed one concerning practical matters, that is
concerning things that involve the appetite. This is true of

each of the main divisions of rhetoric. Speeches concerned
with praise and blame involve standards of conduct not theoreti-
cally or remotely, but as they have governed some individual.
The hearer who is asked to praise or blame some one must see
the conduct of the other as somehow conforming to or deviating
from his own standards of conduct or at least those he can be
made to admire or despise for the time being. This is to say
the rhetor must portray the action as desirable or undesirable,
and the man he is praising or blaming as being either good or
bad. The same is true in the case of trials of accused crimin-
als, for the second species of rhetoric very closely resembles
the first. The main difference is that in the second kind,
the hearer, judge or jury, has to decide here and now about
infliction of a punishment.

Likewise in deliberative speeches, those wherein someone
speaks for or against a proposed course of action, we are
essentially involved with things as determinants of choice.
The rhetor must not only portray the course of action he ad-
vocates or the one to be followed because it is desirable, but
he must also overcome fears, arouse courage, and otherwise
enlist the passions of his hearers on his side, since this is
essential to securing their adherence to his plan. People do
not, on the whole make decisions contrary to their sympathies,
or if they do, their adherence is only half hearted.

As Aristotle says, and as experience shows so clearly, men
in general live by their senses. (20) They follow their sense
impressions of what is good and evil. Only in the case of a

few is the apprehension of reason a sufficient guide. To
follow reason steadfastly involves the possession of all the
virtues and experience shows that this is a rare thing.

Even for the few who can and do follow their reason, there
can be very little certainty about individual actions of men.
We are so completely involved in contingency, our actions are
opened to so many contradictions that it is very difficult to
have any speculative certainty about them. (20a) This is most
obvious in the case of future actions. Is a given course really
expedient or will it bring disaster? This is something only God
who sees all things in eternity can know. For Him all determined
causes as well as contingency lies open, but for us there is
little certain about the future. (21)

Even past actions are very imperfectly knowable to us.
Praise or blame are given on essentially flimsy grounds ex-
cept in the case of the Saints. Even here a general statement
of praise runs far less risk of being beside the point than
a judgment of a particular action.

Because then of the essential indetermination of the matter
of rhetorical argument, individual actions of men, the rhetor
has to appeal to the passions of his hearers. This isn't an
argument at all. Besides this he must manifest himself as a
reliable character. This is only indirectly an argument.
Lastly, the arguments that he uses are in the main not of such
a character as to be finally convincing. The rhetorical
enthymeme is a mangled syllogism, (if we may so translate St.
Thomas's _Syllogismus detruncatus_) in which the proper form is
not present, and hence one that does not compel our assent even

if we grant the certainty of the premisses. The example is an
extremely imperfect induction. Its main merit is that in pre-
senting a particular example, the imagination is more surely
aroused and hence the appetite is aroused. In its use of ex-
ample, rhetoric is less intellectual than poetry. As we have
seen the fictions of poetry have a certain superior universal-
ity over the facts of history.

All this emphasis on the uncertain nature of the object of
rhetoric, the inconclusiveness of its arguments, the unintellec-
tual character of appeals to the passions, plus the consequence
of all this, namely that rhetoric can only beget an imperfect
kind of assent, may lead one to conclude that rhetoric is a low
art, one that merits contempt. Such a conclusion can only be
justified if the whole of the practical order, the whole of
politics is despicable. Rhetoric, is according to Aristotle,
a kind of likeness of dialectics, a likeness begotten of the
association between dialectics and politics. The offspring,
rhetoric, has lost the essentially speculative character of
dialectics, and stands forth as an instrument of the politician.

Politics obviously is involved in all the imperfection that
belongs to the divided nature of men. It is the art of governing
those who for the most part follow their senses and so fall into
evil. Malum ut in pluribus in specie humana, (22a), is the
sober judgment of Aristotle, accepted by St. Thomas. Despite
this politics is not per se an evil thing. On the contrary it
is the art of achieving as far as possible the common good.
Government is the indispensable instrument for the establishing
of those conditions wherein the life of virtue will be possible

at least for the few. Besides this, politics in the sense of sharing in the life of the state is the highest life open to the majority of men. The delights of the contemplative life are higher, but they are not for the majority. If we were to say that political life was, per se, low, we would dondemn the great mass of men to a life that could in no way be good. Experience does not bear this out. The good of the city, the order and tranquility that come from law are precarious and imperfect. They are not non-existent.

It may also be objected against rhetoric that it is not only the apt instrument of the politician who aims at the common good, but that it is also ready to hand for any evil intentioned person who has the shrewdness and the unscrupulousness to use it. Aristotle answers this charge, by pointing out that not only rhetoric but all human things are capable of being perverted except virtue. From the fact that it can be misused we can argue to the imperfection of both man and rhetoric, but not to the essential badness of either.

In all completely practical matters there is only one certainty possible to man, that namely, which comes from prudence. Speculative error is not only possible about practical matters, but is often unavoidable as we have seen. The prudent man can have certainty about the rightness of his actions, since prudence does not depend upon the adequation of the judgment and things as the speculative reason does, but rather on the conformity between things and the rectified appetite. We may very well take poison for medecine and not be guilty of moral error. Indeed, if our intention was good and we make normally

prudent investigations beforehand, we are certain to have done morally well.

Rhetoric used by the prudent man is then a valuable instrument. It takes on a nobility that belongs to the high purposes for which it is used. It would be wrong to despise either it or politics. A sense of this dependence of rhetoric upon prudence for its right use is involved in Aristotle's injunction that the orator must succeed in getting his hearers to accept him as a good man. It is this use by a man with appetites rectified at least with respect to the matter in hand that justifies oftentimes the following of arguments not in themselves conclusive.

If it is wrong to despise rhetoric and with it politics, it is likewise wrong on the other hand to exalt either of them unduly. If man were the highest thing in the universe politics would be the highest of all ways of life and rhetoric would be the most important kind of human discourse. It is because there are higher objects than man that the purely speculative uses of the reason have a preponderant importance for the life of man. Those educational systems that exalt rhetoric and the arts, both fine and servile, are based on the false notion of the supreme importance of man.

A discipline that has a close kinship with rhetoric is history. History not only offers the rhetor a great number of examples, but oftentimes historical writing itself tends to have a rhetorical character. This of course, is improper to history as such, since it has no concern, with anything except the accurate presentation of the facts. Nonetheless, few his-

torians have completely avoided value judgments and a selection

 of facts that seem to bear these out. This practice makes their

work fall more or less completely, according to the degree this

depend. ncy is pushed, into rhetorical arguments of the "praise

and blame" type.

The mistaken attempts to coordinate the multiple facts

of history and so to show the pattern that guides events over

wide periods belongs neither to history nor to rhetoric but to

poetry, where poetry has no proper place. A full discussion

of these philosophies of history would take us too far afield

here. (23)

A discussion of the relationship between rhetorica docens
                                                          in
and rhetorica utens will be entered into/the chapter on dialec-

tics, since even though the problem of the relationships of

these two aspects is similar in rhetoric and dialectic, many of

the ideas involved are better explained in relationship to

dialectics than in relationship to rhetoric.

CHAPTER FIVE

DIALECTICS

The object of the Topics, according to Aristotle, is to
discover a method whereby we may argue from probable premisses
about any question that arises and whereby we may avoid saying
any thing improbable when defending our own position. More
briefly we may say that dialectics is the art of arguing probab-
ly about any question where our interest is in knowing rather
than in persuading someone that he ought to act in a given way.
As we have seen this last function belongs to rhetoric.

Two other things that are traditionally said about dialec-
tics are illuminating: dialectics is a form of logica inventiva
(indeed the most eminent form), and dialectics is called logica
utens. Both these appellations help to manifest the function of
dialectics by helping us to discover the truth when we do not
have an adequate enough knowledge of a subject to study it ac-
cording to its proper principles. In lieu of proper principles,
we use probable ones in order that we can, if possible, discover
the truth or at least know what is like the truth: the probable.

It is according to the nature of its principles that the
dialectic/syllogism is defined. Just as the scientific syllo-
gism is defined as one that proceeds through certain, necessary
and primary principles, so the dialectical syllogism is one

that proceeds from probable principles. The probable is defined
as that which is like the true. We possess the truth when we are
able to compare one of our judgments with reality and find an
adequation. The comparison may be based on immediate sense
evidence, as when we say that it is a sunny day; or on the im-
mediate evidence of the term, as when we say that the whole is
not greater than the sum of its parts; or on a chain of reason-
ing, as when we say that God is eternal because he is immutable.
However the reduction is made, truth consists in the adequation
we are able to see between our judgment and reality. When we
are not able to make a full reduction of our judgment to reality,
but must rest in the statement that what we say seems to be true,
we have the probable. It is defined as being like to the true,
because it is based on what seems to be so, while truth is
based on what is so.

Probability may be ascribed to a proposition for two rea-
sons: either because of the objective indetermination of the
subject in question with respect to a given predicate, or because
our knowledge of the connection is based on a mere sign instead
of a proper understanding of the nature which causes the property
ascribed. St. Albert distinguishes these two forms of
verisimilitude very clearly.

> "Probabilia autem (ex quibus fit syllogismus dialecticus)
> sunt verisimilia. Dupliciter autem verisililia: aut enim
> in se sunt verisimilia, eo quod ipsa habitudo praedicati
> ad subjectum verisimilis est, eo quod nec praedicatum est
> in subjecto per se, nec subjectum in praedicato per se,
> nec utrumque in utroque, nec praedicatum necessariam et
> essentialem inhaerentiam habet cum subjecto, set verisimile
> est in signis non in causis necessariis acceptum. Aut
> quia necessariam habet inhaerentiam, sed non accipitur
> nisi per signum: et hoc est probabile secundum modum

acceptionis, quamvis in se sit necessarium: sicut solem esse
majorem terra (eo quod ubique unius quantitatis apparet)
probabiliter acceptum est. Solem autem esse majorem terra per
quantitatem diametri acceptum est necessarium et non probabile,
secundum quod probabile et necessarium opponuntur." (1)

These two foundations of the probable resemble somewhat

the distinction between propositions per se nota quoad se and

propositions per se nota quoad nos. (2) Just as one concept,

when adequately understood objectively involves another, so

some things may be thought to be probable rather than certain

merely because we possess an imperfect knowledge of their

natures, a knowledge based on signs.

On the basis of the difference of signs St. Albert accounts

for the various kinds of probable premisses assigned by Aristotle

in the beginning of the Topics. Signs that are easy to see can

be grasped by all. To these correspond the propositions accepted

by all. Propositions based on less evident signs are grasped

by the few. Those based on recondite signs are held only by

the wise. Even among these last there are varying grades of

awareness.

"Probabile autem sic dictum verisimile est quod per
suiipsius veritatis figuram videtur omnibus aut pluribus
aut sapientibus, et his sapientibus videtur omnibus aut
pluribus aut maxime notis et probabilibus: ita quod
sapientibus et his vel omnibus sapientibus vel pluribus
vel maxime notis vel probabilibus, totum pro uno membro
ponatur.
    Signa vero verisimilitudinis, aut occurunt statim in
superficie et in exterioribus rei quae accipit sensitiva
potentia comparans sensata (ad statim in superficie et in
exterioribus rei quaeaccipit sensitive potentia comparans
sensata)ad invicem: et si talia sunt signa, probabile
est quod videtur omnibus, sicut nivem esse albam per hoc
quod nix est parvae partes perspicui in parva conjuncti,
in cujus partibus undique lux diffunditur : hoc enim
signum sensui est medium. Si autem signa indicium facien-
tia de verisimilitudine sunt non in superficie, sed aliqual-
iter profundata, non ad necessaria, sed nec in superficie

extrinsecus manentia: tunc est id quod videtur pluribus:
quia sensui aliquid miscent rationis, sicut quod stella in
cauda minoris ursae sit polus, eo quod non deprehenditur
ejus singularis motus: hoc enim rationis judicium sensui
est permixtum. Si autem signum verisimilitudinis profunda-
tur in essentialium et convertibilium causas quae sunt con-
vertibilia sicut causae: tunc est quod videtur sapientibus,
sicut est, quod luna moveatur in epiciolo: quia profundius
et altius transit per umbram terrae: noc enim non est causa
sed signum.
    Ideo illud quod videtur sapientibus gradus habet, quia
aut videtur omnibus, aut pluribus, aut maxime notis vel
probabilibus. Quia signum convertibile cum causa, vel
apparet mixtum sensui, et tunc videtur omnibus: vel in ipsis
substantialibus profundatur, et tunc non videtur nisi probatis
et probabilibus sapientibus: vel medio modo est acceptum, et
hoc dupliciter. Si enim plus est inclinatum ad sensum: tunc
videtur pluribus sapientibus. Si autem plus est profundatum
ad necessaria essentialia et intellectualia: tunc est quod
videtur maxime notis, qui ex potestate scientiae et artis
hoc deprehendere noverunt. Hoc igitur est probabile, ex quo
fit syllogismus dialecticus, quod tali et taliter diversi-
ficato deprehenditur signo.(3)

As we said at the beginning of this chapter, dialectics,

the art of reasoning from probable principles is also called

logica utens. This requires considerable explanation, since the

reason for this appellation is closely connected with the nature

of dialectics itself. One of the most important texts to con-

sider on this subject is found in St. Thomas's commentary on

the Fourth book of the Metaphysics.

> Dialectici et sophistae induunt figuram eamdem philosopho,
> quasi similitudinem cum eo habentes: sed dialectici et
> sophistae disputant de praedictis: ergo et philosophi est
> ea considerare. Ad manifestationem autem primae ostendit
> quomodo dialectica et sophistica cum philosophia habeant
> similitudinem, et in quo differunt ab ea.
>   Conveniunt autem in hoc, quod dialectici est consid-
> erare de omnibus. Hoc autem esse non posset, nisi consid-
> eraret omnia secundum quod in aliquo uno conveniunt:
> quia unius scientiae unum subjectum est, et unius artis una
> est materia, circa quam operatur. Cum igitur omnes res non
> conveniant nisi in ente, manifestum est quod dialecticae
> materia est ens, et ea quae sunt entis, de quibus etiam
> philosophus considerat.
>   Differunt autem abinvicem. Philosophis quidem a
> dialectice secundum potestatem. Nam majoris virtutis est
> consideratio philosophi quam consideratio dialectici.
> Philosophus enim de praedictis communibus procedit

demonstrative. Et ideo ejus est habere scientiam de
praedictis, et est cognoscitivus eorum per certitudinem.
Nam certa cognitio sive scientia est effectus demonstratio-
nis. Dialecticus autem circa omnia praedicta procedit ex
probabilibus; unde non facit scientiam, sed quamdam
opinionem. Et hoc ideo est, quia ens est duplex: ens
scilicet rationis et ens naturae. Ens autem rationis
dicitur proprie de illis intentionibus, quas ratio ad-
invenit in rebus consideratis; sicut intentio generis,
speciei et similium, quae quidem non inveniuntur in rerum
natura, sed considerationem rationis consequuntur. Et
hujusmodi, scilicet ens rationis, est proprie subjectum
logicae. Hujusmodi autem intentiones intelligibiles,
entibus naturae aequiparantur, eo quod omnia entia naturae
sub consideratione rationis cadunt. Et ideo subjectum log-
icae ad omnia se extendit, de quibus ens naturae prae-
dicatur. Unde concludit quod subjectum logicae aequiparatur
subjecto philosophiae, quod est ens naturae. Philosophus
igitur exprincipiis ipsius procedit ad probandum ea quae
sunt consideranda circa hujusmodi communia accidentia entis.
Dialecticus autem procedit ad ea consideranda ex intentioni-
bus rationis, quae sunt extranea a natura rerum. Et ideo
dicitur, quod dialectica est tentativa, quia tentare proprium
est ex principiis extraneis procedere.

Licet autem dicatur, quod Philosophia est scientia,
non autem dialectica et sophistica, non tamen per hoc
removetur quin dialectica et sophistica sint scientiae.
Dialectica enim potest considerari secundum quod est
docens, et secundum quod est utens. Secundum quidem
quod est docens, habet considerationem de istis intentioni-
bus, instituens modum, quo per eas procedi possit ad con-
clusiones in singulis scientiis probabiliter ostendendas;
et hoc demonstrative facit, et secundum hoc est scientia.
Utens vero est secundum quod modo adjuncto utitur ad con-
cludendum aliquid probabiliter in singulis scientiis; et
sic recedit a modo scientiae. Et similiter dicendum est
de sophistica; quia prout est docens tradit per necessarias
et demonstrativas rationes modum arguendi apparenter.
Secundum vero quod est utens, deficit a processu verae
argumentationis.
Sed in parte logicae quae dicitur demonstrativa, solum
doctrina pertinet ad logicam, usus vero ad philosophiam
et ad alias particulares scientias quae sunt de rebus
naturae. Et hoc ideo, quia usus demonstrativae consistit
in utendo principiis rerum, de quibus fit demonstratio, quae
ad scientias reales pertinet, non utendo intentionibus
logicis. Et sic apparet, quod quaedam partes logicae habent
ipsam scientiam et doctrinam et usum, sicut dialectiva ten-
tativa et sophistica; quaedam autem doctrinam et non usum,
sicut demonstrativa." (4)

After pointing out that there is a resemblance between

the dialectician and the metaphysician, St. Thomas points
out that the ground of this resemblance is that they both
treat of all things. Being is the material subject of both
considerations. They differ in that metaphysics proceeds
demonstratively and so causes certitude while the dialec-
tician proceeds "ex probabilibus" and can therefore only
engender opinion. This difference in procedure is based
on a fundamental division of being into a) ens naturae and
b) ens rationis. These two are coextensive since all real
beings fall under the consideration of reason and so can
found second intentions. Thus, the philosopher proceeds
according to principles attaching to real being and the
dialectician uses principles belonging to the being of
reason.

The difficulty here is to understand what is meant
by the second intentions, the being of reason, that found
dialectics. The dialectician does not use proper prin-
ciples but rather common ones, yet his intention is to
attempt to say something about real things. He does this
by using an argument based on principles whose terms are
second intentions. All sciences use logical argument, but
the dialectician uses principles that are logical. The
text of St. Thomas under consideration implies that the
expression "procedere ex communibus, ex extraneis, and
ex probabilibus" are interchangeable and that all of them
are synonomous with the use of second intentions. As we
proceed in our consideration we must attempt to explain why
this is so.

Before proceeding it is important to note the difference between the use of second intentions in logic and their use in other considerations. Since logic has as its proper function to study second intentions, their use in logic is proper and not dialectical. The considerations in the Topics are as scientific as those in the Posterior Analytics; both proceed from proper principles and are part of logica docens. They differ though in this: there is no use of the principles of demonstration as such in other sciences or disciplines. These all proceed from their proper principles and only use the rules of demonstration as an extrinsic guide. The considerations in the Topics, though, apart from being part of the science of logic, are used to help discover what may be held probably with respect to other matters than logic. Hence it is that St. Thomas says that there is no logica demonstrativa utens but only docens. While dialectics has both a scientific aspect to be distinguished as dialectica docens and a use in investigating other matters called dialectica utens.

As a confirmation of what we have found in the important text from the commentary on the fourth Metaphysics, let us consider briefly another one taken from the commentary on the first book of the Posterior Analytics.

> "Sciendum tamen est quod alia ratione dialectica est de communibus et logica et philosophia prima. Philosophia enim prima est de communibus, quia eius consideratio est circa ipsas res communes. scilicet circa ens et partes et passiones entis. Et quia circa omnia quae in rebus sunt habet negotiari ratio, logica autem est de operationibus rationis; logica etiam erit de his,

quae communia sunt omnibus, idest de intentionibus
rationis quae ad omnes res se habent. Non autem ita,
quod logica sit de ipsis rebus communibus, sicut de
subiectis. Considerat enim logica, sicut subjecta,
syllogismum, enunciationem,praedicatum, aut aliquid
huiusmodi. Pars autem logicae, quae demonstrativa
est, etsi circa communes intentiones versetur docendo,
tamen usus demonstrativae scientiae non est in pro-
cedendo ex his communibus intentionibus ad aliquid
ostendendum de rebus, quae sunt subiecta aliarum
scientiarum. Sed hoc dialectica facit, quia ex
communibus intentionibus procedit arguendo dialecticus
ad ea quae sunt aliarum scientiarum, sive sint propria
sive communia, maxime tamen ad communia. Sicut argu-
mentatur quod odium est in concupiscibili, in qua est
amor, ex hoc quod contraria sunt circa idem. Est ergo
dialectica de communibus non solum quia pertractat
intantiones communes rationis, quod est commune toti
logicae, sed etiam quia circa communia rerum argumen-
tatur. Quaecunque autem scientia argumentatur circa com-
munia rerum, oportet quod augmentatur circa principia
communia, quia veritas principiorum communium est man-
ifesta ex cognitione terminorum communium, ut entis et
non entis, totius et partis, et similium." (5)

The same doctrine as that expressed in the commentary on

the Metaphysics finds its confirmation here. In the logic of

demonstration we must distinguish the use, which belongs to each

of the sciences and the doctrine which belongs to the science of

logic properly. In dialectics the doctrine is scientific and

belongs to logic; the use proceeds from second intentions to

manifest something about the beings of nature. It is for this

reason, the extraneousness of its principles, that dialectics

engenders only opinion.

There is a third important text wherein the same view of

the relationship between dialectica docens and dialectica utens

is expressed. We will cite this too, not only because it is

confirmatory of the other two texts cited, but because it raises

a special problem about the use of common principles outside of

logic.

"Respondeo dicendum ad primam quaestionem, quod processus
aliquis quo proceditur in scientiis, dicitur tripliciter
rationalis. Uno modo ex parte principiorum quibus proced-
itur, ut cum aliquis procedit ad aliquid probandum ex
operibus rationis, hujusmodi sunt genus, et species, et
oppositum, et hujusmodi intentiones quas logici considerant:
et sic dicitur aliquis processus rationalis, quando aliquis
utitur in aliqua scientia propositionibus quae traduntur
in logica, prout scilicet utimur in logica, prout est
docens in aliis scientiis. Sed hic modus procedendi non
potest competere proprie alicui particulari scientiae,
in quibus peccatum accidit, nisi ex propriis procedatur:
convenit autem haec proprie fieri in metaphysica et
logica, eo quod utraque scientia communis est, et idem
subjectum quodam modo habent. 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 judicamus:
quod quidem quando sit, non dicitur processus, vel probatio
naturalis, sed demonstratio. Quando autem inquisitio
rationis usque in ultimum terminum non perducit, sed sistitur
in ipsa inquisitione, quando scilie cet quaerenti adhuc
manet via ad utrumlibet, et hoc contingit quando per proba-
biles rationes proceditur, quae natae sunt facere opinionem
et fidem, non autem scientiam: et sic rationalis processus
distinguitur contra demonstrativum. Et hoc modo procedi
potest rationabiliter in qualibet scientia, ut ex probabili-
bus paretur via ad necessarias conclusiones: et hic est
alius modus logicae, quo logica utitur in scientiis demon-
strativis, non quidem ut est docens, sed ut utens: et his
duobus modis denominatur processus rationalis a scientia
nostra, his enim duobus utitur logica, quae rationalis
dicitur scientia, in scientiis demonstrativis, ut dicit
Commentator I Physicor." (6)

In general the same doctrine is expressed. The use of logical

principles in other sciences is improper and engenders only

opinion. Logic enters into demonstration only in the sense

that it directs the application of proper principles in each of

the sciences. The difficulty is that St. Thomas says that the

use of principles based on second intentions is proper not only

in logic but also in Metaphysics. This seems to contradict

the general principle that beings of reason cannot furnish proper

principles except in logic. Let us see how this doctrine that

their use is proper also to the metaphysician is applied in the

Metaphysics. First let us cite a passage from the commentary
on the seventh book of the Metaphysics wherein the principle
of the legitimacy of the use of logical principles is set
forth.

> "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." (7)

Next let us cite a concrete example of such a use taken
from the commentary on the same book.

> "Et quia posset alicui videri, quod ex quo Philosophus
> ponit omnes modes, quibus dicitur substantia, quod hoc
> sufficeret ad sciendum quid est substantia; ideo sub-
> jungit 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 tanguntur principia rei, ex quibus cog-
> nitio rei dependet; sed tangitur aliqua communis conditio
> rei per quam talis notificatio datur." (8)

Thus it would seem that the use of logical principles is
proper to the metaphysician in the sense that since both logic
and metaphysics have a subject with the same universality, the
metaphysician may use logical principles to manifest his own
subject. It is the metaphysician as metaphysician who uses
dialectics but when he does so he is at least materially speak-
ing as a dialectician. A somewhat parallel case is that of the
theologian who speaks materially as a metaphysician when he

demonstrates the existence of God, but since he not only uses but also judges the principles he uses, he remains formally a theologian.

We must attempt to answer the difficulty proposed earlier about the nature of the second intentions that are used in probable argument. We must attempt to see how it is that whenever we proceed from probable principles we are really proceeding from second intentions. In order to do this we will consider a few passages from the commentaries of St. Thomas on various works of Aristotle. First let us consider a passage from the commentary on the third book of the Physics.

"Postquam Philosophus removit opinionem antiquorum qui de infinito non naturaliter loquebantur, illud a sensibilibus separantes, hic ostendit non esse infinitum, sicut philosophi naturales ponebant. Et primo ostendit hoc per rationes logicas; secundo per rationes naturales, ibi: Physice autem magis etc. Dicuntur autem primae rationes logicae, non quia ex terminis logicis logice procedant, sed quia modo logico procedunt, scilicet ex communibus et probabilibus, quod est proprium syllogismi dialectici.

Ponet ergo duas logicas rationes. In quarum prima ostenditur quod non sit aliquod corpus infinitum. Definitio enim corporis est, quod sit determinatum planitie, idest superficie, sicut definitio lineae est quod eius termini sint puncta. Nullum autem corpus determinatum superficie, est infinitum: ergo nullum corpus est infinitum; neque sensibile, quod est corpus naturale, neque intelligibile quod est corpus mathematicum. Quod ergo dicit rationabiliter, exponendum est logice: nam logica dicitur rationalis philosophia.

Secunda ratio ostendit quod non sit infinitum multitudine. Omne enim numerabile contingit numerari, et per consequens numerando transiri; omnis autem numerus, et omne quod habet numerum, est numerabile; ergo omne huiusmodi contingit transiri. Si igitur aliquis numerus, sive separatus, sive in sensibilibus existens, sit infinitus, sequetur quod possibile sit transire infinitum; quod est impossibile.

Attendendum est autem quod istae rationes sunt probabiles, et procedentes ex iis quae communiter dicuntur. Non enim ex necessitate concludunt: quia qui poneret aliquod corpus esse/ infinitum, non concederet quod de ratione corporis esset terminari superficie, nisi forte secundum potentiam; quamvis hoc sit probabile et famosum. Similiter qui diceret

aliquam multitudinem esse infinitam, non diceret eam
esse numerum, vel numerum habere. Addit enim numerus
super multitudinem rationem mensurationis: est enim
numerus multitudo mensurata per unum, ut dicitur in X
Metaphys. Et propter hoc numerus ponitur species quan-
titatis discretae, non autem multitudo; sed est de
transcendentibus." (9)

Here St. Thomas opposes ex terminis logicis to modo
logico. They are not the same thing. There are logical
principles that may not contain logical terms like genus and
species. These logical principles are not proper to the sub-
ject under consideration and so they yield only probable con-
clusions.

Next let us consider a text from the commentary on the
De Coelo.

"Postquam Philosophus ostendit universaliter non esse
corpus infinitum rationibus physicis, idest quae sumuntur
ex propriis scientiae naturalis, hic ostendit idem
rationibus logicis, idest quae sumuntur ex aliquibus
communioribus principiis, vel ex aliquibus probabilibus
et non necessariis. Et hoc est quod dicit; est, idest con-
tingit, conari ad propositum ostendendum rationabilius,
idest magis per viam logicam, sic, idest secundum rationes
sequentes. Unde alia littera planior est quae sic habet:
magis autem logice est argumentari et sic. Primo autem
ostendit propositum de corpore infinito consinuo;
secundo de infinito non continuo, idi: Si autem non con-
tinuum, etc.
    Circa primum duo facit. Primo ostendit quod corpus
infinitum, similium partium existens, non potest moveri
circulariter. Quod quidem probat per hoc, quod infiniti
non est aliquod medium, sicut nec extremum: motus autem
circularis est circa medium, ut supra habitum est: ergo etc.
    Secundo ostendit tribus rationibus quod non est
possibile quod tale corpus infinitum moveatur motu recto.
Quarum prima talis est. Omne corpus quod movetur motu
recto, potest moveri naturaliter et per violentiam. Quod
autem movetur per violentiam, habet aliquem locum in
quem movetur violenter; et omne quod movetur naturaliter,
habet aliquem locum in quem movetur naturaliter. Locus
autem omnis est aequalis locato. Sic ergo sequetur quod
sint duo loca tanta quantum est corpus infinitum, in quorum
unum movetur violenter, et in alium naturaliter. Hoc
autem est impossibile, scilicet quod sint duo loca
infinita, sicut et quod sint duo infinita corpora, ut
supra habitum est.

Relinquintur ergo quod nullum corpus naturale sit
infinitum. Dicitur autem utraque ratio logica esse,
quia procedit ex eo quod contingit corpori infinito
inquantum est infinitum, sive sit mathematicum sive sit
naturale, scilicet non habere medium, et non habere
aliquid aequale extra se. Supra autem posuit aliqua
similia, sed non tanquam principalia, sed tanquam
assumpta ad manifestationem aliorum." (10)

St. Thomas distinguishes between proper principles, in

this case physical ones, and those which are taken from

something common or probable. In number 3 above he speaks

of the principles as common because one of them takes a

definition of body that is common to the notion of the

mathematician and that of the natural philosopher. A

little further along he says the third reason proceeds from

induction, that is from a partial experience of the phenomena

in question. Thus we have arguments that are logical because

they proceed from principles that are not completely proved.

"Tertiam rationem ponit ibi: Adhuc si ubi etc. Et
dicit quod locus ad quem movetur aliquid praeter
naturam, vel in quo quiescit praeter naturam, necesse
est quod sit cuiusdam alterius secundum naturam, ad
quem scilicet naturaliter moveatur, et in quo natural-
iter quiescat. Et hoc credibile fit ex inductione:
nam terra movetur sursum praeter naturam, ignis vero
secundum naturam; et e converso ignis deorsum praeter
naturam, terra vero secundum naturam. Videmus autem
quaedam moveri deorsum et quaodam sursum. Si autem illa
quae moventur sursum, moventur praeter naturam, oportebit
dicere aliqua alia esse quae moventur sursum secundum
naturam; et similiter, si ponatur quod ea quae moventur
deorsum, moventur praeter naturam, necesse est ponere
alia quae moventur deorsum secundum naturam. Unde neque
omnia habent gravitatem, neque omnia levitatem, secun-
dum positionem praedictam: sed haec quidem habent
gravitatem quae naturaliter moventur deorsum; haec autem
non, quae naturaliter moventur sursum. Ultimo autem
epilogando concludit manifestum esse ex praedictis quod
omnino non est corpus infinitum, scilicet infinitum
continuum neque infinitum distinctum per interpositionem
vacui. Dicuntur autem hae ultimae rationes logicae, quia
procedunt ex quibusdam probabilibus nondum plene probatis."
(11)

Here we have material for an investigation of probable

principles that will lead to an understanding of our problem.

We have seen that St. Thomas distinguishes between proceeding

from logical terms and a logical mode. The logical mode

includes any reasoning from common principles and from those

that are insufficiently proved. Let us see how each of these

last two kinds of principle are examples of the use of second

intentions despite the fact that they do not seem to contain

any logical terms like genus or species. Let us first examine

the idea of community involved in the expression ex communibus,

and then let us consider how second intentions lie concealed

even in propositions that are insufficiently proved. It should

be noted that sometimes the expression ex communibus is used to

signify both principles that spring from terms that have a

certain logical kind of community and principles that are

insufficiently proved. We will treat first of the first of

these two meanings.

Let us note some texts from the commentary on the Posterior

Analytics where certain principles are referred to as common.

"Postquam Philosophus ostendit quod si sit status in
extremis, necesse est esse statum in mediis, et si sit
status in affirmativis, necesse est esse statum in
negativis; hic intendit ostendere quod sit status in
affirmativis in sursum et deorsum. Et dividitur in duas
partes: in prima parte, ostendit propositum logice,
idest per rationes communes omni syllogismo, quae accipiun-
tur secundum praedicata communiter sumpta; in secunda,
ostendit idem analytice, idest per rationes proprias
demonstrationi, quae accipiuntur secundum praedicata per se,
quae sunt demonstrationi propria; ibi: Analytice autem
manifestum etc. Prima autem pars dividitur in duas partes:
in prima, ostendit quod non sit procedere in infinitum in
praedicatis, quae praedicantur in eo quod quid; in secunda,
ostendit quod non sit procedere in infinitum universaliter
in praedicatis affirmativis; ibi: Universaliter autem sic
dicimus etc.

Dicit ergo primo, quod cum ostensum sit quod in privativis
non est ire in infinitum, si stetur in affirmativis; hic
iam manifestum erit quomodo aliqui speculantur in illis,
idest in affirmativis, esse statum per logicas rationes.
Et dicuntur hic logicae rationes, quae procedunt ex
quibusdam communibus, quae pertinent ad considerationem
logicae. Haec autem veritas manifesta est in his, quae
praedicantur in eo quod quid est, idest in praedicatis,
ex quibus quod quid est, idest definitio constituitur.
Si enim huiusmodi praedicata dentur esse infinita sequitur
et quod si definitur aliquid, eius definitionon
possit esse nota. Et hoc ideo, quia infinita non est
pertransire. Non autem contingit definiri, neque defini-
tionem cognosci, nisi descendendo perveniatur usque ad
ultimum, et ascendendo perveniatur usque ad primum. Se
ergo contingit aliquid definire, vel si contingit de-
finitionem alicuius esse notam, ex utroque antecedenti
sequitur hoc consequens, quod in praedictis praedicatis
non sit procedere in infinitum, sed in eis contingat
stare." (12)

Despite the fact that we are in logic, St. Thomas speaks of

proving "logically" that is to say probably, and later he says

the reasons are logical because they spring from common consi-

derations which belong to the consideration of logic.

To these texts let us add two others from the same book in

order to see what is meant a little more clearly.

Quintam rationem ponit ibi: Amplius autem et sic,
quae talis est. Quanto medium demonstrationis est
propinquius primo principio tanto demonstratio est
potior. Et hoc probat, quia si ille demonstratio, quae
procedit ex principio immediato, est certior ea quae
non procedit ex principio immediato, ex mediato, necesse
est quod quanto alique demonstratio procedit ex medio
propinquiori principio immediato, tanto sit potior.
Sed universalis demonstratio procedit ex medio propin-
quiori principio, quod est propositio immediata. Et
hoc manifestat in terminis. Si enim oporteat demon-
strare A, quod est universalisimum, puta substantiam de
homine, et accipiantur media B et C, puta animal et
vivum, ita quod B sit superius quamC, sicut vivum quam
animal; manifestum est quod B, quod est universalius,
erit immediatum ipsi A, et per hoc magis cognoscetur
quam per C, quod est minus universale. Unde relinquitur
quod demonstratio universalis potior sit quam particularis.
Addit autem quasdam praedictarum rationum logicas esse:
quia scilicet procedunt ex communibus principiis, quae non
sunt demonstrationi propria; sicut praecipue tertia et
quarta, quae accipiunt pro medio id quod est commune omni

cognitioni. Aliae vero tres praedictarum rationum, scilicet prima, secunda et quinta, magis videntur esse analyticae, utpote procedentes ex propriis principiis demonstrationis." (13)

"Deinde cum dicit: <u>Contingit quidem igitur</u> etc., ostendit quo modis potest hoc variari. Est autem sciendum quod falsa conclusio non concluditur nisi falso syllogismo. Syllogismus autem potest esse falsus dupliciter. Uno modo, quia deficit in forma syllogistica. Et hic non est syllogismus, sed apparens. Alio modo, quia utitur falsis propositionibus. Et hic quidem est syllogismus propter syllogisticam formam, est autem falsus propter falsas propositiones assumptas. In disputatione ergo dialectica, quae fit circa probabilia, usus est utriusque falsi syllogismi, quia talis disputatio procedit ex communibus. Et ita in ea error attendi potest et circa materiam quam assumit, quae est communis, et etiam circa formam, quae est communis. Sed in disputatione demonstrativa, quae est circa necessaria, non est usus, nisi illius syllogismi qui est falsus propter materiam; quia, ut dicitur in I <u>Topicorum</u>, paralogismus disciplinae, procedit ex propriis disciplinae, sed non ex veris. Unde, cum forma syllogistica sit inter communia computanda, paralogismus disciplinae, de quo nunc agitur, non peccat in forma, sed solum in materia, et circa propria, non circa communia.

Et ideo primo, ostendit quomodo huiusmodi syllogismus procedat ex duabus falsis; secundo, quomodo procedat ex altera falsa; ibi: Sed alteram contingit etc. Primum autem contingit dupliciter, quia falso propositio, aut est contraria verae, aut contradictoria. Primo ergo ostendit quomodo huiusmodi syllogismus procedat ex duabus falsis contrariis veris; secundo quomodo accipitur contradictio; ibi: <u>Potest autem sic se habere</u> etc." (14)

Here we are told that if we make an argument based on a consideration common to all forms of knowledge and apply it to demonstration, we have only a logical argument. This seems to mean that the dialectical and the demonstrative syllogism share the notion of syllogism only analogously and therefore an argument based on what is common to them cannot apply properly to either one.

The dialectician uses terms which are common to many things but neglects what is proper to each. Thus his argument cannot be proper. Let us consider some passages wherein St. Thomas

speaks of this.

"Consequenter cum dicit "differenter autem".
    Insistit circa definitiones. Quia enim ostendit,
quod in difinitionibus passionum animae, aliquae sunt,
in quibus ponitur materia et corpus, aliquae vero in
quibus non ponitur materia, sed forma tantum, ostendit
quod hujusmodi definitiones sunt insufficientes. Et
circa hoc investigat differentiam, quae invenitur in
istis definitionibus. Aliquando enim datur aliqua
definitio, in qua nihil est ex parte corporis, secut
quod ira est appetitus vindictae; aliquando assignatur
aliqua definitio, in qua est aliquid ex parte corporis
seu materiae, sicut quod ira est accensio sanguinis
circa cor. Prima est dialectica. Secunda vero est
physica, cum ponatur ibi aliquid exparte materiae; et
ideo pertinet ad naturalem. Hic enim, scilicet physicus,
assignat materiam, cum dicit, quod est accensio san-
guinis circa cor. Alius vero, scilicet dialecticus,
ponit speciem et rationem. Hoc enim, scilicet appetitus
vindictae, est ratio irae.
    Quod autem definitio prima sit insufficiens, man-
ifeste apparet, nam omnis forma, quae est in materia
determinata, nisi in sua definitione ponatur materia,
illa definitio est insufficiens: sed haec forma,
scilicet "appetitus vindictae" est forma in materia
determinata: unde cum non ponatur in ejus definitione
materia, constat quod ipsa definitio est insufficiens.
Et ideo necesse est ad definitionem, quod in definitione
ponatur hoc, scilicet forma, esse in materia hujusmodi,
scilicet determinata." (15)

It is impossible to understand what a passion is, unless

we include something that belong to matter, since the proper

subject of a passion is a body. Thus the dialectical definition

leaves aside something which is proper to the subject and con-

siders only what is formal. Thus the definitions of the dialec-

tician are called formal and the definitions of the philosopher

of nature are called natural because one excludes matter and

the other includes it.

St. Thomas speaks of this most clearly when he is discussing

the difference between logical and physical genera. There is,

for instance, a passage from the commentary on the De Trinitate

of Boethius.

"Respondeo. Ad evidentiam hujus quaestionis, et eorum
quae in littera dicuntur, opertet videre quae sit causa
hujus triplicis diversitatis quae in littera assignatur.
Cum enim in individuo composito in genere substantiae
non sint nisi tria, scilicet materia, forma, et compositum,
oportet ex aliquo istorum cujuslibet harum diversatum
causas invenire. Sciendum igitur, quod diversitas secun-
dum genus reducitur in diversitatem materiae: diversitas
vero secundum speciem in diversitatem formae, sed diversi-
tas secundum numerum partim in diversitatem materiae, et
partim in diversitatem accidentis. Cum autem genus sit
principium cognoscendi, utpote prima definitionis pars,,
materia autem secundum se sit ignota, non potest secundum
se ex ea accipi diversitas generis, sed solum illo modo
quo cognoscibilis est. Est autem cognoscibilis dupliciter.
Uno modo per analogiam, sive per comparationem, ut dicitur
in I Physi. Hoc est ut dicamus hic esse materiam, vel
quod materia hoc modo se habet ad res naturales, sicut sig-
num ad lectum. Alio modo, cognoscitur per formam per quam
habet esse actu. Unumquodque enim cognoscitur secundum
quod est actu, non secundum quod est in potentia, ut dicitur
IX Metaphys. et secundum hoc sumitur duplex diversitas
generis ex materia. Uno modo ex diversa analogia ad
formam, et sic penes materiam distinguuntur prima rerum
genera. Id enim quod est in genere substantiae comparatur
ad materiam sicut ad partem sui: quod vero est in genere
quantitatis non habet materiam partem sui, sed comparatur
ad ipsum sicut mensura, et qualitas sicut dispositio. Et
his duobus generibus mediantibus omnia alia genera con-
sequuntur diversas comparationes ad materiam, quae est
pars substantiae, ex qua substantia habet rationem subjecti,
secundum quam ad accidentia comparatur. Alio modo, penes
materiam sumitur generis diversitas, secundum quod materia
est perfecta per formam. Et cum materia sit potentia pura,
et Deus sit actus purus, nihil aliud est materiam perfici
in actum, qui est forma, nisi quatenus participat aliquam
similitudinem actus primi, licet imperfecte, ut scilicet id
quod est jam compositum ex materia et forma, sit medium
inter potentiam purem, et actum purum. Non autem materia ex
 omni parte aequaliter recipit similitudinem actus primi,
sed a quibusdam imperfecte, a quibusdam vero perfectius,
utpote quaedam participant divinam similitudinem,
secundum quod tantum subsistunt, quaedam vero secundum quod
intelligunt. Ipsa igitur similitudo primi actus in quacumque
materia existens, est forma ejus. Sed forma talis in quibus-
dam facit esse tantum, in quibusdam esse et vivere, et sic
de aliis in uno et eodem. Similitudo enim perfectior
habet omne id quod habet similitudo minus perfecta et adhuc
amplius. Aliquid igitur invenitur commune in utraque simil-
itudine, quod in una substernitur imperfectioni, et in
alia perfectioni, sicut materia substernitur actui et
privationi, et ideo materia simul accepta cum hoc communi,
est adhuc materialis respectu perfectionis, et imperfectionis

praedictae, et ex hoc materiali sumitur genus, differentia vero ex perfectione et imperfectione praedicta. Sicut ex hoc communi materiali, quod est habere vitam, sumitur hoc genus quod est animatum corpus: ex perfectione vero superaddita, haec differentia, sensibile; ex imperfectione, vero, haec differentia insensibile: et sic diversitas talium materialium inducit diversitatem generis, sicut animalis a planta. Et propter hoc dicitur materia esse principium diversitatis secundum genus, et eadem ratione forma est principium diversitatis secundum speciem, quia a praedictis formalibus quae habent addita materialia unde genera sumuntur, per comparationem formae ad materiam sumuntur differentiae quae constituunt species. Scientamen quod cum illud materiale, unde sumitur genus, habeat in se formam et materiam, logicus considerat genus solum ex parte ejus quod formale est, unde ejus definitiones dicuntur formales, sed naturalis considerat genus ex parte utriusque. Et ideo contingit quandoque quod aliquid communicat in genere secundum logicum, quod non communicat secundum naturalem. Contingit enim quandoque quod illud de similitudine primi actus quod consequitur res aliqua in materia tali, aliud consequitur sine materia, aliud in alia materia omnino diversa. Sicut patet quod lapis in materia quae est secundum potentiam ad esse, pertingit ad hoc quod subsistat, ad quod idem pertingit sol secundum materiam, quae est in potentia ad ubi, et non ad esse, et angelus omni materia carens. Unde logicus inveniens in his omnibus illud ex quo genus sumebat, ponit omnia haec in uno genere substantiae. Naturalis vero et metaphysicus qui considerant principia rerum, omnia non invenientes convenientia in materia, dicunt ea differre genere, secundum hoc quod dicitur Metaphysi., quod corruptibile et incorruptibile differunt genere, et quod illa conveniunt genere, quorum est materia una et generatio ad invicem." (16)

The natural genus is matter in which all physical things share. The logical genus is something which the intellect discovers, something which follows not the natural mode of existence of things, but follows the mode which they have in the intellect which grasps them. Thus angel and stone can be included in the logical genus of substance although they are not in the same natural genus. Thus it becomes clear that arguments from common terms are logical even though they contain no logical terms. The community is not something found

as such in things, but rather it is something formed by the mind, something that attaches to our mode of apprehension. Thus it is that arguments, based on what is common, employ second intentions. (17)

Let us next investigate the question of premisses that are not sufficiently proved and see how second intentions are hidden there too. At first sight there would seem to be even less of second intentions involved here than in common terms. When I say that "all snow is white", for instance, I seem to be saying something that belongs completely to the natural order. There are no logical terms used and there is no community that lets fall what is natural to the subject. How then can I say that an argument that uses this as a principle springs from beings of reason? The answer is rather simple: the universality which I necessarily attach to this proposition in order to make a valid scientific argument springs not from the nature of the subject, but it is attached to our consideration of the subject. It is not something that I find completely in things, but it is something that I add to them in order that my argument may be valid. Since in my experience all snow is white I feel justified in saying that all snow is white simpliciter. It is this last addition that attaches to the proposition in virtue of my mode of understanding it and not to the thing as it is in itself. However it is precisely this added universality which gives formal validity to my argument and makes it improper and capable of engendering only opinion. This seems to be what St. Thomas had in mind when he referred to an universale ut nunc. (18)

Thus, it becomes evident that whenever principles do not
derive completely from the subject about which we are reasoning,
whenever there is something added by the mind, we have overtly
or in a concealed fashion second intentions introduced into our
reasoning. They are patently present in arguments that use
logical terms in reasoning about real being. They are more or
less concealed in propositions that employ common terms in the
sense given above. They are most completely concealed in
arguments that use insufficiently proved premisses. Yet, in
all these cases they are present, and so we can say that
dialectic is _logica utens_ in the sense that it uses arguments
that contain beings of reason of the kind that logic studies.
When these beings of reason are studied for their own sake,
we have logical science, whether of demonstration or of
dialectics or even of sophistic. This is _logica docens._

We must next investigate what is meant by the term
"topics", since the Aristotelian treatise on probable reasoning
bears that name and also because all the suggestions given in
that treatise for discovering what is probable are given under
the heading of topics. This will not only help us to under-
stand probable reasoning a little better, but it will also make
clear that characteristic of probable reasoning that makes it
be called _logica inventiva._

In the fourth book of the _Physics_ Aristotle assigns a
double character to place. He speaks of it as exterior to what
is in place, and he speaks of it as measuring. (19) If we
remember that _topic_ comes from the Greek word for place, it

will appear that the two characteristics of place just men-
tioned have a remarkable application to topics as they are
understood in logic. We have seen that second intentions are
something founded on but exterior to first intentions, and
further we have seen that second intentions are coextensive
with beings of nature since all first intentions can found
second intentions. (20)

To see how fully this topical character of dialectical
argument reveals its essential nature, we have only to repeat
what we have said earlier about the derivation of all scien-
tific arguments from the intrinsic principles of the subject
in question. There is something in the nature of each thing
that gives it a certain fundamental abstractability, that
makes it suitable to be the object of one science or another.
The same thing may be considered under many formal lights, but
there is always something in the subject that makes it apt to
be considered under the given formal light. Since whatever is
attained in a science is attained through its principles, it is
necessary that the formal light of that science should first be
manifest in the principles. Hence it is that in science the
mind finds its principles in the thing as manifest by the
appropriate formal light.

"Recte assignari pro ratione formali specificativa scien-
tiarum diversam abstrahibilitatem objecti, et diversitatem
medii; et utrumque recte componitur, ut late ostendimus
in Logica (q.27, art. 1); concurrit enim diversa abstra-
hibilitas ad specificandum, quatenus redditur objectum
diverso spirituale et intelligibile ex diversa immaterial-
itate seu abstrahibilitate materiae: et ita ex diversa hac
abstractione sumit Div. Thomas diversitatem scientiarum
(in prologo libri de Sensu et Sensato, et in opusculo LXX).
Sed quia in scientiis objectum non attingitur nisi ut
deductum ex aliquo medio, seu in virtute principiorum,

oportet quod ista abstractio seu immaterialitas prius
reluceat in mediis, seu principiis: et ita ex diver-
sitate mediorum, prout diversimode illuminant, sumitur
diversa ratio formalis scientiae, ut D. Thomas docet
(II-II q. 1, a.1; et q. 9, a.2 ad 3)." (21)

When we do not possess sufficient understanding of the
subject in question in order to grasp it by its proper prin-
ciples, there remains one way of discovering something about
it, even though what we discover will not be certain. We
can proceed by the extraneous logical principles that attach
to second intentions, to topical argument. It is this useful-
ness for inquisition that merits for dialectics the name of
logica inventiva.

CHAPTER SIX

ARITHMETIC

In considering any created substance it is possible to
distinguish what is essential, what makes it to be in act a
substance, from those accidental perfections which complete
it. In material substances, the first of these perfections
is that of quantity, that is the order of the parts in the
whole. Because a given substance is by its essense, say, a
stone, it has virtually and indistinctly parts. What orders
these parts and causes them to be distinct is the accident
of quantity. This is why we speak of quantity as being parts
outside of parts, of order in extension.

> "In sententia S. Thomae propria et formalis ratio quanti-
> tatis est extensio partium in ordine ad totum quod est
> reddere partes formaliter integrantes. Unde remota quan-
> titate substantia non habet partes integrales formaliter
> in ratione partis ordinatas et distinctas." (1)

To prove that this is really St. Thomas's opinion, John

of St. Thomas quotes several texts, notably one from the Summa

Totius Logicae:

> "Quod positio uno modo dicitur ordo partium in loco, et
> sic est unum de praedicamentis, quod dicitur situs; alio
> modo positio est ordo partium in toto, et sic positio est
> differentia quantitatis". (2)

It may be objected that the Summa Totius Logicae is not a

work of St. Thomas. John of St. Thomas refers to several authen-

tic texts, however, that state the same doctrine. It will be

sufficient to give one from the commentary on the Physics:

> "Nam situs, secundum quod ponitur praedicamentum, importat
> ordinem partium in loco: licet secundum quod ponitur dif-

ferentia quantitatis, non importat nisi ordinem partium in toto." (5)

It is necessary to point out, as John of St. Thomas has done in explaining a similar passage in De Trinitate, that here situs is not taken formally sed pro radice, and he gives as his reason that otherwise it would not be necessary to point out the difference between the predicament of situs and the formal difference of quantity. (4)

In Metaphysics V, XIII, 1020 a 7-8, Aristotle gives a definition of quantity based on one of its properties, its divisability into homogeneous parts:

"Quantity means that which is divisible into constituent parts, each or every one of which is by nature some one individual thing." (5)

The explanation of the significance of this passage is given by John of St. Thomas:

"Et tota explicatio reducitur ad hoc, quod definit Aristoteles quantum per divisibile, non in partes physicas, id est materiam et formam, nec in partes potentiales, sicut anima dividitur in intellectivum et sensitivum, nec in subiectivas, sicut universale dividitur in inferiora, sed in partes integrales et quantitativas, quae ita sunt compositae, ut facta divisione maneat unaquaeque aliquid unum, sicut patet cum aqua dividitur in varias partes. In has partes integrales divisibilis est res quanta." (6)

In material things quantity is the first of the accidents, the one that immediately follows substance and constitutes it in the perfection that existence requires. So close is the connection between substance and the first of the accidents that many have mistaken quantity for material substance itself.

"Negaverunt hoc aliqui Nominales, qui cum ex una parte sentirent sine quantitate nullas dari partes nec divisibilitatem, ex alia vero parte cuiuscumque rei entitatem nihil aliud quam partes suas existimarent, dixerunt quantitatem non distingui realiter a re habente partes, sive substantia sit sive accidens." (7)

This confusion springs, no doubt, from the fact that the two are never separated in any existing thing. (We speak here of the natural order, and not of such mysteries as the Holy Eucharist). To conclude from the fact of their inseparability to their identity is an example of the fallacy of accident. They are not separable, but they are distinguishable a parte rei. A material substance is constituted in act a substance by its form, that which is expressible in its definition. Because it is thus constituted, it has virtually and confusedly parts. What makes these parts exist distinctly and in their due order is the accident of quantity.

Because of its close connection with substance, quantity alone of all the accidents can found a science. St. Thomas has pointed out this peculiarity of quantity:

> "Sciendum autem est, quod quantitas inter alia accidentia propinquior est substantiae. Unde quidam quantitates esse substantias putant, scilicet lineam et numerum et superficiem et corpus. Nam sola quantibas habet divisionem in partes proprias post substantiam. Albedo enim non potest dividi, et per consequens nec intelligitur individuari nisi per subjectum. Et inde est, quod in solo quantitatis genere aliqua significantur ut subjecta, alia ut passiones."
> (8)

Quantity, being the first of the accidents, and the most fundamental one, is treated as if it were a substance and the science of mathematics demonstrates its properties. Even in mathematics it is ultimately the substance as modified by the accident of quantity that we study. We divide quantity first into its two main species; the discrete and the continuous. After this we further divide number into its various species and the continuous into line, surface, and solid. Finally we demonstrate the properties of each of these kinds of continuous and discrete quantities in the sciences of arithmetic and geometry.

It is not only the mathematician who treats of quantity, though. To be able to distinguish well the mode of consideration of the mathematician, it is well to note the manner of procedure of the metaphysician and the natural philosopher.

To define quantity and its main species belongs to the metaphysician. It is he alone who considers it according to its absolute essence as an accident of material substance. His consideration is an absolute one and must be reducible to the intelligible nature of things alone without reference to the sensible mode of existence as such. (9)

The natural philosopher considers the quantity of things when he notes that one thing is larger than another and seeks the cause for it. He speaks of the quantity of something as it is physically united to the other accidents and as determined within definite limits by form and figure. It is possible to ask why the neck of the giraffe is so disproportionately long. Here we have to deal with a neck of a certain (perhaps statistically) fixed length and with a quantity not conceived separately from the sensible qualities of the giraffe. It is clear that such a problem and any tentative solutions that may be proposed must be tested by whether or not they conform to our sense experience of the giraffe. This is what is meant by saying that in natural philosophy the reduction is to the senses.(10

The mathematician considers quantity neither absolutely, like the metaphysician, nor according to the sensible conditions of its existence, like the natural philosopher. His mode of consideration is an altogether special way of regarding quantity. He considers it in its pure homogeneity as extension, either

discrete or continuous, and without any sensible qualities
whatever. In fact any quantity is qualitatively determined by
form and figure so that it has a precise physical limitation.
The quantity of the mathematician is interminate quantity. By
this is meant that it is thought of as having an undertermined
size. The triangle of the geometer is any triangle that the
proposition requires, and not a triangle with sides six inches
long.

"Pro cujus intelligentia advertendum est ex Cajetano (in
praesenti quaest. 5, a.3), quod quantitas potest dupliciter
abstrahi. Uno modo secundum abstractionem generis vel
speciei ab individuis, remanente tota natura et quidditate
quantitatis, sicut omnes aliae naturae quando in universali
concipiuntur: et haec abstractio fit ab intellectu universali-
zante naturam; et hoc modo quantitas in abstracto consider-
atur a metaphysico, et sic non amittit rationem perfectionis
neque boni. Alio modo fit abstractio quantitatis denudando
illam a sensibilitate, et fit per imaginationem: sicut
imaginamur distantiam quantitatis in vacuo, lineas aut
superficies in eo imaginantes; et talis abstractio non est
universalis a particulari, sed solum quantitatis inter-
minatae, seu imaginatae, a sensibili; sicut si in relatione
aliquis consideraret puram rationem ad, et non rationem in,
solum consideraret id quod est commune relationi reali et
rationis: non autem id quod perfectionis et realitatis est
in relatione."
"Constat autem ad demonstrationes mathematicas perinde se
habera lineas et figuras imaginarias, et reales; nam etiamsi
in vacuo imaginemur lineam, aeque bene potest ibi fieri
demonstratio mathematica. Si vero fiat linea in aliqua
materia reali, non considerat illam quantum ad suam quid-
ditatem realem (id enim pertinet ad metaphysicum), sed solum
quantum ad proportionem mathematicam. Quare ex vi talis
abstractionis omittit rationem boni, quia non attenditur
ejus perfectio vel convenientia, aut conducentia ad aliquid:
sed sola est extensio imaginata prout continuitatem,
commensutationem vel proportionem habet, ut docet D. Thomas."
(11)

John of St. Thomas says the quantity of the mathematician is
midway between the real quantity existent in physical things
according to a real determination and the imaginary quantity of a
pure being of reason like, say, a line in a vacuum.

"Ita mathematica considerat quantitatem, quantum ad id
praecise quod habet de extensione interminata, et secundum
id quod habet a materia: non secundum terminationem et modum
quem habet a forma, ratione cujus redditur sensibilis.
Quare quantitas mathematica habet conceptum positivum
quantitatis interminatae, eo modo quo quantitas potest in-
veniri, sive imaginario, sive sensibiliter in ratione entis
veri. Unde permissive se habet ad rationem entis realis
et veri: neque positive includendo et considerando
adaequate, neque positive excludendo per repugnantiam,
realitatem ipsius quantitatis. Et in hoc differt a quan-
titate pure imaginaria, quae est ens rationis: haec enim
repugnanter se habet ad quantitatem realem, quia ens
rationis est. At vero quantitas mathematica non repugnanter
se habet, sed indifferenter: quia aeque bene potest facere
suas demonstrationes in lineis realibus, vel imaginariis;
sicut si relatio consideretur secundum rationem ad prae-
cise, nondum consideratur ut ens rationis: nec tamen ut
determinate ens reale: sed indifferenter ad illud; quia
non consideratur adaequata ratio ejus ex omni parte quae
requiritur ad realitatem, ad quam etiam requiritur rationi:
sed ex ea parte qua indifferens est ad realitatem, et
solum explicat rationem ad. Sic quantitas consideratur
a mathematico inadaequate, et sub ea ratione praecise
extensionis interminatae; quae indifferenter se habet ad
imaginariam et realem, et sic non excludit rationem entis,
sed permittit: neque repugnanter se habet ad illud, sed
indifferenter. Und nec ens rationis est determinate, nec
ens reale determinate: sed indifferenter et permissive
se habet ad utrumque." (12)

It is perhaps for this reason that Aristotle confines the

use of the term "abstraction" to the mode of conceiving of the

mathematician. (13)

Because he envisages quantity in this manner, the mathema-

tician is in a peculiar way confined to working with abstractions.

He not only considers things apart from their particularity, as

does the metaphysician and the natural philosopher, but according

to a mode incompatible with existence.

Since all of the external senses must convey their object

according to the mode in which they have received it, and quan-

tity exists completely separately from any qualitative deter-

mination, it is impossible for the mathematician to reduce the

object of his consideration to the external senses. The imagination can make this separation and convey the pure homogenity of extended parts. It is for this reason the St. Thomas, following Aristotle, says that mathematics is reducible to the imagination.

This is particularly clear in the passages where intelligible matter, the matter of mathematical objects, is treated.

In Met. VII, lect.X, St. Thomas is contrasting the objects of natural philosophy with those of mathematics:

> "Nec differt utrum singularia sint sensibilia vel intelligibilia. Singularia quidem sensibilia sunt sicut circuli aerei et lignei. Intelligibilia singularia sunt sicut circuli mathematici. Quod autem in mathematicis considerentur aliqua singularia, ex hoc patet, quia considerantur ibi plura unius speciei, sicut plures lineae aequales, et plures figurae similes. Dicuntur autem intelligibilia, hujusmodi singularia, secundumquod absque sensu comprehenduntur per solam phantasiam, quae quandoque intellectus vocatur secundum illud in tertio de Anima: "Intellectus passivus corruptibilis est."
> "Ratio autem hujus est, quia materia, quae principium est individuationis, est secundum se ignota, et non cognoscitur nisi per formam, a qua sumitur ratio universalis. Et ideo singularia non cognoscuntur in sua absentia nisi per universalia. Materia autem non solum est principium individuationis in singularibus sensibilibus, sed etiam in mathematicis. Materia enim alia est sensibilis, alia intelligibilis. Sensibilis, quidem ut aes et lignum, vel etiam quaelibet materia mobilis, ut ignis et aqua, et hujusmodi omnia; et a tali materia individuantur singularia sensibilia. Intelligibilis vero materia est, quae est in sensibilibus, non inquantum sunt sensibilia, sicut mathematica sunt. Sicut enim forma hominis est in tali materia, quae est corpus organicum, ita forma circuli vel trianguli est in hac materia quae est continuum vel superficies vel corpus." (14)

To this we should add a passage from the commentary on Met. VIII

> "Deinde cum dicit "est autem". Solvit praedictam dubitationem in mathematicis: et dicit quod duplex est materia: scilicet sensibilis et intelligibilis. Sensibilis quidem est, quae concernit qualitates sensibiles, calidum et frigidum, rarum et densum, et alia hujusmodi, cum qua quidem materia concreta sunt naturalia, sed ab ea abstrahunt mathematica. Intelligibilis autem materia dicitur, quae accipitur sine sensibilibus qualitatibus vel differentiis, sicut ipsum continuum. Et ab hac materia non abstrahunt mathematica."(15)

Lastly there is a passage in the Summa that brings the whole matter into the sharpest light. What this contributes beyond the other passages is the relating of intelligible matter to substance:

"Dicendum quod quidam putaverunt quod species rei naturalis sit forma solum, et quod materia non sit pars speciei. Sed secundum hoc in definitionibus rerum naturalium non poneretur materia. Et ideo aliter dicendum est quod materia est duplex, scilicet communis, et signata vel individualis; communis quidem, ut caro et os; individualis autem, ut hae carnes et haec ossa. Intellectus igitur abstrahit speciem rei naturalis a materia sensibili individuali, non autem a materia sensibili communi. Sicut speciem hominis abstrahit ab his carnibus et his ossibus, quae non sunt de ratione speciei, sed partes individui, ut dicitur in VII Metaph.; et ideo sine eis considerari potest. Sed species hominis non potest abstrahi per intellectum a carnibus et ossibus.
     Species autem mathematicae possunt abstrahi per intellectum a materia sensibili non solum individuali, sed etiam communi; non tamen a materia intelligibili communi, sed solum individuali. Materia enim sensibilis dicitur materia corporalis secundum quod subiacet qualitatibus sensibilibus, scilicet calido et frigido, duro et molli, et huiusmodi. Materia vero intelligibilis dicitur substantia secundum quod subiacet quantitati. Manifestum est autem quod quantitas prius inest substantiae quam qualitates sensibiles. Unde quantitates, ut numeri et dimensiones et figurae, quae sunt terminationes quantitatum, possunt considerari absque qualitatibus sensibilibus, quod est eas abstrahi a materia sensibili; non tamen possunt considerari sine intellectu substantiae quantitati subiectae, quod esset eas abstrahi a materia intelligibili communi. Possunt tamen considerari sine hac vel illa substantia; quod est eas abstrahi a materia intelligibili individuali.
     Quaedam vero sunt quae possunt abstrahi etiam a materia intelligibili communi, sicut ens, unum, potentia et actus, et alia huiusmodi, quae etiam esse possunt absque omni materia, ut patet in substantiis immaterialibus." (16)

It is important to realize that there are two irreducible species of quantity: the continuous and the discrete. (17)

Continuous quantity is the order of undivided parts in a whole; it is undivided extension. Extension, in turn, is of three kinds: length, breadth, and thickness. It is of these that geometry treats.(18)

Discrete quantity is the order of parts, distinct

and separate, though homogeneous. Here, the word "whole" in
the definition of quantity (as the order of parts in a whole)
has a distinct meaning. The "whole" of continuous quantity is
something physically one, as, for instance, this stone.
That of discrete quantity is a unity of order in separate things,
as, for instance, seven oranges on my desk. There is something
about each orange in the group that allows it to be regarded as
as joining with the others to make up seven oranges. They do
not lose their identity and become one large orange, but, each
remaining separate, they make up seven together. What formally
constitutes them as seven is the last unity, the seventh. This
is not to say that one is eternally predesignated as the last one
I will count. It does not make any difference which one I count
last; for this will in no way affect the total. We say that there
are seven because there are one more than six present. It is
the additional unit that changes the number from one species to
another, and hence we speak of the last unit as the constitutive
one.

In all this we suppose a homogeneity among the things that are
numbered. It is evident that we cannot add horses, bottles, and
angels, and get a predicamental number, since these t ings are not
differentiated mainly by number as are oranges, but rather by
their forms. The most fundamental note of predicamental quantity
is homogeneity. This permits us to ignore qualitative differences
and consider nothing but pure quantity. (17)

Number, the class to which all discrete quantities belong,
is defined as a multitude measured by one. (18)

"Sic igitur unum, secundum quod simpliciter dicitur ens

indivisibile, convertitur cum ente. Secundum autem quod accipit rationem mensurae, sic determinatur ad aliquod genus quantitatis, in quo proprie invenitur ratio mensurae.

Et similiter pluralitas vel multitudo, secundum quod gnificat entia divisa, non determinatur ad aliquod genus. Secundum autem quod significat aliquid mensuratum, determinatur ad genus quantitatis, cujus species est numerus. Et ideo dicit quod numerus est pluralitas mensurata uno, et quod pluralitas est quasi genus numeri. Et non dicit quod sit simpliciter genus; quia sicut ens genus non est, proprie loquendo, ita nec unum quod convertitur cum ente, nec pluralitas ei opposita. Sed est quasi genus, quia habet aliquid de ratione generis, inquantum est communis.

Sic igitur accipiendo unum quod est principium numeri et habet rationem mensurae, et numerum qui est species quantitatis et est multitudo mensurata uno, opponuntur unum et multa, non ut contraria, ut supra dictum est de uno quod convertitur cum ente, et de pluralitate sibi opposita; sed opponuntur sicut aliqua eorum quae sunt ad aliquid, quorum scilicet unum dicitur relative, quia alterum refertur ad ipsum. Sic igitur opponitur unum et numerus, inquantum unum est mensura et numerus, est mensurabilis.

Et quia talis est natura horum relativorum quod unum potest esse sine altero, sed non e converso, ideo hoc invenitur in uno et numero, quia si est numerus, oportet quod ubicumque est unum, quod sit numerus." (20)

It is important to understand the nature of the one that is the principle of number. There is a transcendental predicate of being whereby it is undivided. This predicate belongs to all that is inasmuch as it has being. One, the principle of number adds the notion of measure to this formal indivision of each thing. Predicamental measure is that whereby the quantity of a thing is known. Its essential characteristics are homogeneity with what is measured and greater simplicity and knowability than it.

"Deinde cum dicit "semper autem". Ponit secundum quod considerandum est circa mensuram; dicens, "quod metrum", idest mensura, semper debet esse cognitum, scilicet ejusdem naturae vel mensurae cum mensurato sicut mensura magnitudinum debet esse magnitudo: et non sufficit quod conveniat in natura communi, sicut omnes magnitudines conveniunt: sed oportet esse convenientiam mensurae ad mensuratum in natura speciali secundum unumquodque, sic

quod longitudinis sit longitudo mensura, latitudinis
latitudo, vox vocis, et gravitas gravitatis, et unitatum
unitas.

Sic enim oportet accipere,ut absque calumnia loguamur; sed
non quod numerorum mensura sit numerus. Numerus autem
non habet rationem mensurae primae, sed unitas. Et si
unitas mensura est, ad significandum convenientiam inter
mensuram et mensuratum, oportet dicere, quod unitas sit
mensura unitatum, et non numerorum. Et tamen si rei
veritas attendatur, oportebit hoc etiam concedere, quod
numerus esset mensura numerorum, aut etiam unitas numer-
orum similiter acciperetur. Sed non similiter dignum videtur
dicere unitatem esse mensuram unitatum, et numerum numeri,
vel unitatem numeri; propter differentiam, quae videtur esse
inter unitatem et numerum. Sed istam differentiam observare,
idem est, ac si quis dignum diceret quod unitates essent
mensurae unitatum, sed non unitas; quia unitas differt ab
unitatibus ut singulariter prolatum ab his quae pluraliter
proferuntur. Et similis ratio est de numero ad unitatem;
quia numerus nihil aliud est quam pluralitas unitatum.
Unde nihil aliud est dicere unitatem esse mensuram numeri,
quam unitatem esse mensuram unitatum." (21)

Thus, one must be identical with each of the things to be
counted, and further, it must simply by repeating itself render
an adequate account of the number of the group of homogeneous
objects. (22)

One, the principle of number, is not a number, since it is
not a multitude. It must be indivisible or it is not one. When
we divide an orange, we have not two oranges, but rather no orange
at all. Likewise with anything else that is said to be one; it
cannot be further divided into homogeneous parts or it is not one.

"Assignat autem rationem, quare mensuram oportet esse
aliquid indivisibile; quia scilicet hoc est certa mensura,
a qua non potest aliquid auferri vel addi. Et ideo unum
est mensura certissima; quia unum quod quod est principium
numeri, est omnino indivisibile, nullamque additionem aut
subtractionem suscipiens manet unum. Sed mensurae aliorum
generum quantitatis imitantur hoc unum, quod est indivisibile,
accipiens aliquid minimum pro mensura secundum quod pos-
sibile est. Quia si acciperetur aliquid magnum, utpote
stadium in longitudinibus, et talentum in ponderibus, lateret,
si aliquod modicum subtraheretur vel adderetur; et semper
in majori mensura hoc magis lateret quam in minori." (23)

It is only because modern mathematicians conceive of number

dialectically as containing the property of infinite divisability that they have accepted fractions as numbers.

St. Thomas says that number arises from the division of the continuum. (24) The fundamental notion of quantity is the order of parts in the whole. When we add to this the notion of actual division between homogeneous parts, we have the idea of number. It is only the division of the continuum that is capable of giving us the notion of number, because the number system is potentially infinite and any actual number of real things is finite./ The number system is potentially infinite, since no (25) matter how large a number one conceives, it is always possible to think of a larger by adding one to it. The continuum is actually not divided at all, but it is capable of being divided indefinitely. Thus it is the ideal basis for generating the number system.

. The proper notion of number includes nothing then but the order of absolutely homogeneous parts. Because of its abstraction from all qualitative determinations it can be applied to all homogeneous objects. The proper notion of seven applies to seven oranges or seven blocks of wood. It is not with these applications of number that arithmetic deals, but rather with the numbers themselves conceived as species of discrete quantity. Othe wise, arithmetic would not be founded on the mode of defining proper to mathematics.

The traditional designation for predicamental number is numerus numeratus. (26) This applies strictly to homogeneous parts ordered under the last unity in them. In contrast to this proper sense of number, there is also the dialectical notion of number which is called numerus numerans. It is by a conception

of this kind that even non-homogeneous things can be counted.
We can say that an angel, a bottle, and a grain of sand are
three things. This will be true, but the three which is said
of these things will not be a predicamental number, since it
does not measure really homogeneous things. A quasi-homogen-
eity is given them by the mind when it unites them in the
logical genus of thing, but this is not a real homogeneity such
as is required to constitute the number which is the subject of
arithmetic.

This second sense in which number is used, namely, numerus
numerans, is formed by the mind through a further prescinding
from the properly quantitative notion of number. Just as
numerus numeratus is attained by leaving aside all qualitative
differences between different things and retaining only the
pure notion of parts of a homogeneous continuum, so numerus
numerans leaves aside even homogeneity and considers only the
order that can be conceived of as existing between non-homo-
geneous objects when they are treated by the mind as if they
shared in some genus. (27)

Classical arithmetic, that of Euclid in Books VII through
IX of the Elements, for example, treats only of numerus numeratus.
Modern mathematics is founded rather on numerus numerans. We
will here consider the mode of procedure of these two disciplines
in order to see the profound differences that there are between
them; how, for instance, one is perfectly scientific in its
procedures and the other is only dialectical.

The first proposition of the seventh book of Euclid's Elements
is: "Two unequal numbers being set out and the less being
continuously subtracted in turn from the greater, if the number

which is left, does not measure the other, the original numbers
will be prime to one another". For instance, *if* I choose two
numbers 29 and 7, and then set them forth thus: "29-7 equals
22; 22-7 equals 15; 15-7 equals 8; 8-7 equals 1. Of the
original numbers, 29 and 7, the proposition states that I can
say that they are prime to one another. By this is meant that
they have no other common measure than one. The proof is as
follows:

> "For, the less of two unequal numbers AB, CD being con-
> tinually subtracted from the greater, let the number
> which is left never measure the one before it until an
> unit is left;
> I say that AB, CD are prime to one another, that is, that
> an unit alone measures AB, CD.
> For, if AB,CD are not prime to one another, some number
> will measure them.
> Let a number measure them, and let it be E; let CD,
> measuring FH, leave an unit HA.
> Since, then, E measures CD, and CD measures BF, therefore
> E also measures BF.
> But it also measures the whole BA; therefore it will also
> measure the remainder AF.
> But AF measures DG; therefore E also measures DG.
> But it also measures the whole DC, therefore it will also
> measure the remainder CG.
> But CG measures FG; therefore E also measures FH.
> But it also measures the whole FA; therefore it will also
> measure the remainder, the unit AH, though it is a number:
> which is impossible.
> Therefore no number will measure the numbers AB, CD;
> therefore AB, CD are prime to one another."(28)

Euclid's method of proof is to suppose that they have another
common measure and then to show that as result we must assume
that a greater number can measure a lesser one. Everything in
the enunciation and the proof depends on the simple notion of
numbers and the operations that are possible following the
nature of each number. It is possible to subtract one number
from another because the second is greater than the first, and
it is impossible that a greater number should measure, that is
divide evenly, a smaller one. This is all that is necessary to

state the proposition and to prove it. In other words, in
Euclidean arithmetic problems and proof can be reduced to

1. certain self-evident principles, as, for instance, those about
   greater and less quantities

2. to the simple notions of unity and the numbers.

All operations performed in it are justified by these same
perfectly certain starting points.

Let us contrast this scientific mode of procedure with
modern algebraic handling of a problem. For instance, it can be
stated that a - x equals y. If this is to have meaning in the
sense of classic arithmetic a must be greater than x, but modern
algebra is not content with this limitation. It strives to be
perfectly general, that is to make a statement that will be true
for all values of its symbols. If a equals 8 and x equals 10,
algebra invents -2 in order to permit the interpretation
of the equation. Likewise in order that all numbers can be
divided, fractions are invented. Furthermore, other symbols
are used to allow the extraction of the square roots of all
numbers including such numbers as 2 which do not have square
roots. Algebra thus reverses the method of arithmetic by
inventing what passes for numbers to justify its operations
instead of making the range of possible operations depend
on the nature of the numbers involved. Even the rules for
operation become extremely mysterious sometimes. It is im-
possible in the range of elementary algebra to understand why
a minus number times a minus number gives a positive one, though
this must be adopted as a rule of procedure from the very first.

> "The use however, of the same terms in these two sciences
> will by no means imply that they possess the same meaning
> in all their applications. In Arithmetic and Arithmetical

Algebra, addition and subtraction are defined or under-
stood in their ordinary sense, and the rules of operation
are deduced from the definitions: in Symbolic Algebra, we
adopt the rules of operation which are thence derived,
extending their application to all values of the symbols
and adopting also as the subject matter of our operations or
of our reasonings, whatever quantities or forms of sym-
bolical expression may result from this extension:
but, inasmuch as in many cases, the operations required
to be performed are impossible, and their results inex-
plicable, in their ordinary sense, it follows that
the meaning of the operations performed, as well as of
the results obtained under such circumstances, must be
derived from the assumed rules, and not from their
definitions or assumed meanings, as in Arithmetical
Algebra."
. . . .
"In as much as the results of symbolical addition and
subtraction are obtained from an assumed rule of operation,
and not from the definition of the operation itself, it
will follow that their meaning, when capable of being
interpreted, must be dependent upon the conditions which
they are required to satisfy."
. . . .
"It appears, therefore, that in the case of negative sym-
bols, the operation of addition is no longer associated
with the fundamental idea of increase, nor that of sub-
traction with that of decrease: and thus a change of sign
from plus to minus, in the symbol operated upon, is
equivalent to a change of operation from addition to sub-
traction and conversely."
. . . .
"The signs plus and minus, when prefixed to symbols de-
noting quantities of the same kind, cannot denote modi-
fications of magnitude, but only such affections or
qualities of the magnitudes represented, as are converti-
ble by the operations of addition and subtraction: it is
on this account that -a can admit of no interpretation,
as compared with a or plus a, when a denotes an abstract
number, to which no qualities are attributed."
. . . .
"Quantities and their symbols are said to be real or
possible, when they can be shewn to correspond to real or
possible existences: in all other cases, they are said
to be unreal, impossible or imaginary. It will follow,
therefore, that when positive symbols represent real quan-
tities, the same symbols with a negative sign will be said
to be impossible or imaginary, whenever they are not capable
of an interpretation, which is consistent with the con-
ditions they are required to satisfy. It remains to shew
that there exist large classes of magnitudes which possess
qualities which can be correctly symbolized by the signs
plus and minus, and that consequently the terms negative
and impossible are not coextensive in their application."

(29)

Algebra is justified as a means of calculating the measurement of continuous quantities. Its great operational facility makes it an apt instrument in the physical sciences where it is necessary to have a formula that measures one sort of length or area in terms of another. Here, what is sought is not the properties of a subject in terms of its own intelligibility, but an approximation of one definite (and in this sense even variable quantities are definite) quantity in terms of another.

What would be unjustified intellectually would be to think that algebra and arithmetic are mathematics in the same sense. One starts with simple self evident statements immediately graspible by the mind without experience; the other, with a dialectical meaning of number justified only in terms of operation. (30) One is intended as a means of understanding the nature of the objects it studies; the other is used as a means of calculation merely. One is absolutely certain and scientific. The other is a dialectical since it effectuates its operations through beings of reason and is only significant when its results are capable of interpretation in terms of the physical objects to which it ultimately relates.

While it is justifiable to teach algebra to even young students, even necessary in view of the needs of the experimental sciences, it is sophistry to pretend that its "numbers" are numbers in the same sense as those of arithmetic, or that its operations are the same. This is the effect of the teaching of algebra to those, and especially by those not perfectly capable of distinguishing dialectical reasoning from

what is scientific. Those who have not this ability may/with

perfect safety undertake the teaching or even the prolonged

study of algebra. Otherwise the mind is warped by being

exercised in a discipline where it is not possible to know

the definitions of what is being studied and where one

reasons according to rules that one does not understand.

If such procedures are confused with science, then the

natural tendency is to believe that all reasoning is pos-

tulational, and that it is impertinent to ask what one is

talking about. Perhaps the widespread atrophying of the

philosophic temper of mind sometimes observed in modern

students can be traced to such sophistical formation.

CHAPTER VII

GEOMETRY

Quantity is, as we have seen, the order of parts in a
whole. When these parts are discrete we have numbers; if they
are not, we have continuous quantity. Aristotle has pointed
out several ways in which a quantity can be continuous.
(1) If, for instance, the parts are united by a ligature or by
contact or in any other such artificial way we have a kind of
continuity, but this is not the kind of union of parts in which
continuity properly consists. It is possible to characterize
the properly continuous as that wherein the end of one part
is the beginning of the other. (2) It is this infinite density
that is proper to the continuum, and it is from this character-
istic that all its other properties, (its infinite divisability,
for instance,) follow.

As we pointed out in the previous chapter, mathematics
does not study quantity as quantity. More particularly,
geometry does not study the continuum as such, but rather it
studies the interminate continuous quantity according to the
special manner it is grasped in mathematical abstraction.
It is this special manner of consideration that distinguishes
the geometer and the arithmetician from the metaphysician and
the natural philosopher. These remarks are prefaced only to
avoid a possible confusion between a study like this one for

instance, and one that would be properly mathematical.

Extension, which is synonomous with continuous quantity, can be of three kinds: length, breadth, and thickness. (3) These are the primary species of all that belongs per se to continuous quantity.

Point, which is defined by Euclid as that which has no parts (4) is the principle of a line, just as a line is the term of a surface and a surface is the term of a solid. A line must be terminated by points, otherwise it would be infinite and this is impossible.

"Similiter, se esset longitudo infinita, non esset lines. Lines enim est longitudo mensurabilis." (5)

These points are actual, that is to say, they are the real terminations of the line. Besides these terminal points, every line has an infinity of points in potency. None of these are actual, however, or we would have not one line but many.

What is said here about the termination of every line does not conflict with the interminateness of mathematical lines, since mathematics does not envisage lines as infinite, but merely as not having any definite length.

Point differs from one, principle of number, in that it is not actually present in the line, and hence it cannot measure it. It is for this reason that there is no minimum measure in continous quantity. Hence it is, also, that any measure in the genus of continuous quantity is imperfect. Ideally a measure must be first and absolutely simple in order to make known the quantity of what is being measured. If it is not perfectly simple it requires something beyond itself to make its own quantity known.

Even position belongs to point only per accidens. John

of St. Thomas gives a satisfying explanation of this.

> "SECUNDO COLLIGITUR punctum separatum non esse per se in
> loco; caret enim quantitate, et illud dicitur per se
> esse in loco, quod potest per se loco moveri. Puntum
> autem non potest per se moveri loco, (ut dicemus infra q.
> 20. art. ult.,) quia correspondet tantum indivisibili
> loci. Si autem moveretur per se, immediate post
> corresponderet alteri indivisibili; non dantur autem duo
> indivisibilia immediate. Solum ergo punctum est per ac-
> cidens in loco ratione partium, quae ponuntur in loco."(6)

This can also be seen from the fact that points inter-

penetrate, and that no two things can be in the same place at

the same time.

> "Itaque plura indivisibilia non requirunt distinctum
> locus, sed tanguntur se totis, quia idem est in illis
> tangi et tangi se totis, cum careant partibus; faciunt
> tamen, ne partes penetrentur, quia faciunt ne partes se
> totis tangantur, sed solum pense extremitates......
> quod punctum continuativum inhaeret parti inadaequate,
> scilicet toti parti, sed non totaliter, nec eam compre-
> hendo et undique penetrando, cum sit illi improportio-
> natum, utpote indivisibile cum divisibili, sed inhaeret
> parti tamquam subiecto ut principium eius vel finis."(7)

Line, surface, and solid are the ultimate subjects of

geometry. They, like all that belongs per se to the predicament

of quantity, have a quasi-substantial character, as St. Thomas

remarks, and thus we can demonstrate their proper passions of

them. These ultimate subjects are not constructed, but they

are abstracted from material being. We are not studying

something of our own creation when we study geometry, but some-

thing objective, an aspect of material being.

It is important to insist on this objective character of

geometry, since Kant's view (8) that its object is something

purely ideal has obtained a wide currency. This is no place to

enter into an explanation of his position. For our purpose it

is sufficient to oppose the Aristotelian doctrine of mathematical abstraction to it, and to insist on the consequent objectivity of all mathematics in the proper sense, namely all that which deals with species of what is per se quantitative.

No less false than the Kantian view of the object of geometry, is the opinion that geometry is the study of space, that is of the actual dimensions and shape of the material universe. This view is expressed in some mathematical writings from at least the time of Descartes. (9) In a way Kant did not deny this opinion, but merely transformed it by making space a category of perception rather than something physically existent in the universe as his predecessors had done.

It is sometimes alleged in favor of modern dialectical geometries like those of Riemann and Lobachevski that they are or may be truer than the Euclidean because they describe more accurately the actual physical universe than Euclid's geometry does. Such a statement is based on a false understanding of the nature of geometry. Continuous quantity as abstracted from material beings contains nothing but the notion of pure extension in its three dimensions. Attached to these fundamental concepts are properties like straight and curved for line, the species of polygon for figure and the various kinds of solids. What constitutes the science of geometry is the demonstration of the properties that follow upon the demonstration of its ultimate subjects. It is completely per accidens that a given theorem manifest or does not manifest the properties of the whole physical universe or one of its parts. It belongs to a scientia media like astronomy to apply the findings of geometry to the physical world.

Thus the true concept of the object of geometry is that it is something real, something not fabricated by the mind, but rather abstracted in such a way that all sensible qualities that belong de facto to the physical universe are not included.

It is important to see that it is sensible qualities that are excluded from mathematics and not necessarily all qualities. St. Thomas gives the example of hot and cold and others like them to illustrate what mathematics leaves out.

> "Sensiblis quidem est, quae concernit qualitates sensibiles, calidum et frigidum, rarum et densum, et alia hujusmodi, cum qua quidem materia concreta sunt naturalia, sed ab ea abstrahunt mathematica. Intelligibilis autem materia dicitur, quae accipitur sine sensibilibus qualitatibus vel differentiis, sicut ipsum continuum. Et ab hac materia non abstrahunt mathematica." (10)

This is clear up to a point, but it must not be forgotten that "triangle" and all such determinations are qualitative.

> "Mathematica enim sunt numeri, et magnitudines; et in utrisque utimur nomine qualis. Dicimus enim superficies esse quales, inquantum sunt quadratae vel tringulares. Et similiter numeri dicuntur quales, inquantum sunt compositi. Dicuntur autem numeri compositi, qui communicant in aliquo numero mensurante eos; sicut senarius numerus et novenarius mensurantur ternario, et non solum ad unitatem comparationem habent, sicut ad mensuram communem."
> (11)

The explanation of this seeming contradiction between a form of abstraction that excludes sensible qualities and yet seems to include qualitative determinations that are sensible like hot and cold would seem to be that "triangle" and all similar notions are qualitative determinations of quantity as such, and not merely sensible qualities that inhere in the subject as determined by quantity but do not determine further what is specifically quantitative. It is rather to this last kind of qualities that heat and cold, etc. belong.

If geometry does not construct, but rather receives its object, it does use construction a great deal. St. Thomas has pointed out that there are two kinds of subject in geometry.

"In illis autem scientiis, quae sunt de aliquibus accidentibus, nihil prohibet id, quod accipitur ut subiectum respectu alicuius passionis, secipi etiam ut passionem respectu anterioris subiecti. Hoc tamen non in infininitum procedit. Est enim devenire ad aliquod primum in scientia illa, quod ita accipitur ut subiectum, quod nullo modo ut passio; sicut patet in mathematicis scientiis, quae sunt de quantitate continua vel discreta. Supponuntur enim in his scientiis en quae sunt prima in genere quantitatis; sicut unitas, et linea et superficies et alia huiusmodi. Quibus suppositis, per demonstrationem quaeruntur quaedam alia, sicut triangulus aequilaterus, quadratum in geometricis et alia huiusmodi. Quae quidem demonstrationes quasi operativae dicuntur, ut est illud. Super rectam lineam datam triangulum aequilaterum constituere. Quo adinvento, rursus de eo aliquae passiones probantur, sicut quod eius anguli sunt aequales aut aliquid huiusmodi. Patet igitur quod triangulus in primo modo demonstrationis se habet us passio in sucundo se habet ut subjectum." (13)

The first and most important are the ultimate subjects, like line and figure, but one of the first tasks of the geometer is to prove that it is possible to take a simpler subject like line and from it to construct a more complex one like triangle. Hereby he arrives at a secondary kind of subject about which he makes further demonstrations. They remain secondary because they are reducible to the elementary notions that are not constructed but discovered. Indeed, the very possibility of the existence of the secondary subjects remains a property of the primary.

Also, geometry uses construction very extensively as a means of manifesting the properties of its subjects. Aristotle refers to the construction of a line through the vertex of a

triangle parallel to one of the sides as a means of manifesting
that the sum of the angles of a triangle are equal to two
right angles. (13) That he was referring to one of the most
indispensable methods of the geometer can be seen by merely
looking at any geometrical work.

The geometer bases his science on definitions, axioms,
and postulates. The definitions are either nominal defin-
itions of what we have called the ultimate subjects of
geometry or they refer to notions readily traceable to these
ultimate notions.

The axioms are special geometrical adaptations of more
general principles which are self evident in themselves.
Evidently it does not belong to the geometer either to ex-
amine or defend these principles. Both of these tasks be-
long to the metaphysician.

Geometrical postulates are statements of the possibility
of effecting certain constructions or of the results of such
constructions. What is needed to show the legitimacy of
these postulates is to show the nature of the possibility
or the inevitability involved. Cajetan distinguishes two
main kinds of possibility: physical possibility and what
he calls equivocal possibility. The second of these includes
Mathematical possibility.

> "Aristoteles dividit potentiam in potentias, quae eadem
> ratione potentiae dicuntur, et in potentias, quae non
> ea ratione qua praedictae potentiae nomen habet, sed alia.
> Et has appellat aequivoce potentias. Sub primo membro
> comprehenduntur omnes potentiae activae, et passivae, et
> rationales, et irrationales. Quaecunque enim posse
> dicuntur per potentiam activam vel passivam quam habeant,
> eadem ratione potentiae sunt, quia scilicet est in eis
> vis principiata alicuius activae vel passivae. Sub

secundo autem membro comprehenduntur potentiae mathema-
ticales et logicales. Mathematica potentia est, qua
lineam posse dicimus in quadratum, et eo quod in seme-
tipsam ducta quadratum constituit. Logica potentia est,
qua duo termini coniungi absque contradictione in enun-
ciatione possunt." (14)

Cajetan does not expressly say of mathematical possibility
that it really means non-contradiction, but this appears to
be one of its meanings. As is consistent with a mathematical
statement the test of possibility, the manifestation of non-
contradiction, must be visualized in the imagination.

For instance, when it is said that it is possible to
draw a line from any point to any other one, all that is ex-
pressed is the non-contradictoriness of such a construction.
There is nothing in the nature of a line that prevents its
terminating in any two given points. The verification of
this is made by referring the suggested construction to the
image of line in the imagination. Thus is certified to us
that there is nothing contradictory in the supposition that such
a line is or can be constructed.

The most celebrated of/the postulates is Euclid's famous
fifth postulate. It is usually enunciated thus: "If a straight
line falling on two other straight lines make the interior
angles on the same side less than two right angles, the two
straight lines if produced indefinitely meet on the side on
which are the angles less than two right angles". (15)
This postulate has given rise to endless controversy and it
has been interpreted in such a way as to cast doubt not only
on it but upon the whole of Euclidean geometry. Perhaps it
is not too much to say that the widespread disbelief in the

possibility of certain knowledge has as one of its main supports
the theory that the fifth postulate is arbitrary and hence that
geometry itself is uncertain. Geometry has always been re-
garded as one of the most certain achievements of the human
mind. It is only reasonable, then, that any doubt cast upon
it would also reflect on the power of the mind to know any-
thing with certitude.

The way in which the fifth postulate is undermined is
to declare that there is no reason to suppose that from the
same point several lines cannot be drawn parallel to a given
line. Hence, it is supposed that there are several such lines
and all of them are called parallel. It will be admitted
that with all except one of these lines the transversal cut-
ting each of them and the line to which they are supposed
parallel will form less than two right angles on the same
side of the transversal. In other words, it is supposed that
all the "parallels" except one will be inclined toward one
another and still never meet. We must ask then what is the
character of the inclined lines. Are they, for instance,
straight or curved. If they are straight they must be homo-
geneous in every part or they will not conform to the famous
descriptive definition that has straight lines extending
evenly in every part. By this definition if the beginning of
the line is inclined ever so slightly, even a billionth of a
degree, all the other parts must continue to incline accor-
dingly. As long as we suppose that there will continue to be
homogeneous inclination there is a contradiction involved in

supposing that lines which are separated by a finite distance
will not meet.

Riemann's introduction of a dialectical consideration of
the line based on the nature of the horosphere does not in
any way contradict what we have said. It is true that, if
we suppose a circle of infinite radius, any part of the cir-
cumference would be indistinguishable from a straight line.
This means that the same line can be regarded as straight and
curved. What is important to remember is that we have here
nothing but a hypothesis useful in dialectical consideration
but in the last instance expressive of a contradiction. No
line, mathematical or real, can be at one straight and not-
straight any more than it can be a line and not a line. It
would be foolish to abandon perfectly clear and certain defin-
itions like those of straight line for a purely dialectical
consideration, however useful.

If we rule out this contradictory notion of the line, the
only way in which from a given point more than one line can be
drawn and of course prolonged in both directions so as never
to meed a given line is for all save one to be asymptotic.
As we have seen, they can be asymptotic only if they are not
straight. Hence it is an equivocation to call the one straight
line drawn from a given point so as not to meet a given line
parallel in the same sense as a number of curved lines.

It is not astounding that non-Euclidean geometries should
be useful in describing the space that seems to be included in
our physical universe. All its main types are concerned with

curves, whether hyperbolas or ellipses. What wonder is it
that they apply very well to a space that experiment seems to
show is a curve with a tremendously long diameter? Classic
geometry has long since undertaken the strictly scientific
study of the properties of curves. What has been added by
the non-euclideans is the use of the algebraic method of
analytic geometry. It is in no way a contribution to have
added the equivocal use of the term parallel.

It is only this last aspect of their work that is
undesirable. When they suppose that Euclid's work rests on
an arbitrary assumption they make it dialectical. Alongside
of it they pretend to set up equally arbitrary systems. Thus
Euclid becomes one species of a wide variety of geometries
and some have said that schools should teach geometry according-
ly from the very first. What is lost here is the formation
of the scientific _habitus_ with the consequent scepticism we
have spoken about. All this shows how important the regulatory
role of the metaphysician is in examining and justifying the
principles of the other sciences.

An excellent example of the contrast between the ancient
scientific mathematics and their modern dialectical develope-
ment is afforded by comparing the work of Apollonius on Conic
Sections with the treatment of them in analytic geometry.
Take for instance the eleventh proposition in the first book
of Apollonius.

> "Let a cone be cut by a plane through the axis, and let it
> be also cut by another plane cutting the base of the cone
> in a straight line perpendicular to the base of the
> axial triangle, and further let the diameter of the section

be parallel to one side of the axial triangle; then if
any straight line be drawn from the section of the cone
parallel to the common section of the cutting plane
and the base of the cone as far as the diameter of
the section, its square will be equal to the rectangle
bounded by the intercept made by it on the diameter in
the direction of the vertex of the section and a certain
other straight line; this straight line will bear the
same ratio to the intercept between the angle of the cone
and the vertex of the segment as the square on the base
remaining two sides of the triangle; and let such a
section be called a parabola." (16)

After the construction of the parabola has been thus
described and one of its properties set forth, he proceed to
prove the proposition. His methods are properly geometrical
and every statement he makes can be justified in terms of the
elementary notion of figure, line, proportion and the axioms
and postulates.

Analytic geometry has as its initial postulate that for
every point on a line there exists a number and for every
number there corresponds a point on a line. Obviously,
this supposes a dialectical conception of number that includes
fractions and the roots of numbers that are not perfect
squares. This means that the number system attempts to re-
produce the density that belongs to the continuum. Also,
the line must be thought of as being points in act, and so to
be really discrete and not continuous.

Once this initial step has been taken it is possible to
construct a graph dividing a page into four parts. The divi-
sion is made by two lines at right angles to one another.
These lines are divided according to a scale to represent
numbers. Once this is done it becomes possible to represent
any point on the paper in terms of its reference to the

dividing lines. Formulae can be set up to describe the locus of any line during its whole length. This is done by substituting numerical values for general symbols like a, b, and x. One of the ways of representing the parabola is by the formula y^2 equals 4ax. This formula permits us to dispense with geometrical considerations and to work only with symbols. What is sought is ease of operability and nothing is easier than to work with precisely these symbols. They must be interpreted in terms of their correspondence on the graph, since some values of the symbols may involve quantities that have no sense in terms of the graph. An example would be a value that would make one of the symbols mean the square root of a negative number. Furthermore absolute accuracy cannot be had because there will always be a margin between the smallness of any fraction and the infinite divisability of the continuum. For most operational needs and for applications in engineering this discrepancy is of course negligible.

What is lost, though, is the manifestation of the properties of a subject through a proper concept of its nature. It is this that Appolonius supplies and that analytic geometry cannot. It is well that Descartes' discovery of Analytics permits us greater facility in operation. It is not well that this greater operability should have caused us to neglect a more scientific mode of procedure in the early steps of education.

Two things make a science perfect: (18) the certainty of its principles and the nobility of its object. Classical mathematics is preeminent amongst human sciences in the first

respect. Its principles are not only most certain _per se_
but also _quoad nos_. For this reason the young should study
it so that they may begin to possess science to the degree
and according to the mode possible for them at that age.

The object of classical mathematics is an accident of
material substances considered inadequately, according to a
mode that makes it incapable of existing. It is for this
reason that mathematical objects are not good, since the
good is object of desire and we can only desire what is
actual or capable of becoming so. Desire carries us outside
ourselves toward objects as they are in themselves. If they
are incapable of being in themselves they cannot be desired.

Considered, then, from the point of view of their object
the mathematical sciences are not the noblest of human dis-
ciplines. Natural doctrine gives us a far richer knowledge
of material substances since it considers them adequately
according to all the causes. It seeks to understand their
principles, causes,and elements as Aristotle says in the first
book of the _Physics_. (19) In other words we seek to penetrate
not only into what is generically true but we try to under-
stand the inner constitution of each thing as well as of its
properties and inseparable accidents.

Metaphysics is our human mode of knowing those things
that are higher than we are: the separated substances and
the Cause of all being. Hence, it has a higher object than
either natural doctrine or mathematics.

Inasmuch as the modern dialectical development of mathem-

atics is used mainly in an attempt to manifest imperfectly
and extrinsically the properties of material substances as
these are reflected quantitatively, it tends to have a
nobility that classical mathematics has less perfectly.
This can be said because the less perfect operability of
ancient mathematics makes them less adaptible to being used
in natural doctrine.

To despise the dialectical developments of mathematics
is to despise modern empirical investigations into nature and
that is to underestimate the main achievement of the last
four hundred years. Nothing like this is suggested when the
dialectical character of these disciplines is pointed out.
It is important, however, to be able to distinguish what
is scientific from what is dialectical. Teaching which ob-
scures or denies this distinction is sophistical. St. Thomas
has said that logic (20) must be learned before mathematics,
not because logic is easier, but because it is more necessary.
It is needed precisely to protect one from being malformed by
a discipline which (in its specifically modern form) proceeds
from conceptions that only the most learned understand accor-
ding to rules that are extremely mysterious. It is impertinent
for a beginner in such a discipline to ask what is being
talked about. If this is his only or his main training he will
be spoiled for the intellectual life where the first questions
are "an sit" and "quid sit".

NOTES ON CHAPTER ONE

1. <u>In Met</u>. lib. 1, lect. 1, n 23.

2. <u>In Met</u>. lib. 1, lect. 1n, 32.

3. <u>In Met</u>. 1, lect. 1, nn. 32, 33.

4. <u>In Met</u>. 1, lect. n.34.

5. <u>In Ethics</u> VI,n. 1152.

6. In Ethics VI, n 1145.

7. <u>Summa</u> I-II, q. 57, art. 3, ad 3.

8. <u>Summa</u> II-IIae, q. 47, art. 2, ad 3.

9. <u>In De Trin</u>. q.V, art. 1 ad 3.

10. The special problem posed by music will be discussed in the chapter on music.

11. <u>In Ethics</u> VI, n. 1211.

12. <u>De Trin</u>. q. V, art. 1, obj. 3 and answer to objection 3.

13. <u>In Post. Anal</u>. lect. 1, n. 1.

14. Idem, n.2.

15. Idem, n. 4.

16. Idem, n. 5.

17. Idem, n. 6.

18. Idem, n. 8.

NOTES ON CHAPTER TWO

1. Dositheus, <u>Ars Grammatica</u> in Keil,Vol. VII, p. 376.

2. Diomedes, <u>Ars Grammatica</u>,Lib. II, in Keil Vol. I, p. 426.

3. Quintillian, <u>Instit. Orat.</u>,Lib.,cap. 4, 10.

4. I lib. <u>Peri Hermeneias</u>, cap. I,.

5. St. Thomas, in I Lib. <u>Peri Hermeneias</u>, prologue.

6. In <u>I Post. Anal.</u>, lect. 1, n. 2.

7. Cf. <u>De Doctrina Christiana</u>, Lib. I, 4.

8. Cf. Arts libéraux, in <u>Dictionaire d'Histoire et de Géographie</u>, Tome 4, p. 827, col B et seq.

9. Amongst others that of Thomas of Erfurt, published in the complete works of Duns Scotus, vol. 1. Cf. Also Gilson in the 2nd edition of his <u>Philosophie Médievale</u>.

Notes on Chapter Three

1. Cf. <u>De Poetica</u>, cap. 1-3.

2. I, Q.35 ad 1 et 2; Q. 93, 1c et 9c.

3. Idem et I, p. 93, a. 5 ad 4.

4. The fine arts, all of them arts of imitation, can be classified according to the species of quality they imitate. Painting, sculpture and architecture imitate form and figure, the fourth kind of quality in the list Aristotle gives in his categories. Music and the dance imitates passion, the third species of quality. Poetry (and for our purposes this includes the drama) imitates human actions, as we have said. Indirectly it also imitates passions, since many actions are influenced by passion and rear the sign of this influence in the way they are accomplished.

5. Ia IIae, Q. 22, art. 3 sed contra.

6. IIa IIae, Q. 141, art. 3 corpus.

7. II IIae, Q. 142, art. 1 corpus

8. IIa IIae, Q. 114, art. 1 et 2.

9. IIa IIae, Q. 123, art. 2; Q. 127, art. 1. et 2

10. II IIae, Q. 153, art. 5 corpus

11. IIa IIae, Q. 35, art. 4 corpus

12. Ia IIae, Q. 63, art. 2 corpus.

13. Cf. <u>In De Anima</u> II, lect. XIII, ed. Pirotta, n. 387.

14. <u>Poetics</u> c. 9, 1451 b 5-7.

15. J. of St. Th. c. Phil., Logic II, Q.XVIII, art. 3, p.538 b 44.

chapter four

1. Aristotle, <u>Rhetoric</u> I, 2, 1355 b. 26.

2. Idem, 1355b. 28 b. et et seq., also 1356a 33.

3. <u>Rhetoric</u>, 1, chap. 3, 1358b. 7 et seq.

4. Id. 1357a 26 et seq.

5. <u>In Post. Anal</u>., Lib. 1, lect. 1, n.12. Cf. <u>In Eth</u>. I, lect. 3, n. 36.

6. <u>In Post. Anal</u>., lect. 1, n. 6.

6a. J. of St. Th., <u>C. T</u>. III, Disp. 27, art. 2, p. 341 n.3.

7. <u>In III Sentent</u>.

8. <u>Rhet</u>. 1, chap. 2, 1356b 1-4.

9. <u>Prior Analytics II</u>, cap. 23, 70a 11.

10. Id. 70a 15-24. Cf. <u>Rhetoric</u> I, 2, 1357b 4 et seq.

11. <u>Prior Anal</u>. I, 27a 1-5.

12. <u>In Post. Anal</u>., lect. I, n. 12
Cf. <u>Prior Anal</u>., 70a 25. Here Aristotle says that when one premiss is supressed we have an enthymeme; otherwise there is a syllogism. This purely material indication (material here means exterior) of what an enthymeme is has led to the usual definition of it as a syllogism with one premiss omitted. (Cf. J. of St. Th., <u>Cphil</u>. Logic I) No attention whatever has been paid to the kind of premiss used in an enthymeme.

13. <u>Rhetoric</u> I,II, 1356b 10.

14. Cf. <u>Prior Anal. II</u>, chap. 33, 68b, 7-38.

15. <u>In Post. Anal. I</u>, lect. 6, n. 5.

16. St. Albert, <u>In Prior. Anal</u>., lib. 2, tract. VII, cap. 5.

17. <u>Rhetoric</u> I,II, 1355b39-1356a4.

18. Id. loc. cit. 1355b32-35.

19. Id. loc. cit. ....

20. Ia, IIae, Q. 71, art. 2 ad 3.

20a. Cf. <u>In Eth. I</u>, lec. 3.

21. In Peri., lib. 1, lect. 14, nn. 19, 20.

22. It is necessary to distinguish between the speculative truth possible in radically practical and virtually practical discourse from practical truth which belongs to prudence.

23. Cf. Father Kearney, "Cassirer's Conception of Art and History", in <u>Laval Théologique and Philosophique</u>, vol. I, n.2, pp. 131-153.

Notes on Chapter Five

1. St. Albert, <u>In Lib. I Top.</u> Tract. 1, cap. 2, p. 241.

2. J. of St. Th., <u>Curs. Théol.</u> T. I, Disp. 11, a. 1, nn.1&2.

3. St. Albert, <u>In Lib. I Top.</u> Tract. 1, cap. 2, p. 241,242.

4. St. Thomas, <u>Met.</u> Iv, lect. 4, nn. 573-577.

5. <u>Post. Anal.</u>, lect. 20, n.5.

6. <u>In Boeth.De Trin.</u>, q. VI, a. 1 corpus.

7. <u>Met.</u> VII, lect. 3, n. /308

8. <u>Met.</u> VII, lect. 2, n. 1280.

9. <u>III Phys.</u>, lect. 8, nn. 1-4.

10. <u>De Coelo</u>, Lib. I, lect. 15, nn. 1-3.

11. <u>De Coelo</u>, Lib. I, lect. 15, n.9.

12. <u>I Poster.</u>, lect. 33, nn. 1-2.

13. <u>I Poster.</u>, lect. 38, n. 6.

14. <u>I Poster.</u>, lect. 27, n. 7.

15. <u>De Anima</u> I, lect. 2, nn. 24-25.

16. <u>De Trin.</u>, q. 4, a. 2 corpus.

17. There are many other interesting passages, confirmatory and explanatory, which help clarify the notion of logical genus and dialectical definition. Let us mention <u>De Trin.</u>, q. 7, art. 3; De Spirit. creaturis, art. 1 ad 24um, and Cajetan <u>In De Ente et Essentia</u>, edit. Laurent., 131.

18. <u>I Poster. Anal.</u>, lect.

19. <u>IV Phys. Arist.</u>, lect. 1, n.1.

20. <u>In IV Met</u>., lect. 4, n. 572-577.

21. J. St. Th.,<u>C. Theol</u>., T. I, Disp.2, art. 7, n. 16.
    Cf. also nn. 14, 15, 24, 31.

Notes on Chapter VI

1. <u>Curs. Phil</u>.,Log. II, q. XVI, art. 1, p. 545b 25-28.

2. Id. loc. cit. p. 541 a 17-23.

3. <u>In IV Phys</u>. lect. 7, n. 4.

4. Idem loc. cit. p. 544 b 12-18.

5. <u>Met. V</u>, XIII, 1020 a 7-8.

6. Idem 1541 a 1-15.

7. Idem 541 a 24 et sequ. Cf. also Descartes, "Principes de
   la phil." n. 53.

8. <u>In Met. V</u>, lec. XV, n. 983.

9. <u>In De Trin</u>. q VI, art I, ad 3 partem in fine.

10. <u>In De Trin</u>. q VI, art. I, ad 1 partem in fine.

11. <u>Curs. Theol</u>. I, Disp. 6, art. 2, p. 533, n 17 & 18.

12. <u>Curs. Theol</u>. I, Disp. 6, art. 2, p. 534, n. 20.

13. <u>In De Trin</u>. q VI, art. I, ad 2 partem.

14. <u>In Met. VII</u>, lect. X, 1494-1496.

15. <u>In Met. VIII</u>, lect. V, 1760. Cf. also, in Vi Met. lect. 1,
    1145, and in <u>I Met</u>. lect. V, 334. Also St. Albert.

16. I, q. 85 art. 1 ad 2.

17. Aristotle <u>Categories</u> Cap. VI, 4b 20.

18. <u>Met. V</u>, XIII, 1020a, 11-15.

19. <u>Curs.Phil</u>., Log. II, q. 16, art. 1.

20. <u>Met. X</u>, VI, 1057 a, 4. In Met. X, lect. 8, 2090-2094.

21. <u>In Met. X</u>, lect. 2, 1954 & 1955.

22. Cf. St. Th., Codl. X, q. 1, a.1 corpus and In III Phys. lect. 12, n. 5.

23. <u>In Met. X</u>, lect. 2, 1945.

24. <u>In Phys. III</u>, lect. 12, n. 5.

25.

26. <u>Phys. Iv.</u> cap. 11, 219b 5. Cf. also J. of St. Th., <u>Curs. Phil.</u>,Log. II, q. 16, art.2.

27. <u>De Trinitate</u>, Q. IV, art 2 corpus.

28. Euclid, <u>Elements</u>, Bk. VII, proposition 1. Heath, p. 296-297

29. Peacock, preface to Vol. I, pp. iii-ix & Vol. II, n. 545, 2 & 551, 554, 556, 557, 569, 600, 630, 631. Cf. also article "algebra" in <u>Encyclopedia Britannica</u>.

30. For instance, the use of fractions is contrary to the proper definition of number as a multitude measured by unity. Unity, by its nature implies indivision of a thing within itself.
    Also, negative numbers, and square roots of numbers like two are justifiable only in terms of operation not in virtue of the nature of number.

Notes on Chapter VII

1. <u>In Met. V</u>, lect. 7, no. 850.

2. <u>In Met. XI</u>, lect. 13, n. 2413.

3. <u>In Met. V.</u>, cap. 13, 1020a 13.

4. Euclid, Book I, Def. 1, Heath, Vol. I, p. 153.

5. <u>In Met. V</u>, 978.

6. J. S. Th., II, p. 347a 14-27.

7. Id. p. 429 a 27 and a 43.

8. <u>Critique of Pure Reason</u>, by Kant. Preface to the Second edition, Everyman edition, p. 10.

9. Cf. Pascal, <u>On Geometrical Reasoning</u>.

10. <u>In Met. VIII</u>, 1760.

11. <u>In Met. V</u>, lect. 16, n. 989.

12. <u>In Post.</u>, lect. 2, n. 5.

13. _In Met.IX_, Cap. 9, 1051 a 22-30.

14. _In II PeriHermeneias_, lect. 12, n.1.

15. Heath, vol. I, p. 155.

16. _Greek Math. Works_, vol. II, p. 305.

17. Cf. Brink, _Analytic Geometry_, chap. 1, n.1.

18. Cajetan, _Comment. In De An_.

19. Aristotle, _Physics I_, lect 1, n. 4.

20. _In De Trin_., q. V, art. 1, ad 2.

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