Week One

Logic as a Liberal Art, Some Aristotelian and Thomistic Starting Points, and Introduction to the Doctrine of Signs

Logic as a Liberal Art

> The Liberal Arts are those steady and right shapings of works realized primarily in the mind—a melody, an argument, a mathematical proof, the design of a decisive experiment—works that are known in being made and made in being known.
>
> Joseph Lanigan

Whatever can truly be called "art" [*ars,* ἡ τέχνη] involves *making* or *production* [from *producere,* "to bring/lead forth"], according to reasoned—hence, stable and teachable—procedures, that is, according to rules of art. Hence, Aristotle's characterization of art from its source:

> [And] art comes into being [γίγνεται δὲ τέχνη] whenever, out of many conceptions from experience [ἐκ πολλῶν τῆς ἐμπειρίας ἐννοημάτων], a single universal judgment arises [μία καθόλου . . . ὑπόληψις γένηται] about those [*sc.* conceptions born of experience] that are similar [περὶ τῶν ὁμοίων].[1]

Hence, too, Aristotle's formal definition of art:

> Accordingly, art, as has been said, is a kind of productive habit [or capacity: ἕξις τις . . . ποινητική ἐστιν] following on a true [or sound] account [or reason: μετὰ λόγου ἀληθοῦς].[2]

As *arts*, then, the liberal arts involve steady, right ways of shaping *works, works* in precisely the sense in which we speak alike of "the works of Jane Austen," or of "BMW—Bavarian Motor *Works*—products," or of "artisans' craftworks." Aristotle's analysis of ἡ τέχνη among the human faculties concerned with rationality—concerned, that is, with living by the truth of things—is given most fully in Book VI of the *Nicomachean Ethics*[3] (and is underscored and explicated in St. Thomas' *Commentary*[4]).

Truth—which comes by judgment, that is, by affirmation or denial [τῷ καταφάναι ἢ ἀποφάναι]—Aristotle observes, falls under five human capacities (*habitus,* ἕξεις). These are divided in relation to two sorts of object, namely: what can be otherwise [ἄλλως ἔχειν

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[1] *Metaphysics* Book I, 1, 981^{a}5–6 (translation after Joe Sachs, *Aristotle's Metaphysics* [Santa Fe, New Mexico: Green Lion Press, 2002), loc. cit.

[2] *Nicomachean Ethics* Book VI, 4, 1140^{a}21.

[3] Cf. *Nicomachean Ethics* Book VI, 3–5, 1139^{b}15–1140^{b}7.

[4] Cf. St. Thomas Aquinas, *Commentary on the* Nicomachean Ethics *of Aristotle,* Bk. VI, Lection 3, nos. 1142–1160 (pp. 364–368).

ἔστι; in Thomas' terms, *contingentia,* "a contingency"[5]] and what is unalterable [τὸ ἀδύνατον ἄλλως ἔχειν] because it is by necessity [τὸ ἐξ ἀνάγκης ὄν; in Thomas' terms, *ex necessariis necessaria,* "a necessity from necessities"[6]]. Schematically:

the variable/contingent (what *can* be otherwise through human intervention: objects of practical intellection)		the invariable/necessary (what *is* and cannot be otherwise through human intervention: objects of speculative intellection)		
art [*ars,* τέχνη]: truths re: what can be made → right precepts or judgment re: what can be produced [making → transitive acts, acts that terminate in something apart from the act itself]	prudence [*prudentia,* φρόνησις]: truths re: what can be done → right precepts or judgment re: what can be done [doing → intransitive acts, acts that teminate in themselves]	science [*scientia,* ἐπιστήμη]: truths by deduction from 1st principles → necessary knowledge of the reasoned fact	wisdom [*sapientia,* σοφία]: truths by comprehensive grasp of 1st principles in relation to their uses → reflexive knowledge of speculative and practical knowing from principles to terms	intellection [*intellectus,* νοῦς, νόησις]: truths by comprehensive grasp of 1st principles → knowledge of essences or natures

The whole "suite" of capacities [*habitus,* ἕξεις] makes for a human being fully capable of the actions required to perfect his whole person—required, that is, to attain the goods achieveable *by*, and also *as*, human activity. *Analytically,* considered in themselves, these capacities can be set forth discretely, as above; *existentially,* as they obtain in the human being, these capacities are all at one as, and so far as, the person is *one* agent in and through several capacities.

As *liberal*, arts—the free arts—take their name from *liberti,* free persons who are "for their own sake" or "their own good," in contradistinction to *servi,* who are "for another's sake" or "the good of another."[7] Liberal arts [*artes liberales*[8]], then, would seem to stand in contrast to *servile* arts [*artes serviles*[9]], which involve the steady and right shapings of instruments: things that are made for the sake of something else, and so are what they are in service to something beyond them.

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[5] *Commentary on the* Ethics, Book VI, Lection 3, n. 1150 (p. 367).
[6] Ibid., n. 1148.
[7] Cf. St. Thomas Aquinas, *Commentary on Aristotle's* Metaphysics, Book I, Lection 3, nos. 7–8.
[8] The term "liberal art," *ars liberalis* [plural: *artes liberales*], offered by way of translating the Greek ἐγκύκλιος παιδεία—"comprehensive" or "all-round education"; thus, education aimed at a complete person—is first recorded in one of Cicero's early works, *De Inventione* (a handbook on rhetoric), and while the term may not have been coined by Cicero, nevertheless, Cicero is traditionally credited with it. The division of the liberal arts into the arts of speech (grammar, logic and rhetoric: the *trivium,* or "threefold way") and the arts of reckoning and measuring (arithmetic, geometry, astronomy and music: the *quadrivium,* or "fourfold way) is current by the time of Boethius (early 5th century, A.D.), while the quadrivium goes back at least to the program of education prescribed for Plato's Guardians in the Seventh Book of *Republic.*
[9] "Servile" from *servus,* "servant" or "slave," one who exists and acts for the sake of another.

It should be immediately apparent that what it is to be *liberal* [*sc.* free and freeing] and to be [an] *art* are in significant tension, and that in two (related) senses. (1) *Any* art is somehow subordinated to the works it produces; that is, art is for the sake of something else, the artifact, and is so far frankly instrumental, "servile." "Liberal art," then, might appear to be a contradiction in terms, and "servile art" might appear to be a redundancy. (2) Art as a human capacity places the *artist* at the service of the artifact: the artist is good, fulfilled *as* an artist, if and only if the artifact is sound, and the artifact is sound if and only if it subserves the use to which it is destined; so, transitively, the artist's obligation to the artifact places the artist in service to the artifact's use.

Joseph Lanigan's formula, "[works] realized principally in the mind . . . [that are] known in being made and made in being known," suggests a way of resolving the tension between arts *as* arts and arts *as* liberal.[10] The works or productions shaped according to the liberal arts are realized *in* the mind: they are, to speak precisely, "in the mind" not as water is "in the glass," but as the statue is "in the marble" or "in the bronze," or as one's meaning is "in" one's words. The works of the liberal arts subsist, in this fashion, in the artist. Moreover, that they are "made in being known and known in being made" entails that they are, so to speak, knowable shapings of the artist's active knowing: steady and right, they give the artist's knowing *character, amplitude, ἕξις, habitus*. Liberal arts thus perfect the human *artist,* and perfect the artist *as* a knowing being, that is, in the artist's specifically human—defining—act. They are, so to speak, artifacts for the sake of the artificer, who is (according to the beautiful, compact formula of Fr. Robert Sokolowski[11]) destined to flourish as "an agent of truth."

The argument that, as (i) immanent to the mind and as (ii) thus directed to the specifically human end of speculative or theoretical knowing, the works of liberal artistry are indeed liberal—free—supposes that the human intellect attains its end *via* intelligible [immaterial] instruments, forged according to logical art: so far as they are directed to "useless" knowledge, knowledge for its own sake, so far are they liberal.

Some Aristotelian Starting Points:
Artless *versus* Artful Success

Anyone familiar with spoken and written English will have more than a passing acquaintance with spoken or written tropes like the following:

> Any plane, rectilineal figure is divisible into triangles;
> and every heptagon is a plane, rectilineal figure.

[10] Br. S. Edmund Dolan's essay, "The Liberal Arts as *Arts,*" pursues a thoroughly Thomistic resolution.
[11] Cf. *Phenomenology of the Human Person* (Cambridge University Press, 2008).

Even if one is a bit hazy on the exact meaning of *plane, rectilineal figure,* or entirely at sea as to *heptagon*; and, moreover, even if one is unsure whether "any *x*" and "every *x*" are interchangeable expressions; even so, to read together—that is, to enunciate for oneself—the statements "any plane, rectilineal figure is divisible into triangles" and "every heptagon is a plane, rectilineal figure," is to discern that if one takes *them* for truths, one must also assert (that is, enunciate as a truth):

Every [or "any"] heptagon is divisible into triangles.

Moreover, the same pattern or *schema*,[12] "Any X is Y; and every W is X: every W is Y," may be observed to produce the same sort of result, whenever suitable terms are inflected into the places held by X, Y, and W:[13]

I.	II.
Any X is Y;	Any X is Y;
Any bird is equipped with talons;	Any human act is a purposeful act;
and every W is X:	and every W is X:
and every duck is a bird:	and every statement is a human act:
every W is Y.	every W is Y.
every duck is equipped with talons.[14]	every statement is a purposeful act.

Suitable terms certainly *are* required: the result, that is, is not independent of the terms inflected into the *schema*:

III.	IV.
Any X is Y;	Any X is Y;
Any sweet thing is palate-pleasing;	Any gyrer is a slithy tove;
and every W is X:	and every W is X;
and every victory is a sweet thing:	and every gimbler is a gyrer:
every W is Y.	every W is Y.
??every victory is palate-pleasing??	??every gimbler is a slithy tove??

[12] *Schema* [Greek: τὸ σχῆμα; plural, τὰ σχήματα] is Aristotle's term for the architecture of a logical whole-of-parts: any statement conforms to a *schema* [cf., e.g., *Categories* v, $3^b13–15$] and any argument [syllogism] conforms to a *schema* [cf., e.g., *Prior Analytics,* I, iv–v, $26^b27–37$].
[13] I., II., and the introductory instance to which they conform, express what is traditionally called Aristotle's "first figure" [τὸ πρῶτον σχῆμα] or primary pattern; cf. *Prior Analytics* I, iv, 26^b34; $25^b32–40$.
[14] As a matter of fact, although their feet are webbed, all species of ducks (including domestic species) *do* have talons.

Even upon merely cursory examination, suitable terms clearly must (for one thing) carry the same sense for each of their occurrences in a single construct. In III., only were *victory* a sweet thing in the same sense as something *palate-pleasing* is sweet could the ascription, "____ is sweet," serve to make *victory* manifest as *palate-pleasing*. But, of course, any experienced English-speaker will recognize that the expression "victory is sweet," like the expression "the taste of victory," involves a metaphor sprung from the primary sense of "sweet" as palate-pleasing.[15] And (for another thing), if (as IV. suggests) the "observation," *T'was brillig, and the slithy toves did gyre and gimblel in the wabe,*[16] is to be explained by IV., then *gyrer, slithy tove* and *gimbler* will have to prove such that one can ascertain whether there *are* any that *gyre* except your *slithy tove,* or any that *gimbel* yet do not *gyre*. In short, IV. will resolve like I. or II. *only* if

- what it is to be a *slithy tove,* to *gyre* and to *gimble,* and
- whether *slithy toves* are uniformly given to *gyre,* and
- whether to *gimble* can be attained independently of to *gyre,*

are matters already determined, just as that *to be a bird is to be furnished with talons* or that *human actions (as opposed to things humans just happen to do) are uniformly purposeful* are matters determined, and must be asserted (not merely entertained), if I. and II. are to resolve, respectively, into *every duck is equipped with talons* and *every statement is a purposeful act*.

Again, consider the construction:

Any X is Y;
Any plane, rectilineal figure is divisible into triangles;
but no W is X:
but no circle is a plane, rectlineal figure.

Here, the *schema* is: any X is Y; but no W is X; and one might well be inclined to "see" in the truth of these statements, a demand to assert the further statement,

no W is Y,
no circle is divisible into triangles,

which, after all (like "every heptagon is divisible into triangles"), is manifestly true. Nevetheless, one might be caught short by the reflection that the true statements,

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[15] "Metaphor," Greek again: μεταφέρω—to carry over, transfer, alter in relation; thus, to "carry over" a word, namely, into an extended, changed sense.
[16] "Jabberwocky," in Lewis Carroll, *Through the Looking-Glass . . . and what Alice found there* (1873); reprinted with Introduction by Morton N. Cohen (New York: Random House/Bantam Classics, 2006), 124.

Every X is Y;
Every bird is a vertebrate;
but no W is X:
but no pig is a bird:

which repeat the *schema*, complete it with the falsehood:

no W is Y.
no pig is a vertebrate.

Moreover, this *schema* is, so to speak, reliably unreliable: two true statements in the form, "Any X is Y; but no W is X," deliver sometimes a true, sometimes a false, completion in the form, "no W is Y":[17]

V.

Every hawk is carnivorous;
no vulture is a hawk:
no vulture is carnivorous.

VI.

Every hawk is carnivorous;
no sparrow is a hawk:
no sparrow is carnivorous.

Now, Aristotle grasped that constructions like I. and II. characterize those occasions on which human beings manage not only to assert *what* is so, but to assert it in such a way as to make manifest *why* it is so (and, indeed, cannot be thought otherwise). And, he proposed, this sort of knowing—ἐπιστήμη, or, in Latin, *scientia*—is definitive (though not exhaustive) for the human being: to be human is to be rational; the properly rational act, what it is to *be* rational, is to be in the habit [*habitus*] of, or to embody the capacity [ἕξις] for, ἐπιστήμη/*scientia*. Concomitantly, Aristotle grasped that constructions like V. and VI. constitute in-principle failures to produce constructions that function as I. and II. function, while constructions like III. and IV. constitute occasional failures to produce such constructions.

Hence, to recognize the differences among I.–VI. (and between the paradigms or patterns, i.e., the *schemata*, that they embody) is to see that there might be rules that set reliable *schemata* off from the unreliable *schemata* and so point to the architecture of reliable ones. Moreover, a canvass of I.–VI. suggests that the crucial *schemata* are realized or embodied in relations among distinct, but inseparable elements. In I. –II., the Y-term is said of the X-term, and the X-term of the W-term, yielding the Y-term said of the W-term. We might call such patterns, *schemata* in which the elements are terms, the "background pattern" (traditionally, the "remote matter") of logical (in the sense of well-ordered, artful) inference:

[17] Aristotle introduces the instances of his πρῶτον σχῆμα, primary pattern, that are followed by V. and VI. as defective at *Prior Analytics* I iv, 26ª2–9.

$X \leftarrow Y$ [Y is sayable of X.]
$W \leftarrow X$ [X is sayable of W.]
$W \leftarrow Y$ [Y is sayable of W.]

Traditionally, our Y- and W-terms are called *extremes*: one, the "major," standing only as *what is said of* another; the other, the "minor," standing only as *that of which another is said;* our X-term is called the "middle," standing "between" the extremes as that of which another is said in one connection, and that which is said of another in a second connection.

The relations among the terms are realized through three statements or propositions. Trial and error suggests that the pattern or *schema* of propositions which *affirm,* respectively, that to all that the X-term applies, the Y-term applies (traditionally called the major premise), and that to all that the W-term applies, the X-term applies (traditionally called the minor premise), necessitates the affirmation that to all that the W-term applies, the Y-term applies.[18] That is, in case the premises are true, the conclusion is manifestly true. We might call such patterns, the *schemata* in which the elements are propositions or judgments, the "foreground pattern" (traditionally, the "proximate matter") of logical (in the sense of well-ordered, artful) inference:

$X \leftarrow Y$ [Y is said of X as of a whole.]
$W \leftarrow X$ [X is said of W as of a whole.]
$W \leftarrow Y$ [Y must be said of W as of a whole.]

As we have seen, the pattern of propositions through which the relation among the terms is realized can vary. When it varies as in V. and VI.—so that, as premises, the Y-term applies to everything to which the X-term applies, while the X-term applies to nothing to which the W-term applies—the "obvious" conclusion, that the Y-term applies to nothing to which the W-term applies, is sometimes manifestly true and sometimes manifestly false:

$X \leftarrow Y$ [Y is said of X as of a whole.]
$W \not\leftarrow X$ [X is denied of W as of a whole.]
$??W \not\leftarrow Y??$ [Y must be denied of W as of a whole??]

Accordingly, even when appropriate terms are inflected into it, the *schema* is unreliable, that is, hit or miss: it does not rise to *art*.[19]

Inspection and counter-example by trial and error, then, suggest that success in the act of inference or reasoning—which is signified by arguments so structured that, given the truth of their premises, their conclusion must be affirmed (enunciated as true)

[18] "Applies" is a bad translation of Aristotle's term, ὑπάρχειν [cf. *Prior Analytics* I, 2, 25^a1, et sqq.]; to my knowledge, no one's yet suggested a good one in English.
[19] And, we may note, so far as the art of logic is, on the side of reflection, the science of logic, the failure of the *schema* can be exhibited as a failure in principle.

as a result—pre-supposes and incorporates success in other acts of the mind. The terms that stand in the *schemata* suppose success in the act of setting forth definitions—which are *ultima* of logical analysis. Enunciation of the premises supposes success in the act of combining terms in *judgments* or *propositions*—which are thus the signs of what is or is not so, of the fact, of the true or false. Furthermore, since good definitions are adequate to things, while propositions and arguments are true to the ways things are—since, that is, they are signs of how things stand for the mind—an introduction to logic must include a proportionate account of the notions of *sign* and *signification*.

Taking logic, then, as the art which directs the acts through which the intellect comes to know, we can join John of St. Thomas in proposing for introductory logic[20] a division and correspondent order of exposition, one that follows St. Thomas' division of the subject in the *Commentary on the* Posterior Analytics:[21]

> Since Logic directs the manner of reasoning correctly and there are three acts of reason in which there is progress from one thing to another, as St. Thomas teaches, no better order can be followed than to partition the treatment of Logic on the basis of these three operations. The first operation of our intellect is called a simple apprehension, as when I understand man but make no affirmation or denial about man. The second operation is composition or division; when namely I so know a thing that I attribute something to it, or deny something. For example, when I say that man is white or deny that man is a stone. The third operation is discourse; as when from some known truth I infer and conclude another truth not so known. For example, from the truth *Man is rational* I infer *Therefore he is educable*. First, then, I apprehend the terms, then I compose a proposition from these, and finally I form inferences from propositions.

More graphically:

Logical object	*Correspondent Act*	*Completed as Knowledge by*
simple (concepts)	simple apprehension	definition
complex (propositions)	composition or division	argumentation
	reasoning (inference)	

Introduction to the Doctrine of Signs

Human beings know by sensation and by intellection [or, equivalently, cognition; or even intellectual cognition]. Sensation conveys sense-knowing to, or makes present, "thats" [singulars, whether concrete, "out there," or intangible, "in here"]. Intellection

[20] John of St. Thomas would say "formal logic" in a sense we have yet to address, but which is (broadly) conformable to the present-day notion of an introduction.
[21] Cf. Appendix to Br. S. Edmund Dolan's essay, "The Liberal Arts as *Arts*," *Commentary on the* Posterior Analytics, Book I, Lection 1, n. 4.

conveys the mind to, makes present, "whats" [commonalities among singulars]. Thus, we speak of *sensing* and *sensations* and of *intellecting* and *intellections* much as we speak of *painting* and *paintings,* but with crucial differences. (1) When painting ceases, *the* painting remains, but not so with sensing or intellecting: what remains is something distinct from the sensation or intellection, namely: *recollecting* and *recollections*. (2) The point of painting is *the* painting; but the point of sensing is not the *sensation,* nor the point of intellecting the *intellection*. Rather, the sensation and the intellection, respectively, *convey* objects beyond themselves; or, more exactly, make present to the knower singular concrete things and their (singular) features, in the first case, and forms common among singulars, in the second. One thing conveying another in thought or in imagination is ordinarily called a *sign* of the other, and the conveying is called *signifying*.

John of St. Thomas gives the classic, *common* definition of sign [Latin, signum; "common definition" in the sense of "definition applicable to all sorts of signs"], viz.: That which represents something other than itself to a knowing [cognitive] power.[22] As he notes,

> A term [terminus], no less than a statement [propositio], and any other logical instrument, is defined by means of signification. This is due to the fact that the understanding [intellectus] knows by means of the signification of concepts, and expresses what it knows by means of the signification of sounds, so that, without exception, all the instruments we use for knowing and speaking [*sc.* saying what we know] are signs. Therefore, if the student of logic is to know his tools—namely terms and statements—in an exact manner, it is necessary that he should also know what a sign is.[23]

It's notable that the *instances* of the sign [namely, instances immediately relevant to logical art and science] given by John are one and all *sensible* signs, and are one and all characterized as logical instruments [instrumenta logicalia]. This usage suggests divisions of the notion of sign [that is, it suggests distinctions drawn within, and thus differences introduced under, the common definition]. Among those divisions of immediate relevance to the sign as logical instrument:

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[22] Id quod potentiae cognoscitivae aliquid aliud a se repraesentat: *Ars Logica, Pars Prima,* Bk. I, ch. 2 [cf. Wade, trans., *Outlines,* p. 31; John Deely, ed., *Tractatus de Signis: The Semiotic of John Poinsot,* 2nd ed. (South Bend, Indiana: St. Augustine's Press, 2013), 25].

[23] Ibid.: Quia ergo tam terminus quam oratio et propositio et relinqua instrumenta logicalia per significationem definiuntur, eo quod intellectus cognoscit per conceptus significativos et loquitur per voces significativas, et in universum omnia instrumenta, quibus ad cognoscendum et loquendum utimus, signa sunt, ideo ut logicus exacte cognoscat instrumenta sua, scilicet terminos et orationes, oportet quod etiam cognoscat, quid sit signum.

Sign

Natural *v.* Conventional

Leads the knowing power from one thing to another, immediately and in virtue of the knower's grasping what it is in itself:

smoke ⇒ fire;

groan ⇒ present pain ⇒ injury;

thunder ⇒ storm.

NB: Natural sign *by intent* converts a natural sign to a human instrument and artifact: groaning by way of signaling pain; sending up smoke to call attention to a location.

Establishes by human initiative [agreement, deliberation], i.e., *as* an artifiact, a relation of sign to thing signified—by (i) contrivance, or (ii) custom or tradition:

i. ⃠ ⇒ ____ prohibited;

i. © ⇒ copyright by;

ii. common term ⇒ its ordinary referent;

ii. ♉ ⇒ zodiaical constellation Taurus.

Instrumental *v.* Formal

A sign that incorporates features or properties apart from its capacity to represent another; the sign is thus at once distinguishable from what it signifies and separable from the knower to whom it signifies, e.g.:

> spoken words have physical properties that can be known apart from their sense, e.g.: length (for poetic meter), rhymability, accent;
>
> an American stop sign is octagonal, bright red, inscribed with letters in white, normally mounted on post on the roadside on the right-hand approach . . .
>
> any smoke possesses definite, assessible chemical and physical properties of its own, quite independently of its capacity to suggest fire to a knowing observer.

A sign that is nothing other than (has no property in addition to) a representation to the knowing power of something other than itself (or, equivalently, a making present to the knowing power of something other than itself[24]): such a sign must be intrinsic to—a modification or feature of—the knowing power, which (in the case of human beings) is either sensitive or intellective:

> *sense image* [percept, phantasm] is nothing but the making present of the sensible object *as* sensible;
>
> *concept* [conceptus: so-called from the intellect's power to reproduce; also "mental word" or "expressed species"[25]] is nothing but the intellect's representation of an object's immaterial form or intelligible species

[24]Cf. John of St. Thomas, *Outlines,* trans. Wade, Bk. I, Ch. 2 (p. 32): "*To represent* is said of everything by which something is made present to the [*sc.* knowing] power" [repraesentare dicitur de omni eo, quo aliquid fit praesens potentiae . . .].

[25] Cf. Deely, ed., *Tractatus de Signis,* 240–241 = *Ars Logica, Secunda Pars,* Bk. II Q. 2, "Whether the Concept is a Formal Sign."

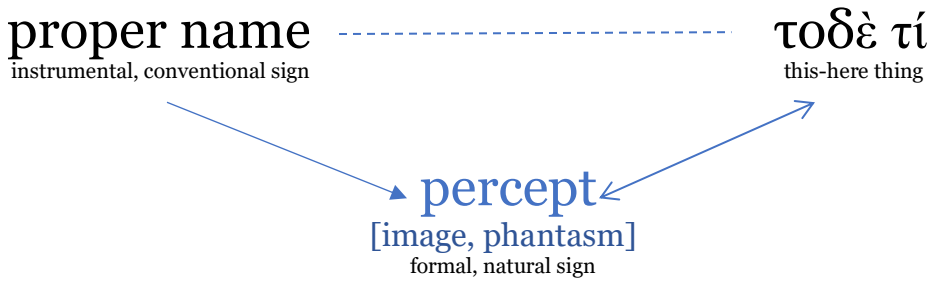
Clearly, natural and conventional signs are one and all instrumental: that is, they must be known *as* objects as the condition for their serving to represent yet other objects to the knower. Necessarily, then, all natural and conventional signs signify consequently upon formal signs. By way of illustration: a paw-print is a natural sign of the past presence of an animal of some sort; it can be apprehended because it is, in itself, a knowable thing—knowable so far as the sensible image conjours the sort of animal that accounts for such a print: "It's from a fox," we say.

The word, human speech, looms undeniably in experience as the all-adequate, indispensable galaxy of conventional signs, constituting *the* instrument *par excellence* of personal and common knowing. However useful may be the symbols elaborated for special purposes—from wiring diagrams, to the Periodic Table, to mathematical formulas of every sort . . .—all are, unless reducible to natural language, doomed to languish, uninterpretable and incommunicable. For, the word is the conventional sign ordered immediately to conduct the mind to concepts: it is the prime witness to thought. The distinction of instrumental-conventional from formal signs is convertible with the distinction between word and concept.

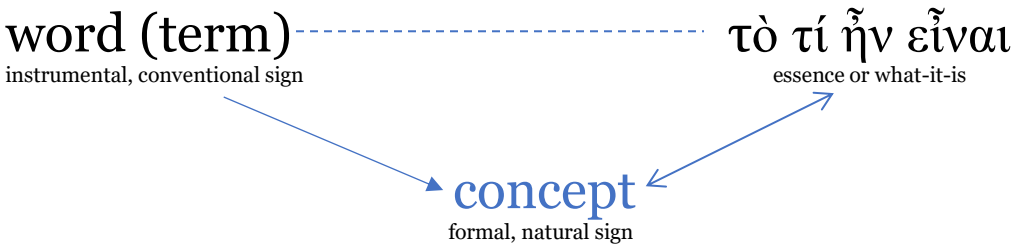
Accordingly, words never directly signify objects or things; speech conveys the mind to things only *via* concepts. Aristotle's *On Interpretation* opens with the classic, lapidary expression of the mediate word–world relation:

> What are [embodied] in voice are symbols of affects in the soul [τῶν ἐν τῇ ψυχῇ παθημάτων σύμβολα], and what are [embodied] in letters [are symbols] of those [embodied] in voice [καὶ τὰ γραφόμενα τῶν ἐν τῇ φωνῇ]. And just as letters are not the same for all, neither are voicings identical; nevertheless, the things of which these [*sc.* voicings and writings] are, in the first place, signs [ὧν μέντοι ταῦτα σημεῖα πρώτως] —namely, the affects of the soul in all—are likenesses [ὁμοιώματα] of others, to wit, the things themselves [πράγματα ἤδη ταὐτά].[26]

Σύμβολον [plural, σύμβολα], or token, is Aristotle's term for an instrumental sign. The instrumental sign, token or σύμβολον differs from the primary signs, σημεῖα, which are affects of the soul that signify as ὁμοιώματα, likenesses, the things in point, the πράγματα or subjects of inquiry. Graphically:



[26] *On Interpretation* [ΠΕΡΙ ΗΕΡΜΕΝΕΙΑΣ], 16ᵃ4–9: Ἔστι μὲν οὖν τὰ ἐν τῇ φωνῇ τῶν ἐν τῇ ψυχῇ παθημάτων σύμβολα, καὶ τὰ γραφόμενα τῶν ἐν τῇ φωνῇ. Καὶ ὥσπερ οὐδὲ γράμματα πᾶσι τὰ αὐτά, οὐδὲ φωναὶ αἱ αὐταί· ὧν μέντοι ταῦτα σημεῖα πρώτως, ταὐτὰ πᾶσι παθήματα τῆς ψυχῆς, καὶ ὧν ταῦτα ὁμοιώματα, πράγματα ἤδη ταὐτά (trans. Cortright).



Observations and, especially, some qualifications are immediately in order. That words signify concepts conventionally explains why word—concept relations need not be unique (although, for a given natural language, they often are): *race* may signify a swiftly flowing channel of water or a contest of speed; conversely, *wealth* and *riches* seem, quite indifferently, to signify abundant possessions; meantime, there seems to be no ready alternative for *redness* or *aunt*.

A signal qualification: the relation word—concept—thing should not be thought unqualifiedly straightforward. To propose that words signify things *through* concepts is to propose that they signify according to the ways things become known to us and are present to the mind. Everyone is familiar with the experience of seeking, and perhaps attaining, a refined, a more adequate, or a more exacting grasp of the object one has in view [the German for "concept" is Begriff, "what is grasped"]. The refinement of concepts *as* held in thought is, of course, the aim of logical art in its direction of the first act of the intellect.

Appendix I

The Liberal Arts as *Arts*[27]

A lecture delivered at Thomas Aquinas College,
Santa Paula, California,
Feast of St. Thomas, 1985

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(August 19, 1917–August 24, 2003)

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Saint Mary's College of California

INTRODUCTION

I would like to present a series of reflections on on what are called the "Liberal Arts."

Following some thoughts about the nature of the Liberal Arts, I would like to call your attention to the Liberal Arts precisely as *arts*; perhaps more accurately, I would like to dwell upon the "mental work" or "construction" which alone seems to justify our speaking of the Liberal Arts as *arts* in the first place.

In this latter connection I shall try to provide a few extended examples of what I believe to be typical "constructions" or "works" in the Liberal Arts; and I shall attempt to conclude this lecture by raising a series of questions as to how familiar the students of the Liberal Arts ought to be with the peculiar "works" or "structures" of each of the Arts.

The Liberal Arts seem to have gotten their name from a Roman attempt to translate the Greek expression that described early formal education in Greece. The phrase was ἐγκύκλιος παιδεία. For reasons that remain obscure to us, Cicero is said to have rendered the expression by the Latin phrase, *artes liberales*; whence the name has come down to us in English, "Liberal Arts." Whether they were aware of it or not, Cicero and his Roman friends brought together in this phrase a couple of ideas that a good part of the philosophical tradition has tended to keep separate.

Both the Latin, *artes liberales,* and the English, "Liberal Arts," are synthetic expressions that bring together notions which, if not incompatible, do as a matter of fact present awkward problems.

LIBERAL

In the first book of his *Metaphysics,* Aristotle, in attempting to define "first philosophy," argues initially by listing the qualities of "wisdom" and then by showing that, as a matter of fact, "first philosophy" possesses these qualities of wisdom to an eminent degree. One of the qualities that wisdom is said to possess is that "we do not seek it for

[27] Br. Edmund's essay first appeared in Saint Mary's College *Educational Perspectives* (1986); I have retained Br. Edmund's renderings of Greek and Latin sources (I believe they are all his own) and have added the corresponding original texts in the notes, together with the concluding Appendix—SAC

the sake of any other advantage; but, as the man is free, we say, who exists for his own sake and not for another's, so we pursue this as the only free science; for it alone exists for its own sake."[28]

Commenting on this passage, St. Thomas writes as follows:

> That man can properly be called free who is not for the sake of another, but is for his own sake. For slaves are for the sake of their masters, and they act for them, and whatever they acquire they acquire for them. But free men are for their own sake, as acting and acquiring for themselves. Only this science [*sc.* first philosophy or metaphysics] is for its own sake; therefore, it alone among the sciences is free [*libera*: *sc.* "liberal"].[29]

Aristotle and St. Thomas agree that wisdom or first philosophy (what has come to be called "metaphysics") is free or liberal in a very special sense. But, in his Commentary, St. Thomas is concerned to reflect that there exists a group of studies which, while they are called "liberal," are not always and everywhere "for their own sake." What, indeed, could justify describing as "liberal" those arts which, like grammar or logic, one might for some aberrant reason study for their own sake, but which, almost universally, are considered as preparatory to the higher reaches of knowledge? St. Thomas seems to be alluding to some such anomaly in the sequel to the passage of his Commentary quoted above:

> And it should be remarked that this [*sc.* the conclusion reached above, namely, "only this science (first philosophy) is free or liberal"] can be understood in two ways. In one way, the expression "only this science" refers in general to all speculative science, and then it is true that only this kind of science is sought for its own sake. And this is why only those arts are called "liberal" which are ordered to knowing; whereas those [arts] that are ordered to something useful, that can be had by way of action, are called "mechanical" or "servile." In another way of understanding [*sc.* the same conclusion] it refers to that philosophy or wisdom which is concerned with the highest causes, because among the highest causes there is the final cause . . . Hence, it is necessary that this science consider the ultimate and universal cause of all things. And in this sense, all the other sciences are ordered to this one as to their end; and this why only this [science] is for its own sake.[30]

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[28] Aristotle, *Metaphysics* I, 2, 982^{b}25–28:

> δῆλον οὖν ὡς δι᾽οὐδεμίαν αὐτὴν ζητοῦμεν χρείαν ἑτέραν, ἀλλ᾽ ὥσπερ ἄνθρωπος, φαμέν, ἐλεύθερος ὁ αὐτοῦ ἕνεκα καὶ μὴ ἄλλου ὤν, οὕτω καὶ αὐτὴν ὡς μόνην ἐλευθέραν οὖσαν τῶν ἐπιστημῶν· μόνη γὰρ αὕτη αὐτῆς ἕνεκεν ἐστιν.

[29] *Commentary on Aristotle's* Metaphysics, Book I, Lection 3, no. 7:

> Ille homo proprie dicitur liber, qui non est alterius causa, ed est causa suiipsius. Servi enim dominorum sunt, et propter dominos operantur, et eis acquirunt quicquid acquirunt. Liberi autem homines sunt suiipsorum, utpote sibi acquirentes et operantes. Sola autem haec scientia est propter seipsam: ergo ipsa sola est libera inter scientias.

[30] Ibid., no. 8:

Here St. Thomas seems to be saying that the term "liberal" belongs to metaphysics in the strongest possible sense, because metaphysics is pre-eminently "for its own sake." If, however, we group metaphysics together with the science of nature and mathematics in what might be called the "speculative" sciences, there is a sense in which the term "liberal" belongs to each one of these sciences taken separately. It must be acknowledged, however, that insofar as the science of nature and mathematics are in some sense "for the sake of" metaphysics, there is a sense in which the term "liberal" is less strong when applied to them. Finally, there are certain arts (which St. Thomas contrasts with what he calls the "mechanical" or "servile" arts) that deserve the designation "liberal" precisely because they are "for the sake of" something, namely, for the sake of the speculative sciences and, especially, for metaphysics.

Thus, there are three senses in which the term "liberal" is used: (1) in reference to wisdom or metaphysics, which merits to be called "liberal" because it is pre-eminently free and pre-eminently "for its own sake"; (2) in reference to the *kind* of knowing, of which wisdom or first philosophy or metaphysics is the model and to which the liberal arts and sciences are ordered; and finally (3) in reference to the traditional seven liberal arts, which deserve to be called "liberal" because they are ordered to liberal studies and especially to wisdom.

It is, perhaps, worth noting, if only in passing, that while neither metaphysics nor the speculative sciences (with the exception of logic and mathematics) are ever called "arts," it is not exceptional for the liberal arts (and especially when taken individually, as logic or mathematics) to be called "sciences."

What we would like to conclude from these reflections is that the term "liberal" in the expression "liberal arts" gets its meaning from the way in which those arts are associated with knowing "for its own sake," i.e., with the speculative sciences and especially with the highest of the speculative sciences, which is metaphysics.

ART

When we turn our attention to the term "art" in the expression "liberal arts," we may be surprised to discover a provenance of an altogether different order from that of "liberal." In effect, with the exception of its promotion of the phrase "liberal arts," the tradition resolutely opposes the speculative order (whence arises the term "liberal") to the practical order (whence arises the designation "art").

Et notandum, quod hoc potest dupliciter intelligi. Uno modo quod hoc quod dicitur haec sola demonstret in genere omnem scientiam speculativam. Et tunc verum est quod solum hoc genus scientiarum propter seipsum quaeritur. Unde et illae solae artes liberales dicuntur, quae ad sciendum ordinatur: illae vero quae ordinatur ad aliquam ultilitatem per actionem habendam, dicitur mechanicae sive serviles. Alio modo, ut demonstret specialiter istam philosophiam, sive satientiam, quae est circa altissimas causas; quia inter causas altissimas etiam est est finalis causa . . . Unde oportet, quod haec scientia consideret ultimum et universalem finem omnium. Et sic omnes aliae scientiae in eam ordinatur sicut in finem; unde sola ista mxime propter se est.

Art is an intellectual virtue which belongs to that use of the mind which is concerned with opinions about changeable or contingent things—things that can be other than they are. Such changeable things may be of two sorts: either they may be human acts that are in need of regulation, or they may be things in the external world that are subject to human transformation. The virtues of the practical intelligence which enable us to intervene in these two realms are *prudence*, with respect to the regulation of human acts, and *art*, with respect to those things which we can make. In this latter sense, Aristotle defines *art* as a habit of right reason with respect to things that can be made.[31] What distinguishes doing from making, prudence from art, is that prudence and doing are essentially immanent, remaining within the doer; by contrast, art is essentially transitive, in that the work of art comes to exist in something that is external to the maker. Another way of saying the same thing is that the perfection of prudence remains with the doer while the perfection of art lies in the externally produced work of art. It is in this sense that the tradition allows a genuinely prudent act which turns out badly to be regarded as a morally good act, however unfortunate, while the artist who produces a bad work of art is simply inept.

The term "art" as employed in the expression "liberal arts" is derived from this sense of the term that we have been at some pains to explicate. The contrast between the origins of the two terms in the expression could hardly be more decisive: the one arises from the speculative uses of the mind, and other arises from its practical uses. Art is concerned with the contingent, while the speculative sciences, from which the term "liberal" derives, deal with what is necessary. Art is concerned with the kind of direction that it gives the practical reason in the production of a work, whereas the speculative sciences are primarily concerned with the object as it is given in experience. Art proceeds synthetically or compositively while the speculative sciences proceed analytically or by way of resolution.

Nevertheless, it is true that there are other considerations that tend to reduce somewhat the sharp division that we have been describing between the speculative and the practical. A brief reference to these doctrines may help us to soften the contrast between "liberal" and "art" and, perhaps, suggest how these two notions might have been brought together in a single expression.

There is an illuminating discussion of these ideas in the opening chapter of the first book of the *Metaphysics*;[32] there, art (ἡ τέχνη) stands as a sort of bridge between experience (ἡ ἐμπειρία), on the one hand, and science (ἡ ἐπιστήμη) on the other. People possessed of experience can do and they can make; they can live good lives and they can build things; and, in doing so, they may no doubt furnish excellent examples for others who wish to follow in their steps. But their expertise never translates into genuinely communicable generalizations. Art, on the other hand, not only can make, it can generalize, and at least in some instances it can manifest, if not the truth, then the probability of these generalizations. Science, however, goes beyond both experience and art in that it can demonstrate the truth of its generalizations.

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[31] *Nicomachean Ethics* VI 4, 1140^{a}20: ἡ μὲν οὖν τέχνη . . . ἕξις τις μετὰ λόγου ἀληθοῦς ποιητική ἐστιν . . .

[32] Cf. *Metaphysics* I 1, *c.* 980^{b}25–981^{a}12.

I refer here to this discussion of Aristotle's because it seems to be suggesting that there is a sort of normal development from experience, through art, and on into science, and that there is a point at which, at least in the order of generation, art touches upon science. So much is this the case that in the passage under consideration, Aristotle speaks in the same breath, as it were, of the "art" of the builder or carpenter or physician along with allusions to the "art" of logic and the "art" of mathematics, which in other contexts are termed "sciences." It is to be noted, however, that in this same text Aristotle refers his readers to the sixth book of the *Nicomachean Ethics* where he deals formally with the distinction between art and science, and assigns the former to the practical part of the soul and the latter to the speculative part.

What is there about the Trivium and the Quadrivium, about grammar, rhetoric, and logic about arithmetic, geometry, music, and astronomy that courts the oxymoronic, if not self-contradictory, expression "liberal arts"?

St. Thomas seems to be dealing with our problem on at least three separate occasions in his writings. In his *Commentary* on Boethius' *de Trinitate* he says that

> these [seven liberal arts] are, among the sciences, called "arts" because they not only have to do with knowledge, but also with a "work" (*opus*), which belongs immediately to reason, such as: to construct a sentence, a syllogism, or a speech, to count and measure, to compose melodies and compute the course of the stars. The other sciences do not have to do with such structure, but only with knowledge. Thus metaphysics and natural science, as a consequence, cannot be called "arts," since the term "art" involves reason in so far as it is a maker.[33]

Elsewhere we read:

> Even in speculative matters there is something of a "work"; thus, the construction of a syllogism or of an appropriate speech, or the work of counting or measuring. Hence, whatever habits of the speculative reason that are ordered to [*sc.* the knowledge of] works of this kind are, by a sort of likeness, called "arts," i.e., "liberal arts," in contradistinction to those arts which are ordered to works that are achieved through the body, which are in a way servile insofar as the body is servilely subject to the soul, whereas man is free (*liber*) through his soul. Those sciences, however, which are in no way ordered to works of this [*sc.* either] sort

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[33] *Commentary on the* de Trinitate *of Boethius,* Q. V, a. 1, ad 3:

> Vel ideo hae inter ceteras scientias artes dicuntur, quia non solum habent cognitionem, sed opus aliquod, quod est immediate ipsius rationis, ut constructionem syllogismi vel orationem formare, numerare, mensurare, melodias formare et cursus siderum computare. Aliae vero scientiae 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 metaphysicae. Vel habent opus corporale, sicut medicina, alchimia et aliae huiusmodi. Unde non possunt dici artes liberales, quia sunt hominis huiusmodi actus ex parte illa, qua non est liber, scilicet ex parte corporis. Scientia vero moralis, quamvis sit propter operationem, tamen illa operatio non est actus scientiae, sed magis virtutis, ut patet in libro Ethicorum. Unde non potest dici ars, sed magis in illis operationibus se habet virtus loco artis. Et ideo veteres diffinierunt virtutem esse artem bene rectequevivendi, ut Augustinus dicit in IV de civitate Dei.

> are called "sciences" simply, but not "arts." Nevertheless, it does not follow that because the liberal arts are nobler, the idea of "art" more appropriately belongs to them.[34]

What St. Thomas is proposing in these passages is that the notion of "art" is sufficiently broad as to be able to extend to processes which, in effect, issue in works or constructions that are either imminent or transitive. The idea of "art" can be realized even if the work or structure remains within the mind and is not produced in exterior matter, as appears to be the case with the constructions associated with the traditional seven liberal arts. In St. Thomas' words these works "belong immediately to reason." No doubt, as we are reminded by the final lines of the text just quoted, such realizations of the notion of "art" fulfill a secondary and, perhaps, feeblest use of the term. Nevertheless, it is, according to St. Thomas' analysis, a proper employment. Reflecting on why it is that it is thus possible to have speculative arts (and therefore the liberal arts), although it is not possible to have speculative prudence, St. Thomas says:

> Every application of right reason to the makeable is an instance of art, whereas prudence does nothing more than apply right reason to that concerning which it is possible to take counsel. Now, we can take counsel only regarding those things which do not have determined ways of achieving the end. Because, therefore, the speculative intellect makes things, like a syllogism, a proposition, and so on, in which it proceeds according to determined and fixed ways, hence it is that in relation to [such works] we can retain the notion of "art," but not the notion of "prudence." This is why there is such a thing as a speculative art, but there is no speculative prudence.[35]

It seems to emerge from what we have been saying that, generally speaking, the traditional seven liberal arts are constituted of two closely associated aspects. One of these, which is expressed by the term "art," is the work or the structure which is the

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[34] *Summa theologiae* Ia IIae Q. 57, a. 3 ad 3:

> Ad tertium dicendum quod etiam in ipsis speculabilibus est aliquid per modum cuiusdam operis, puta constructio syllogismi aut orationis congruae aut opus numerandi vel mensurandi. Et ideo quicumque ad huiusmodi opera rationis habitus speculativi ordinatur, dicuntur per quandam similitudinem artes, sed liberales; ad differentiam illarum artium quae ordinature ad opera per corpus exercita, quae sunt quodammodo serviles, inquantum corpus serviliter suditur animae, et homo secundum animam est liber. Illae vero scientiae quae ad nullum huiusmodi opus ordinatur, simpliciter scientiae dicuntur, no autem artes. Nec oportet, si liberales artes sunt nobiliores, quod magis eis conveniat ratio artis.

[35] *Summa theologiae* IIa IIae Q. 47, a. 2 ad 3:

> Ad tertium dicendum quod omnis applicatio rationis rectae ad aliquid factibile pertinet ad artem. Sed ad prudentiam non pertinet nisi applicatio rationis rectae ad ea de quibus est consilium. Et huiusmodi sunt in quibus non sunt viae determinatae perveniendi ad finem; ut dicitus in III Ethicorum. Quia igitur ratio speculativa quaedam facit, puta syllogismum, propositionem et alia huiusmodi, in quibus proceditur secundum certas et determinatas vias; inde est quod respectu horum potest salvari ratio artis, non autem ratio prudentiae. Et ideo invenitur aliqua ars speculativa, non autem aliqua prudentia.

product of the mind's making. It is a structure which remains within the mind and upon which the mind turns in a second effort, which is intended to know the very structure that is its own making. This effort to know constitutes the second effort of the liberal arts. Thus, the liberal art of geometry constructs "figures" and then proceeds to show that those figures which are its own work possess certain properties. Thus, all the liberal arts involve the manifestation of a work that has been produced by reason.

However, it is not in virtue of this knowledge or manifestation of attributes that the liberal arts are termed "liberal," but rather, as we have seen, because the liberal arts are ordered to the speculative sciences which "are for their own sake." A sign that this so must be found in the fact that the kinds of knowledge or manifestations associated with the liberal arts are of a very uneven order. Thus, the cognitive aspect of grammar is practically non-existent, and the sort of manifestation peculiar to music and astronomy appears to be no more than probable, while the arts of logic and mathematics are, both of them, sciences.

WORKS AND CONSTRUCTIONS

In the Proemium to his *Commentary* on the *Posterior Analytics* St. Thomas is concerned to present the various operations of the mind, but especially to describe what he calls "the act which is proper to reason"; this is the act "of discoursing from one thing to another, so that through what is known one comes to the knowledge of the unknown."[36] He goes on to list the "works" or "constructions" that the art of logic studies and identifies the appropriate logical reflection. The passage is far too long for me to quote here *in toto,* but perhaps we can be satisfied simply to indicate the *opus* proper to each of the operations of reason and the special kind of discourse that the mind employs to examine each of these structures.

In presenting this material St. Thomas adopts an order which takes him from the perfect discourse of the demonstrative syllogism (which he calls "judicative logic") to a variety of more or less imperfect discourses (which he calls "inventive logic"), an order which of course best suits his purpose in writing an introduction to a commentary on the *Posterior Analytics*. Because here I am primarily concerned to illustrate works or structures peculiar to the liberal art of logic and the analyses appropriate to each, I believe my purpose can best be served by reversing St. Thomas' order and presenting first the various "works" of inventive logic before those of judicative logic.

The work of poetry consists in the construction of the metaphor and its variations, which are intended to incline the mind or, perhaps better, the imagination to pass on from the way in which something is represented to the adoption of an attitude toward that thing.

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[36]*Commentary on the* Posterior Analytics, Book 1, Lect. 1, n. 4: Tertius vero actus rationis est secundum id quod est proprium rationis, scilicet discurrere ab uno in aliud, ut per id quod est notum deveniat in cognitionem ignoti.

The work of rhetoric is the speech, as a whole, but especially the enthymeme, which is a syllogism in which only a single premise is expressed, while the second premise, which might prove fatal to the argument if expressed, is left understood. The discourse of rhetoric is intended to create something more than an attitude: it is designed to procure a suspicion to support trust or mistrust on the part of an audience.

The work of dialectic is the inquiry into the probable and is, perhaps, best illustrated for us by the more "socratic" of Plato's Dialogues. It is, says St. Thomas, intended "to incline the reason totally in favor of one side of a contradiction, although not without fear that the other side might be true."[37]

These are three works belonging to what St. Thomas calls "inventive discourse"; and he compares them with those occurrences in nature which, while not being necessary, do as a matter of fact take place successfully, fairly frequently. Yet, they do not always succeed. Thus, these kinds of discourse never allow the mind to come completely to rest in the known truth.

That consequence, says St. Thomas, is the issue of the fourth and perfect form of rational discourse, which is the demonstrative syllogism, through which "reason acquires the certitude of science."[38] It is here alone that the mind's discourse, as it goes from known into the unknown, achieves complete success. And no doubt the success achieved here invites us to compare and contrast this discourse of the demonstrative syllogism with the three inventive discourses of poetry, dialectic, and rhetoric, in order to understand how these latter are incomplete and need to be assisted and supplemented by the discourse of the judicative or demonstrative syllogism.

It should be noted that St. Thomas' reference to rhetoric in the present context seems to be made without prejudice to the fact the rhetoric appears elsewhere in St. Thomas' writings as a liberal art in its own right. Does that mean that St. Thomas might have entertained the idea that, under some circumstances, rhetoric might be included with logic and that he might be satisfied with a "Trivium" that contained only the arts of grammar and logic? Perhaps it might also be suggested that the independent liberal art of rhetoric may very well trace its origin to some historical accident: that is to say, not to speculative considerations but to practical concerns. We know, for instance, that the number of the liberal arts was a variable thing; membership on the list, whatever the number, was subject to what might be called "social factors." Thus, early, the Greeks seem to have considered physical education as a liberal art; and much later the Romans included architecture among the liberal arts. Neither was it a constant view that the liberal arts were ordered to philosophy. On the contrary, the sophists and many Romans, including, at least early in his career, Cicero and, later on, Quintillian, thought of the liberal arts and of philosophy itself as being ordered to rhetoric. Indeed, if one shares the view that man is the measure of all things, political science becomes wisdom and rhetoric

[37]Op. cit., I. L. 1, n. 6: . . . quia ratio totaliter declinat in unam partem contradictionis, licet cum formidine alterius.

[38] Ibid., n. 5: et per huiusmodi rationis processum scientiae certitudo acquiritur.

shares in the primacy of political science, since without rhetoric, politics is powerless. But for instances of disarray in the liberal arts one need not go far afield: almost since the Renaissance, the Trivium (with courageous but not particularly conspicuous exceptions) have functioned, however poorly, in the total absence of the Quadrivium.

CONCLUSION

To return from this digression, let me conclude this part of the lecture by repeating that it is perfectly natural for the human mind to make discourse, to go from the known to the unknown. It seems only obvious that some people do this better than others; that some succeed more often than others; and that there may be those people who, especially when thay make discourse concerning certain special matters, always seem to succeed. The liberal art of logic begins when people start to study those instances of successful discourse with the view of learning what successful discourse consists in and the conditions under which it takes place.[39]

Of the Trivium, then, logic seems to be pre-eminently the "liberal art," since it includes a number of structures created by the mind which, in turn, become the object for reflection and analysis; this knowledge, in its turn, can procure logical works with greater ease and order. Indeed, of the Trivium, only logic is a science, as we have noted.

Why, then, was logic excluded from the famous "order of the sciences" which St. Thomas developed on the strength of some very clear indications in Aristotle? The reason is, of course, that the "order of the sciences"—the one that includes the science of nature and mathematics and metaphysics— was drawn up with a view of a knowledge of objects that are given to the mind: these are the sciences of "what is." But the objects of logic, as we have been saying, are the works or sturctures that are produced by the reason. These are beings-of-reason rather than the being which forms the object of the disciplines listed in the "order of the sciences."

Turning now, briefly, to the quadrivial liberal arts of arithmetic, geometry, music, and astronomy, we note the same need for the mental or imaginative *opus* or structure which we found in the trivial liberal arts. We have already mentioned how the quadrivial arts are said to require such works as "numbering," "measuring," "composing melodies," and "computing the course of the stars." And here again we have a situation somewhat similar to what we have observed in the case of the Trivium: just as the trivial liberal arts are dominated by logic, so the quadrivial liberal arts are dominated by mathematics. In effect, the quadrivial arts consist of two mathematical arts (arithmetic and geometry) and two remaining arts in which mathematics is applied to sound, in music, and to visibles in local

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[39] By way of a footnote to what we have just said, I would like to quote a passage from the opening lines of Aristotle's *Rhetoric* where, speaking of rhetoric and dialectic, he says:

> . . . All men make use, more or less, of both [of these]; for to a certain extent all men attempt to discuss statements and to maintain them, to defend themselves and to attack others. Ordinary people do this either at random or through practice and from acquired habit. Both ways being possible, the subject can plainly be handled systematically, for it is possible to inquire into the reason why some speakers suceed through pracice and others spontaneously; and everyone will at once agree that such an inquiry is the function of an art.

motion, in astronomy.[40] While each of the liberal arts in this group has its characteristic *opus* or structure, and each of them is perfected and completed by an analysis of that work, there can be no doubt that each is a liberal art in its own right. Nevertheless, it remains true that the liberal arts of arithmetic and geometry are purely mathematical (and, in the ancient world, they were all there was of mathematics proper) and that the remaining quadrivial arts would not exist without mathematics.

We have already noted in discussing the Trivium that mathematics, like logic, is not only an art but a science as well. We also saw that because the object of logic is beings-of-reason, logic is not classified with the speculative sciences. There is something very much like this situation with the arts of mathematics. While it remains both an art and a science, and a science having to do with the "real order," still, because it deals with the accident of quantity which imagination forms into figures and numbers, the object of mathematics is thus deficient by comparison with the objects of the science of nature and of metaphysics. And for this reason both of the latter sciences enjoy a sort of primacy over mathematics.

However, within the quadrivial liberal arts there is no doubt concerning the priority of mathematics, and it is from this science that I shall select an example with which to illustrate how the mental *opus* functions in this group of liberal arts and how the knowledge proper to each of them is a knowledge of an appropriate structure. I shall select an example from geometry.

Example

By way of introduction, the history of mathematics suggests that contact with the ancient civilizations of Babylonia and Egypt placed the Greeks in the way of becoming familiar with certain elementary geometric facts. Thus, it is thought that the Egyptian art of land-surveying was able to stake out plots of agricultural land that were still under water as the result of the annual overflow of the Nile, by the simple expedient of locating two opposite corners of the land that had emerged from the water and by drawing and measuring the line between these two points and by constructing a square upon it. They were thus able to discover the lengths of the two lines that were still under water and thereby stake out the boundaries of a plot of land. This knowledge seems to have been wholly experiential, and there seems to be no evidence that for the Egyptians geometry was anything other than more or less a knack that they had picked up about land measurement. "Working on these things," continues the historian, "the Greek genius, by an inspiration unique in the history of the world, first conceived the idea of a *science* . . .

[40] The printed typescript of the lecture reads: "In effect, the quadrivial arts consist of two mathematical arts (arithmetic and geometry) and the two remaining arts in which mathematics is applied to sound in music and space in geometry." The phrase "mathematics is applied to . . . space in geometry" clearly breaches the structure of the proposition, which calls for a parallel between "mathematics applied to sound [music]" and "mathematics applied to ____ [astronomy]." Accordingly, I have interpolated: "mathematics is applied to sound [audibles], in music, and to visibles in local motion, in astronomy."—SAC

What was wonderful was that the idea of proving such things should occur to anyone at all . . ."[41]

However, I suggest that the idea of making a science out of the accumulated experience of land-surveying did not take place without at least one intermediate step.

In order to see this intermediate step I would ask you to consider briefly a very well-known passage in Plato's *Meno*. I refer to the famous conversation between Socrates and the slave boy, which was ostensibly intended by Socrates to demonstrate the proposition that learning is remembering.[42] Actually, this episode of the Dialogue also illustrates, I believe, the *opus* or construction peculiar to the liberal art of geometry.

After a preliminary conversation in which Socrates satisfies himself that the slave boy has identified a square having an area of four square feet, he asks the boy the question which controls the rest of the conversation, namely: What is the length of the line which forms the side of a square that will be double the area of the original square?

The boy's first response to this question is that the line in question must be double the length of the side of the original square.

On the strength of this answer Socrates proceeds to draw a line which is double the length of the side of the original square; and upon this line he builds a second square which the slave boy immediately identifies as the figure with an area of eight square feet, which is being sought. A brief series of questions, however, induces the boy to see that this second square is not merely twice the area of the initial square but, rather, four times its area; instead of having an area of eight square feet, it is actually sixteen feet square.

Another series of questions leads the slave boy to propose that the side of the square that is being sought lies somewhere in between the length of the side of the first square, which was two feet long, and the length of the side of the second square, which was four feet long.

Perhaps the process of questioning "sets the slave boy up" for his third important answer; but we are not interested in that aspect of Socrates' experiment. Let us assume that the slave boy falls into Socrates' trap, and this time he hits upon a square to be built upon a side that is three feet long. Socrates obliges and proceeds to sketch a square which in area is larger than the first but smaller than the second square. But, in any case, it is found to constitute an area, not of eight square feet and not of sixteen square feet, but of nine square feet, which, as the boy sheepishly confesses, is not the square they are looking for.

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[41] The *Educational Perspectives* typescript includes no citation; an internet search for the quotation "Working on these things, the Greek genius, by an inspiration unique in the history of the world, first conceived the idea of a *science* . . ." yields an exact return (though without *locus*) to the *Cambridge History of the Ancient World,* vol. 7 (1928).

[42] *Meno* 82a–85d.

We omit the dramatics of perplexity at this point and turn immediately to the procedure that Socrates adopts in order to continue his pursuit of the answer to the question he has put to the slave boy. That procedure, in effect, consists of returning to the very first step and redrawing the initial square with its area of four square feet. To his primitive square Socrates obtains the slave boy's consent to ad three more squares equal in area to the first and arranged in such a way that they give the square of sixteen square feet, which the slave boy had hit upon (wrongly, as it turned out) as his first answer to Socrates' question. By way of drawing appropriate bisectors through the four small squares that go to make up this fourth figure that has an area of sixteen square feet, Socrates draws a figure within the larger square made up of half of each of the original four squares, each of which has an area of four square feet. Actually, this new figure turns out to be a square which occupies precisely half the area of the square whose area is sixteen square feet. At length, the slave boy identifies this square-within-a-square as the figure they are looking for. Because its area is half the area of a square having an area of sixteen square feet, this interior area has an area of eight square feet. He also agrees that the square he has been looking for is not built upon the side of the given square but upon its diagonal. And at this point the slave boy professes a willingness to declare that it is "his personal opinion that the square on the diagonal"[43] of a square gives double the latter's area.

There follows a series of important exchanges between Socrates and Meno, not all of which concern us here; but in the course of these comments Socrates describes the present position of the boy's mind as "having true opinion about that which he does not know." Socrates asserts that such newly acquired opinions have "a dream-like quality . . . but that if the same questions are put to him on many occasions and in different ways, you can see that in the end he will have a knowledge on the subject as accurate as anybody's."[44]

It seems clear that the slave boy's "true opinion" has gone a step beyond the "experience" of the land-surveyor. He has assented to a generalization, the basis of which is his identification of a figure that has emerged from the "work" that Socrates has sketched with such great skill. He has true opinion bearing on an object of human making that remains essentially immanent. But as yet the slave boy does not possess the liberal

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[43] *Meno,* 85b: **Σωκράτης** . . . ὥστ᾽ εἰ ταύτη διάμετρος ὄνομα, ἀπὸ τῆς διαμέτρου ἂν, ὡς σὺ φῄς, ὦ παῖ Μένωνος, γίγνοιτ᾽ ἂν τὸ διπλάσιον χωπίον.

[44] *Meno,* 85c:

> **Σωκράτης** ἐνῆσαν δὲ γε αὗται αἱ δόξαι: ἢ οὔ;
> **Μένων** ναί.
> **Σωκράτης** τῷ οὐκ εἰδότι ἄρα περὶ ὧν ἂν μὴ εἰδῇ ἔνεισιν ἀληθεῖς δόξαι περὶ τούτων ὧν οὐκ οἶδα;
> **Μένων** φαίνεται.
> **Σωκράτης** καὶ νῦν μὲν γε αὐτῷ ὥσπερ ὄναρ ἄρτι ἀνακεκίνηται αἱ δόξαι αὗται: εἰ δὲ αὐτόν τις ἀνερήσεται πολλάκις τὰ αὐτὰ ταῦτα καὶ πολλαχῇ, οἶσθ᾽ ὅτι τελευτῶν οὐδενὸς ἧττον ἀκριβῶς ἐπιστήσεται περὶ τούτων.

art of geometry, nor will he possess it until he goes on to raise those further questions to which Socrates refers and that can only be answered, as the liberal art of geometry answers them, in the language of the Pythagorean Theorem.

It seems quite clear that without the *opus,* the "construction," there can be no liberal art. It is, of course, also true that without the knowledge there can be no liberal art either; but it has to be remembered that this reflective or analytical component of the liberal arts exists for the improvement and perfection of the work—so that the work may be accomplished in a more orderly way and with greater ease. There are liberal arts in which the more perfect and complete the work is, the better and clearer will be the knowledge that reflects on the work. Such, it seems to me, is the case with logic and mathematics. Thus, the better one argues dialectically, the more likely it is that the mind can discover the order of the dialectical syllogism and can identify the rules that make it succeed.

The question arises whether the "work" that is associated with a liberal art must always be found together with the reflection on that work in the same person. The question arises especially in connection with such liberal arts as grammar and rhetoric. Thus, for example, it is not inconceivable that a person might master a treatise like Aristotle's *Rhetoric* without appreciably improving one's ablities as an orator, while at the same time a gifted orator might profit immensely by that treatise although it might never occur to the orator to undertake his own analysis.

Further, to what extent must the student of the liberal arts possess and control the work that defines each of these arts? We are familiar with the student who depends more or less completely on the "works" and "structures" that are provided by others. Most of us, as a matter of fact, fit this description. We form our idea of the "works" from models that have been supplied us in our reading. One of the advantages of liberal arts programs based upon the great books is the opportunity they afford us to come in contact with the "works" characteristic of each of the liberal arts. The question arises, however, to what extent we should be concerned to discover and refine works of our own.

Perhaps the single most glaring error of current, so-called liberal arts education is its attempt to teach the analytical component of the liberal arts without reference to a "work." We are all familiar with the endless efforts that are made to teach grammar to people who rarely speak or write in complete sentences and have difficulty recognizing a paragraph. We subject people to the study of rhetoric without requiring any experience with many good examples of persuasive speech. And we teach logic to people who are incapable of recognizing an argument. To compare two quite different things, such educational procedures remind us of Aristotle's complaint in the first book of his *Ethics* against those who try to help people who have never acquired good habits to understand true happiness or to analyze virtue. They can use the vocabulary of ethics but they cannot know to what the words refer. Such an education quite literally prepares people to talk about things of which they are ignorant.

Let me conclude by drawing your attention to a passage from the ninth book of Aristotle's *Metaphysics*. It will go a long way, I think, to suggest why the *opus* in the liberal arts should be as complete and perfect as it can be. I should note, perhaps, by way

of preface that the lines I shall quote are taken from an argument that has only remote connections with our theme. In the place referred to, Aristotle is arguing that "actuality is . . . better and more valuable than the good potency."[45] In support of this thesis Aristotle offers several arguments, among which there is one that touches on the principal point of this lecture:

> It is by an activity also that geometrical constructions are discovered; for we find them by dividing. If the figures had already been divided, the construction would have been obvious; but as it is, they are present only potentially. Why are the angles of the triangle equal to two right angles? Because the angles about one point are equal to two right angles. If, then, the parallel to the side had already been erected, the reason would have been evident to anyone as soon as he saw the figure.[46]

Thus, the better and more complete the "work" or "construction," the more actual it is; and the more actual, the more it reveals of itself, and the easier it will be for the mind to discover the principles of the "work."

Addendum

Commentary on the Posterior Analytics, Book I, Lect. 1, nn. 1–6
with a translation from
John A. Oesterle, *Logic, The Art of Defining and Reasoning*
Second Edition (Upper Saddle River, New Jersey: Prentice Hall, 1962), 269–271.

1. Sicut dicit Aristoteles in principio metaphysicae, hominum genus arte et rationibus vivit: in quo videtur philosophus tangere quoddam hominis proprium quo a caeteris animalibus differt. Alia enim animalia quodam naturali instinctu ad suos actus aguntur; homo autem rationis iudicio in suis actionibus dirigitur. Et inde est quod ad actus humanos faciliter et ordinate perficiendos diversae artes deserviunt. Nihil enim aliud ars esse videtur, quam certa ordinatio rationis quomodo per determinata media ad debitum finem actus humani perveniant. Ratio autem non solum dirigere potest inferiorum partium actus, sed etiam actus sui directiva est. Hoc enim est proprium intellectivae partis, ut in seipsam reflectatur:	1. As Aristotle says at the beginning of the *Metaphysics,* the human race lives by art and reason. In making this point, the Philosopher touches upon a property that differentiates man from other animals, for their actions are prompted by a kind of natural instinct, whereas man in his actions is directed by a judgment of reason. Hence, the various arts serve to facilitate and order the accomplishment of man's actions. In fact art is precisely a particular ordering of reason as to the way human acts, through determinate means, may reach their intended end. Now reason can not only direct the acts of the inferior powers of man, but also its own. Indeed to reflect upon itself is peculiar to man's intellective power, for the intellect

[45] *Metaphysics* IX, 9, 1051^{a}4: Ὅτι δὲ καὶ βελτίων καὶ τιμιωτέρα τῆς σπουδαίας δυνάμεως ἡ ἐνέργεια, ἐκ τῶνδε δῆλον . . .

[46] Ibid., 1051^{a}22–27:

> Εὑρίσκεται δὲ καὶ τὰ διαγράμματα ἐνεργείᾳ, διαιροῦντες γὰρ εὑρίσκουσιν· εἰ δ᾽ ἦν διῃρημένα, φανερὰ ἂν ἦν· νῦν δ᾽ἐνυπάρχει δυνάμει. διὰ τι δύο ὀρθαὶ τὸ τρίγωνον; ὅτι ἂν περὶ μίαν στιγμὴν γωνίαι ἴσαι δύο ὀρθαῖς. εἰ οὖν ἀνῆκτο ἡ παρὰ τὴν πλευράν, ἰδόντι ἂν ἦν εὐθὺς δῆλον διὰ τί.

nam intellectus intelligit seipsum et similiter ratio de suo actu ratiocinari potest. Si igitur ex hoc, quod ratio de actu manus ratiocinatur, adinventa est ars aedificatoria vel fabrilis, per quas homo faciliter et ordinate huiusmodi actus exercere potest; eadem ratione ars quaedam necessaria est, quae sit directiva ipsius actus rationis, per quam scilicet homo in ipso actu rationis ordinate, faciliter et sine errore procedat.	comprehends itself and, similarly, reason can reason about its own act. Hence, just as reason by reasoning about manual acts, has devised the art of building for example, which enables man to exercise an act of this kind easily and in an orderly way, so it is necessary to have an art which directs the very act of reason so that man in reasoning may proceed in an orderly way, and without error.
2. Et haec ars est logica, idest rationalis scientia. Quae non solum rationalis est ex hoc, quod est secundum rationem (quod est omnibus artibus commune); sed etiam ex hoc, quod est circa ipsum actum rationis sicut circa propriam materiam.	2. This art is logic, that is, rational science. It is rational not only because it involves reasoning, for this is common to all arts, but because it concerns the very act of reason itself as its proper matter.
3. Et ideo videtur esse ars artium, quia in actu rationis nos dirigit, a quo omnes artes procedunt. Oportet igitur logicae partes accipere secundum diversitatem actuum rationis.	3. Hence, logic is regarded as the art of arts, because it directs us in the act of reasoning from which all arts proceed. Accordingly, the parts of logic must correspond to the diverse acts of reason.
4. Sunt autem rationis tres actus: quorum primi duo sunt rationis, secundum quod est intellectus quidam. Una enim actio intellectus est intelligentia indivisibilium sive incomplexorum, secundum quam concipit quid est res. [Et haec operatio a quibusdam dicitur informatio intellectus sive imaginatio per intellectum.] Et ad hanc operationem rationis ordinatur doctrina, quam tradit Aristoteles in libro praedicamentorum. Secunda vero operatio intellectus est compositio vel divisio intellectus, in qua est iam verum vel falsum. Et huic rationis actui deservit doctrina, quam tradit Aristoteles in libro perihermeneias. Tertius vero actus rationis est secundum id quod est proprium rationis, scilicet discurrere ab uno in aliud, ut per id quod est notum deveniat in cognitionem ignoti. Et huic actui deserviunt reliqui libri logicae.	4. There are three acts of reason. The first two of these are of reason as it is a kind of understanding. The first action of the intellect is the understanding of indivisible or incomplex things. By this action it conceives what a thing is. [And this operation is called by some the idea, conception or likeness according to the intellect.][47] Aristotle treats the doctrine ordered to this operation of reason in his book on the *Categories*. The second operation of the intellect is the composition and division of what is apprehended, wherein there is truth and falsity. Aristotle treats the doctrine ordered to this operation in his book *On Interpretation*. The third act of reason is the one distinctive of reason, namely to proceed discursively from one thing to another so as to arrive at knowledge of what was previously unknown from what is already known. The rest of Aristotle's logical works are ordered to this act of reason.
5. Attendendum est autem quod actus rationis similes sunt, quantum ad aliquid, actibus	5. It should be noted that the acts of reasoning are similar, in some respect, to the acts of

[47]Translation omitted from Oesterle's text—SAC.

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 conveniens, 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 rationis processus est, in quo ratio a vero deficit propter alicuius principii defectum; quod in ratiocinando erat observandum.

nature. Hence in this also art imitates nature so far as possible. Now there is a threefold diversity in the acts of nature. In some cases nature acts necessarily, in such a way that it cannot fail. In others, nature operates in a regular fashion but can sometimes fail to bring about its act. In the latter, therefore, there is a twofold act: one which occurs for the most part, as when a perfect animal is generated from seed; the other when nature brings about something disadvantageous, as when, because of the corruption of some principle, a monster is generated.

These three diversities are found in the acts of reasoning. There is a process of reasoning which induces necessity, in which one cannot fail to reach truth. The certitude of science is acquired by a process of reasoning such as this. There is another process of reasoning in which the truth is inferred for the most part, not, however, necessary truth. The third process of reasoning is one in which reason is defective with respect to truth because some principle which should be observed in reasoning is violated.

6. 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 posteriorum 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 pluribus 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 omnimoda certitudine, gradus aliquis

6. The part of logic devoted to the first process is called *judicative* because a judgment having scientific certitude is attained. And since we cannot have a sure judgment about effects, without a resolution to first principles, this part of logic is called *Analytics,* that is, the resolutory part. Now the certitude of judgment attained by resolution is either from the form of the syllogism alone, and the book of the *Prior Analytics,* which deals with the syllogism absolutely, is ordered to this, or [it is] from the matter also, because per se and necessary propositions are used, and the book of the *Posterior Analytics,* which deals with the demonstrative syllogism, is ordered to this.

The part of logic which is called *inventive* is devoted to the second process of reasoning, for certainty does not always accompany invention. Hence a judgment is required is order to have certitude about what comes from discovery. Just as in natural things which act for the most part there is a certain gradation (for in proportion as the power of nature is stronger the more rarely does it fail with

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 probabilitatem 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 dialecticus 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 ordinatur rhetorica. Quandoque vero sola existimatio declinat in aliquam partem contradictionis propter aliquam repraesentationem, ad modum quo fit homini abominatio alicuius cibi, si repraesentetur ei 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. Tertio autem processui rationis deservit pars logicae, quae dicitur sophistica, de qua agit Aristoteles in libro elenchorum.	respect to its effect), so in that process of reasoning which is not in every way certain, there is a gradation corresponding to the degrees of certitude. Accordingly, even though science is not attained by this process, sometimes faith or opinion is, because of the probability of the propositions from which the reasoning proceeds. In this case, reason is totally inclined to one part of a contradiction, but is still uneasy about the other. The *Topics* or *Dialectics* is ordered to this kind of reasoning, for here Aristotle treats of the dialectical syllogism which proceeds from probable propositions. Sometimes, however, faith or opinion is not completely attained, but only a kind of suspicion, in that reason is not wholly inclined to one part of a contradiction, although it inclines more to one than the other. The *Rhetoric* is ordered to this kind of reasoning. But sometimes there is only an evaluation based on some representation, inclining one toward a part of a contradiction, as when a man is brought to abhor certain food if it is represented to him in the likeness of something loathsome. The *Poetics* is ordered to this kind of reasoning, for the poet leads us to something virtuous through an appropriate representation. All of this pertains to rational philosophy, for to induce one thing from another belongs to reason. The part of logic devoted to the third part of reasoning is called sophistic (in which reason is defective with respect to truth because some principle which should be observed in reasoning is violated). Aristotle treats this in the book *Sophistical Refutations*.

Appendix II

WHETHER LOGIC IS BOTH A TRUE SCIENCE AND AN ART

John of St. Thomas, *ARS LOGICA, Pars Secunda*

Question 1, On the Nature and Domain of Logic, article 2

FROM

The Material Logic of John of St. Thomas: Basic Treatises,

trans. Yves Simon, John Glanville, G. Donald Hollenhorst.

Chicago: University of Chicago Press, 1955 (pp. 11–16).

There is no reason why we should spend much time explaining what is meant by 'science.' Clearly, this word designates a habitus acquired by demonstration and constituting a special facility for demonstration. Demonstration is the certain and evident proof of a truth. For a proposition to enjoy demonstrative certainty and evidence, its analysis must be carried up to first principles. If few men succeed in pursuing analysis that far, and if, for these few, success is limited to few subjects, this is not the fault of science, but of the scientists. Of those who are said to know, the vast majority possess only an imperfect and, as it were, subalternate science; instead of analyzing their science into its principles, they accept on belief principles supplied by another science.

Thesis. Logic is truly and properly a science and it is, at the same time, an art, though a liberal one.

Few doubt the truth of this proposition, although some want logic to be called a way to science rather than a science. St. Thomas expressly calls it a science in his *Commentary on the* Metaphysics, Bk. IV, Lection 4, n. 5,[48] and at *Summa theologiae* Ia IIae Q. 57, a. 3, ad 3[49] and a. 6, ad 3.[50] He also calls it an art in the *Commentary on the* Posterior Analytics, Bk. I, Lection 1[51] and at *Summa theologiae* IIa IIae Q. 47, a. 2, ad 3.[52]

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[48] Et huiusmodi, scilicet ens rationis, est proprie subiectum logicae.

[49]Even in speculative matters there is something by way of a work [etiam in ipsis speculabilibus est aliquid per modum cuiusdam operis], e.g. construction of a syllogism or of an apposite speech, or a work of counting or measuring [puta constructio syllogismi aut orationis congruae aut opus numerandi vel mesurandi]. And therefore, whatever capacities [habitus, ἕξεις] are directed to such like works of the speculative reason, are, by a kind of comparison, called arts, but "liberal" [et ideo, quicumque ad huiusmodi opera rationis habitus speclativi ordinatur, dicuntur per quandam similitudem artes, sed liberales], by way of differentiating those arts which are directed to works the body exercises, which are in a certain sense servile, inasmuch as the body is servilely subjected to the soul, while the human being is free in view of the soul [ad differentiam illarum artium quae ordinatur ad opera per corpus exercita, quae sunt quodammodo serviles, inquantum corpus serviliter dubditur animae, et homo secundum animam est liber]. Those true sciences which are not directed to any such work, are called sciences simply, and not also arts [illae vero scientiae quae ad nullum huiusmodi opus ordinatur, simpliciter scientiae dicuntur, non autem artes].

[50]Even in speculative matters, there is one science of dialectics [unde et in speculativis una est dialectica], which inquires about all matters [inquisitiva de omnibus], whereas demonstrative sciences, which pronounce judgment, differ according to their different [*sc.* objects: scientiae autem demonstrativae, quae sunt iudicativae, sunt diversae de diversis].

[51]See the Addendum to Appendix I, "The Liberal Arts as Arts," *Commentary on Aristotle's* Posterior Analytics, Lection 1, from 1. at "Hence, just as reason . . ." through 2.

[52]Every application of right reason in the work of production belongs to art [omnis aplicatio rationis rectae ad aliquid factibile pertinet ad artem]. But to prudence [practical wisdom; φρόνησις] belongs only the application of right reason in matters of counsel [Sed ad prudentiam non pertinet nisi applicatio rationis rectae ad ea de quibus est consilium]. And of that sort are matters in which there is no fixed way of attaining the end, as stated in *Nicomachean Ethics* Book III, 3 [et huiusmodi sunt in quibus non sunt viae

Further, in the *Exposition of Boethius'* de Trinitate,[53] St. Thomas says that "these are called arts among the other sciences because they not only involve knowledge but a certain work which is directly a product of reason itself; for example, producing a composition, syllogism or discourse., numbering, etc."[54]

The first part of this thesis is proved as follows: logic elicits demonstrative acts; therefore it is a scientific habitus.

The consequence is clear and the antecedent is more clear, for logic reduces conclusions to the first indemonstrable principles, for example (a) when it uses the principle "anything whatsoever either is or is not" to prove that contradictories cannot both be true, (b) when it shows that two contraries cannot both be true, because their both being true would imply that contradictories can both be true, (c) when it shows that the syllogism in Darii concludes validly because it fits perfectly under the principle, "said of every . . .," and in a thousand other cases.

The second part of the thesis is proved in the same manner, viz., by showing that the definition of art, "right determination of things to be made," [55] applies to logic. The concept of art, as expressed by this definition, involves two requirements: (1) on the part of the matter to be set in order and shaped, ar requires that there be not entire determination, but some indifference; otherwise the matter would not be capable of regulation and art; the acts of seeing and hearing, for example, cannot be directed by art. (2) On the part of the form, which has the character of a directing rule, art requires that regulation should proceed by certain and determinate ways. If ways and means are contingent rather than certain and determinate, direction is the business of prudence, not

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determinatae perveniendi ad finem, ut dicitur in III Ethic]. Since then, the speculative reason makes things such as syllogisms, propositions and the like, which the proceed along certain and determinate ways [quia igitur ratio speculativa quaedam facit, puta syllogismum, propositionem et alia huiusmodi], consequently in respect of such things it is possible to retain the measure [ratio] of art, but not the measure [ratio] of prudence [inde est quod respectu horum potest salvari ratio artis, non autem ratio prudentiae]. And so, a speculative art is encountered, but not a speculative prudence [et ideo invenitur aliqua ars peculativa, non autem aliqua prudentia].

[53] Question V of St. Thomas' *Exposition* treats Boethius' proposition that speculative or theoretical science [Latin, *scientia speculativa*; Greek, ἐπιστήμη θεωπητική] divides, by its generic objects, into the natural, mathematical, and divine. Among objections [second in Thomas' order] to the Boethian division, Thomas considers the invocation of St. Augustine's authority [*City of God,* Bk. 8, 4] to the effect that logic should be included among the speculative sciences, and the "common opinion" [third in Thomas' order] that philosophy [taken as a generic term for speculative science] divides into the seven liberal arts, which comprise rational science [logic, subordinating grammar and rhetoric] and mathematical science [science of discrete quantity, arithmetic, subordinating music; the science of continuous quantity, geometry, subordinating astronomy]. Thomas' responses to these objections structure John's teaching here; cf. *St. Thomas Aquinas, The Division and Methods of the Sciences: Questions V and VI of His Commentary on the* De Trinitate *of Boethius,* Medieval Texts in Translation, vol. 3, 4th ed., rev., trans. Anton Maurer (Toronto: Pontifical Institute of Medieval Studies, 1986).

[54] *Exposition,* Q. V, a. 1, ad 3: Vel ideo hae inter ceteras scientias artes dicuntur, quia non solum habent cognitionem, sed opus aliquod, quod est immediate ipsius rationis, ut constructionem syllogismi vel orationem formare, numerare, . . . et cetera.

[55] Cf. *Commentary on Aristotle's* Nicomachean Ethics, Book VI, Lection 3, n. 1153, re: $1040^{a}21–22$; translation from Maurer, op. cit.

of art. Prudence exercises direction by an estimate of the pros and the cons, not by art, for it has no cerain and determinate rules; it uses rules of good judgment, prudential rules, issued in relation to the circumstances as they arise.[56] What are the things that fall under the regulation of art? External works, called 'things to be made,' are the matter of arts called mechanical, because such works are more servile and and subject to despotic government. But internal works are also to be set in order by art, and because these works are more free and less servile, the arts which rule them are called liberal. In both cases actions constitute a matter that admits of being set in order by certain and determinate rules, for these actions contain some indifference and can be done rightly or wrongly, with or without error.

Thus, the second part of the thesis is proved by the consideration that the intellectual operations (cognitions) which constitute, remotely,[57] the matter to be ordered by logic, can either fall into error or avoid error in their movement toward their objects; such indifference involves a need for direction and formation by right disposition and order. On the part of the form. i.e., of the rules by which its matter is set in order, logic has certain, determinate, and immutable rules, as anyone can see for himself by surveying the rules formulated in the *Short Treatises*[58] and in the present book, especially in the sections corresponding to the *Posterior Analytics*. Logic fully satisfies the requirements of art and those of science. On the one hand, its regulations are immutably certain; on the other hand, its remote matter is indifferent.

Objections and Answers

Against the first part of the thesis it is argued that logic is a way to science and an instrument of science, and therefore is not a science.

The antecedent is a commonly received statement; it is supported by the authority of Aristotle[59] and that of St. Thomas. The latter says, "Logic is not included under speculative philosophy as a principal part but as something brought under speculative

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[56] Cf. *Summa theologiae* IIa IIae Q. 47, a. 2, ad 3.

[57] Translators' note: Care must be taken not to confuse the object of logic as a science, viz., the second intentions, which are also the rules of logic as an art, with the 'matter to be set in order' by those rules. Such matter is twofold: proximately it is the whole realm of objects taken as such, in particular the complex sets that form the objects of rational 'movement' or reasoning; remotely it is the cognitions of those objects, both the actual and the habitual cognitions, i.e., the acts of understanding as well as the mental products engendered by them—all pointing toward or intending the proximate matter. The remote matter, formal intentions or "intendings," is automatically regulated when the proximate matter—the objects as objects, the objects as intended—is reglated or set in order. That is why they are called remote.

[58] The reference is to *Ars Logica Pars Prima*, translated by Francis C. Wade, SJ as *Outlines of Formal Logic,* Medieval Philosophical Texts in Translation, no. 8 (Milwaukee, Wisconsin: Marquette University Press, 1955).

[59] Aristotle, *Metaphysics* Book II, 2, 985^{a}13: it is absurd to be searching at the same time for knowledge and for the direction to knowledge [ἄτοπον ἅμα ζητεῖν ἐπιστήμην καὶ τρόπον ἐπιστήμης—trans. Joe Sachs, *Aristotle's Metaphysics* (Santa Fe, New Mexico: Green Lion Press, 2002), loc. cit.].

philosophy as furnishing speculative thought with its instruments."[60] Proof of the consequent: An instrument is not on a level with its cause and its effect; thus a saw, a brush and other things are specifically distinct from the things they make, as well as from the agent by which they are moved.

Answer. the statement that logic is a way to science and an instrument of science must not be understood formally but, as it were, objectively. The way to science and the instruments needed by the other sciences, such as syllogisms, propositions, etc. make up the the object of logic. So far as its object is concerned, logic is different from the other sciences, for the latter deal with things, and logic with the way of knowing. Because the way of knowing must be known before things come to be known, Aristotle said [*sc.* at *Metaphysics* 985[a]13] that it is absurd to seek both at the same time. Along the same line St. Thomas says that logic is not contained in philosophy as a principal part because it does not, like philosophy, deal with things: it deals with the way of knowing things, which is a less principal object.

With regard to the consequence of the argument, let it be said, first, that logic is not the instrument of the other sciences; it is the instrument of the intellect itself, whic uses logic as an instrument to direct the other sciences. Secondly, there is no reason why an instrument should not be of the same species as the thing produced. It is sometimes the case, though not always and not necessarily. [Still] one uses a hammer to make another hammer.

Second objection. Doctrinal logic [ut est docens] and logic in use [ut est utens] are probably one and the same habitus, as we shall see in the last article of this question. It follows that the habitus of logic elicits acts of opinion, for it is obvious that logic in use proceeds dialectically and according to probability.[61] Now, a habitus which elicits acts of opinion cannot be a science. Therefore, logic is not a science.

Confirmation. A being of reason cannot specify a real science; it is not knowable of itself, consequently it cannot be, of itself, the object of scientific cognition. Any

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[60] *Exposition of Boethius'* de Trinitate, Q. V, a. 1, ad 2 [logica non continetur sub speculativa philosophia quasi principalis pars, sed sicut quiddam reductum ad philosophiam speculativam, prout ministrat speculationi sua instrumenta]; trans. Maurer, *Division and Methods*.

[61] Cf. *Exposition of Boethius'* de Trinitate, Q. 6, a. 1: Sometimes rational inquiry cannot arrive at the ultimate end [quandoque autem inquisitio rationis non potest usque ad praedictum terminum perduci], but stops in the course of the investigation itself [sed sistitur in ipsa inquisitione], that is to say, when several possible solutions still remain open to the investigator [quando scilicet inquireni adhuc manet via ad utrumlibet]. This happens when we proceed by means of probable arguments, which by their nature produce opinion or belief, but not science [et hoc contingit, quando per probabiles rationes proceditur, quae natae sunt facere opinionem vel fidem, non scientiam]. In this sense, *rational* method is opposed to *demonstrative* method [et sic rationabilis processus dividitur contra demonstrivum]. We can proceed by this rational method in all the sciences, preparing the way for necessary proofs by probable arguments [et hoc modo rationabiliter procedi potest in qualibet scientia, ut ex probabilibus paretur via ad necessarias probationes]. This is another use of logic in the demonstrative sciences; not indeed as having a teaching [doctrinal: docens] function, but as being an instrument [as in use: utens; et hic est alius modus, quo logica utimur in scientiis demonstrativis, non quidem ut est docens, sed ut est utens] (trans. Maurer, *Division and Methods,* loc. cit.); cf. St. Thomas, *Commentary on Aristotle's* Metaphysics, Bk. IV, Lection 4.

scientific object is known by genuine causes and has properties that science predicates of it; a being of reason has neither genuine causes nor nor properties. Now a being of reason is the formal object of logic, as we shall see in the next article. Therefore logic is not a true science.

Answer. This argument belongs in a later place. Let us, at this point, give a mere hint of the discussion to be held in Article 5. Logic in use truly comprises some acts of opinion, but the presence of opinion in the use of logic is not traceable to any formal motive, for the principles upon which logic depends are by no means fallible or contingent. This presence of opinion is traceable to a subsequent effect. Dialectical disputations are merely tentative and do not admit of complete analysis;[62] the procedure that logic directs in these disputations is, consequently, one of opinion. Logic directs acts of opinion rather than elicits these acts. Or, if it should be said that it elicits any acts of opinion, such acts would rank as secondary, not as principal, among the operations of logic. There is no reason why there should not be acts of opinion among the operations of a scientific habitus, provided that they hold secondary rank and are exercised in dependence upon the *rules* of dialectic and probable knowledge that the scientific habitus establishes scientifically.

The *confirmation* will also be answered in Article 5. There we shall see that the requirements of science regarding knowability and objective truth—with foundation in the real and necessary connection—are satisfied by beings of reason. Beings of reason do not have truth subjectively and transcendentally, like genuine beings, but objectively, so to say, i.e. as objects of science.

Last objection. The concept of art excludes that of science; therefore one of these two does not apply to logic.

Proof of the antecedent. Art deals with individual and contingent things and falls under the conjectural function of the mind;[63] on the contrary, science deals with universal and necessary objects and resides in the demonstrative reason. Further, the ways of art are synthetic and practical, those of science analytical and theoretical. This is why St. Thomas opposes art to theoretical reason and places it in the practical part of the intellect.[64]

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[62] Translators' note: One must distinguish between the rules of dialectical disputationwhich are formal and can be scientifically established, and the disputation itself, the effect brought about in the matter as regulated by the rules. The rules do admit of scientific analysis or establishment in the light of the first principles, but the disputation, on account of the material element in its composition, does not.

[63] Cf. *Summa theologiae* Ia IIae Q. 57, a. 4., ad 2: prudence and art are alike "quantum ad subiectum et materiam, utrumque enim est in opinativa parte animae, et circa contingens aliter se habere" [both with respect to subject and matter, and in belonging to the opining part of the soul, in relation contingent things capable being other].

[64] Cf. *Commentary on Aristotle's* Metaphysics, Book I, Lection 1.

Confirmation. It is only by virtue of a certain resemblance that liberal arts are called arts.[65] Therefore logic is not an art in the full sense of the term, but, at most, in a qualified and improper sense.

Answer. The proposition that art deals with individual and contingent things refers either to the application of art to its work or to the remote matter of art, which remote matter is indifferent. It does not refer to the rules by which arts exercises direction: there rules are certain, determinate, and universal. Art is one of the intellectual virtues:[66] now no intellectual virtue is conversant with contingent truth, all deal with truths that are necessary and exclusive of error; otherwise they would not be virtues.[67] The proposition that art falls under the conjectural function of the mind refers either to the mechanical arts or to the application of art to its work and to the indifference of the remote matter; it does not refer to the direction and regulation on account of which art, as an intellectual virtue, contrasts with opinion. Nor is it of the essence of art to proceed by synthetic and practical ways. When the work is theoretical, art exercises direction not by sythesis but by analysis. More on this later (Article 4). The text where St. Thomas oppopses art to theoretical reason does not refer to liberal arts but to those arts whose way of being art excludes the characteristics of science.

Answer to the confirmation. The statement that liberal arts are called arts by reason of a mere semblance holds with regard to the matter to be set in order, not with regard to the directing reason. The matter of a liberal art is an internal work and a work of the reason: it is less servile, and consequently less subjected to the government and direction of art than the work of a mechanical art, which is entirely servile. But with regard to the directing rule, art is predicated univocally of liberal and mechanical arts. be that as it may, we have not said, without further specification, that logic is an art; we say that it is a *liberal art*. It possesses the characteristics of art in the way proper to liberal arts and in no other way.

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[65] Cf. *Summa theologiae* Ia IIae Q. 57, a. 3., ad 3: quicumque ad huiusmodi opera rationis habitus speculativi ordinatur, dicuntur per quandam similitudem artes, sed liberales: whatever habits are ordained to this sort of works [*sc.* intelligible productions, like arguments, measures, and the like] are called arts by a kind of comparison, but liberal [arts].

[66] As the same article, Q, 57, a. 3, adduced in support of the objection and its confirmation attests.

[67] Cf. St. Thomas, *Commentary on Aristotle's* Nicomachean Ethics, Book 6, Lection 5, n. 1178: ". . . the intellectual virtues [virtutes intellectuales]—about which we so truly say that falsehood never underlies them [quibus ita verum dicimus quod eis numquam subest medacium]—are these habits: science, prudence (under which he includes art which also has to do with what is contingent), and, besides, wisdom and understanding [sunt isti habitus, scientia, prudentia (sub qua comrehendit artem quae est etiam circa contingentia), et iterum sapientia et intellectus] . . ."