MAGISTRALIA

FILOSOFI DEL TERZO MILLENNIO – STUDIA

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MAGISTRALIA

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Lo scopo di guesta collana, nella sua parte degli Studia, è quello di dare voce a giovani ricercatori in Filosofia, una disciplina che vive oggi un periodo di radicali mutamenti. Nel mondo accademico le facoltà di filosofia si confrontano con un ridimensionamento del numero degli iscritti, che spesso porta alla chiusura di molte di esse. Allo stesso tempo, l'istanza filosofica, come categoria dell'umano, riemerge con forza, sollecitata da due provocazioni decisive nella cultura dei nostri tempi. Da una parte, la ricerca scientifica, alla quale oggi ci si rivolge per trovare risposte agli eterni interrogativi dell'uomo. Dall'altra, il confronto fra le diverse tradizioni e religioni, stimolate dalla società globalizzata a confrontarsi e collaborare fra di loro, per combattere i fanatismi, senza perdere le rispettive identità. Questa Collana intende così offrire un'opportunità di far conoscere il frutto del proprio lavoro al numero crescente di giovani ricercatori e studiosi di filosofia, provenienti da tutto il mondo, che stanno producendo significative ricerche in questi due campi emergenti della filosofia: il dialogo interdisciplinare fra filosofia e scienza, il dialogo inter-culturale e inter-religioso fra le diverse ontologie. Un saggio di cosa significhi essere "filosofi del terzo millennio".

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DEMONSTRATION, INDUCTION AND METAPHYSICS IN THOMAS AQUINAS A FORMAL APPROACH

Foreword by

FRANCESCO **BERTO**





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FOREWORD

This *Foreword* is for today's philosophers and logicians who don't (yet) know much about Aquinas and his logical theorizing, but who are somewhat curious. If you are one such logician or philosopher, and you are directly exposed to such theorizing, you may initially find yourself caught between the Scylla of irrelevance and the Charybdis of unintelligibility. Both come from the typical training one gets by approaching logic, not only from mathematics or computer science, but also from the viewpoint of today's analytic philosophy.

As for irrelevance: the foundation myth of analytic philosophy has it that, whereas there was some logic going on before the revolution of the late Nineteenth and early Twentieth Centuries, little progress had been achieved beyond Aristotelian logic. Logic as we nowadays understand it is essentially the progeny of the founding fathers, Frege and Russell (with the occasional mentions of George Boole, and of Wittgenstein as an acolyte and then early troublemaker). Pre-Fregean logic is something one has heard of only contrastively, as guilty of mistakes taken on board from the old Aristotelian syllogistic and fixed from Frege onwards. For one typical example: Aristotelian logic assumes that no term showing up in syllogistic arguments has (what we nowadays would call) an empty extension, otherwise certain argument forms deemed valid turn out not to be such. That's fixed in the Fregean treatment of quantification, which Dummett judged the single most important technical advancement in logic. For another example: pre-Fregean logic, as dealing with the "laws of thought", is perceived as affected by a kind of psychologism, wiped away by Frege's definitive and well-known criticisms.

The Charybdis of this Scylla comes from issues of interpretation and understanding. The difficulty is more specific and pressing, I think, than the general issues posed by the interpretation of philosophers of the (distant) past: even those with some good training in the history of philosophy have a hard time understanding the jargon and notions at issue when such philosophers talk specifically about *logic*. This is connected to the aforementioned discontinuity: a rift separates logic before Frege from what happened thereafter - one with no counterpart, for instance, in ethics or metaphysics. Our very understanding of what logic is, is permeated by post-Fregean concepts. It is a tempting strategy, then, to use modern logic, e.g., what we nowadays call the canonical notation of connectives and variable-binding quantifiers, or post-Fregean distinctions like that between content and force, to make sense of the logic of the past. But then, one runs the obvious risk of distorting the thought of those authors, by superimposing on it categories they could not be aware of.

This book by Claudio Antonio Testi guides us through Aquinas' logical theory by striking, I think, a nice balance between Scylla and Charybdis. The author manages to achieve such a result thanks to his crossing of skills – his competence in contemporary formal logic, combined with his patiently built familiarity with the fine-grained texture of Aquinas' work. Testi interprets Aquinas' logical writings by providing textual and exegetical evidence in support of his analysis; at the same time, he shows both that the Doctor Angelicus is not a mere repeater of Aristotle, and that some of his original ideas can be of interest for contemporary logic and the philosophy thereof. The second part of Testi's book focuses on translating into a formal language, based on a system of Stanislaw Leśniewski's, Aquinas' logical (and, metaphysical) concepts he has previously elucidated.

Here's one pattern found in Testi's book, which exemplifies such merits: according to Aquinas, logic deals with *secundae intentiones* – thoughts about thoughts, as we might say –, in opposition to disciplines

which deal with *primae intentiones* - thoughts about the world. One may swiftly conclude that Aquinas' logic is psychologistic in the sense that Frege criticized: perhaps closer to our psychology of reasoning, but of course lacking the empirical sophistication of today's psychological research. But Testi's book shows how one can understand the study of second intentions as being about the general structure of the conceptual realm, and its being mirrored in the general structure of language. Aquinas' focus on language - inherited and developed, to be sure, from Aristotle – makes for part of the freshness of his approach. Contemporary logic is strictly connected to various branches of mathematics, from algebra to order theory, graph theory etc. But what is distinctive of logic, with respect to the rest of mathematics, is its focus on language. Logicians introduce formal languages, investigate and compare their expressive power and their capacity of describing and characterizing models and structures. Today's logicians reading this book, thanks to Testi's guidance, may feel at home as they progress through its Chapters 1 to 5, following Aquinas' Aristotelian path from the workings of terms, to that of predication, to the categorization of utterance kinds, and up to the structure of arguments. While in the business of doing so, Testi convincingly highlights the ways in which Aquinas adds new insights to the logical ideas found in the Aristotelian Organon.

Another pattern found in Testi's book has to do with how Aquinas was – again, following Aristotle and progressing beyond him – not just a logician, but also what we would nowadays call a philosopher of logic. The two tasks of carrying out logical research, and of reflecting on the fundamentals and basic notions of logic itself, are usually pursued in different kinds of works today, and often by different scholars. Working logicians, for good operational reasons, often bracket reflection on the foundations of their discipline: they will, for instance, resort to possible world semantics while refusing to answer questions on what kinds of things worlds may be, metaphysically speaking; or, they will investigate argument validity in a formal setting by relying on "intuitions" of validity and invalidity, bracketing the question of where our epistemic grounds for such intuitions come from.

Aquinas addresses foundational issues head-on. One way in which he does it brings him straight into the territory of epistemology: given

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that an infinite deductive regress in grounding the truth of the premises of good proofs is to be excluded, what grounds knowledge of the premises themselves? Chapter 6 of Testi's book guides us through Aquinas' proposed solution, based on the idea that induction has a key role in our epistemic access to the first premises. The chapter makes us appreciate, at the same time, how Aquinas was aware, well before Russell and Goodman, of one form of the "riddle of induction", and proposed one ingenious approach to deal with it.

Another way in which Aquinas addresses foundational issues in logic, getting due attention in Testi's book, is by tightly linking logic and metaphysics. Second intentions, in an obvious sense, could not be there without there being first intentions, which are about the world, to begin with. Metaphysics is the study of the most general features and structures of the world. So does logic, the study of the most general features and structures of thought, depend on metaphysics. Such connection is at centre stage in Chapter 7, where Aquinas' aforementioned approach to the riddle of induction is connected to his classical doctrine of essence, and with the "real distinction" between essence and existence, which makes for one of Aquinas' most lasting contributions to the history of metaphysical theorizing.

I mentioned above that the second part (as well as the appendix) of Testi's book proposes a serious formalization of Aquinas' key logical and metaphysical concepts, including such notions as proof, induction, *actus essendi*. This contributes to making the book innovative and potentially of interest to contemporary systematic philosophers, working at the interface between logic and its philosophy, and metaphysics. As a philosopher immersed in such contemporary logical milieu, I found Testi's book stimulating. I hope I have tempted you into reading it, and I bet that if you do, you won't be disappointed.

> St Andrews, 23 January 2024 Francesco Berto

PREFACE

The current effort to revive access in English to the whole body of Thomas Aquinas's original works is a much-needed breath of fresh air for students of philosophy. For a time, with Thomas's lesser-known works out of print, some major lacunas understandably but regrettably developed regarding which areas of his thought were regularly engaged. Logic constitutes one of the lacunas that remain. Specifically, there ought to be an up-to-date text that can serve as an introduction to logic based on the texts of Aquinas, distinct from the perennially valuable traditional manuals. In order to make the Thomistic perspective more comprehensible to the modern reader, it should also keep in mind the developments of contemporary formal logic, while shedding light on Thomas's most relevant logical intuitions. With great humility, this text, which is the fruit of thirty years of teaching and research⁽¹⁾, aims to fill this gap in philosophical studies.

In order to satisfy the requirements set out above, in the first part I have used easily accessible language to explain the principal texts of Thomas, and inevitably Aristotle, focusing attention on the theory of demonstration and induction. Following this route, the mature

⁽¹⁾ See the bibliography quoted at the end. This study builds on the theses advanced in BERSELLI-TESTI 2005, expanding on their metaphysical dimension, on which I started working while writing my PhD thesis at the Pontifical Lateran University, entitled *L'ontolgia Formale di Stanislaw Leśniewski e la teoria dei predicamenti di Tommaso d'Aquino (Stanislaw Leśniewski's Formal Ontology and Thomas Aquinas's Theory of Predicaments, 2016)*, and in the first part summarises the contents of Testi 2018.

commentaries of Thomas from *De Interpretationes* to *Posterior Analytics* serve as the basis to perform a fundamental exegesis.

In the second part, I have employed the logical system devised by Stanislaw Leśniewski in an attempt to formalise the concepts of demonstration and induction, which are the hinge factors of Thomist logic. I found this system to be particularly well suited to expressing many of the key concepts of Aristotelian-Thomist logic, although I had to "expand" on the theory, introducing two new axioms that enable the notion of 'being in' and of 'being a definition of' to be sufficiently formalised. I have listed the demonstrations of some theorems of particular interest and importance for this study in the appendix.

In both parts, I have attempted to maintain a degree of symmetry in the numbering of the chapters, by way of indicating the fact that the sections of the formalised part are intended substantially as a 'translation' into a scientific-formal language of the ideas already expressed informally. Given this general expositive intent, each of the two parts:

- begins by thematising the object and the scope of Thomistic-Aristotelian logic (I-II.1) to later analyse increasingly complex linguistic structures;
- from terms (I-II.2: noun-verb, subject-predicate, predicables) to the varying types of propositions (I-II.3);
- from the syllogism and other logical rules (I-II.4) to the demonstration *propter quid* (I-II.5);
- up to the theme of induction (I-II.6);
- whose logical perspective integrates harmoniously in the metaphysical horizon of the Thomist metaphysics of the *actus essendi* (I-II.7).

Were we to summarise the Thomist logical perspective in a few words, it could be said that:

- the demonstration is a syllogism based on the definition and on the induction;
- the notion of definition is intensional in character and presupposes the notions of substance and accident;

- induction is a procedure that moves from propositions to a singular subject to constitute the definitions and the first universal premises of demonstration, thus guaranteeing the continuous adaptation of definitions (and thus of the premises of demonstrations) in the light of new and inexhaustible knowledge of new singulars;
- the metaphysical horizon of this inexhaustibility of singulars is in the distinction between *actus essendi* and essence.

Along the way, I highlight some logical theses of Aquinas that integrate and sometimes go beyond the Aristotelian texts. Most noteworthy among these ideas are:

- an explicit acceptance of the syllogisms with singular subjects (I.5.4.1-2);
- a brilliant interpretation of the propositions per se (I.5.3.4);
- a recursive definition of demonstration *propter quid* (I.5.4);
- an original development of the demonstrations *ex suppositione finis* (I.5.5.1);
- an articulate explanation of the impossibility of infinite regression in demonstrations (I.5.5.4.);
- a clarification of the concept of induction, which can also be based on the examination of just one singular case, and of its role in the foundation of the first demonstrative premises (I.6.1.-6.2.). The last two chapters of the first part propose an innovative solution to the millenary problem of induction (I.6.3.-6.5), which will also be consistent with the Thomistic metaphysical theory of real distinction between the act of being and essence.

Concluding this brief preface, I end with the most difficult lines, which are those of thanks. The persons (some who have already passed away) to whom this text is indebted for diverse reasons – logical, meta-physical, epistemological, editorial – are many, but among these it seems right to mention explicitly at least the following (in alphabetical order): Giuseppe Barzaghi, Gianfranco Basti, Luigi Berselli, Giorgio Carbone, Roberto Zanasi, Maurizio Matteuzzi, Sergio Parenti, Alberto Strumia, Matteo Casarosa, Francesco Berto and all the friends of the Philosophical Institute of Thomistic Studies of Modena.

PART I

INFORMAL EXPOSITION OF THE LOGIC OF THOMAS AQUINAS

CHAPTER 1

LOGIC IN THOMAS AQUINAS

1.1. The Object of Logic from a Thomistic Perspective

At the beginning of his commentary on the *Nicomachean Ethics*, Thomas Aquinas provides us with a profound characterisation of logic.⁽¹⁾ Aquinas defines it as "rational philosophy" or rather as knowledge that studies the

order that reason establishes in its own act of consideration, for example, when it arranges its concepts among themselves, and the signs of concept as well, because words express the meanings of the conceptions. [...] The order that reason makes in its own act of consideration pertains to rational philosophy (logic), which properly considers the order of the parts of verbal expression with one another and the order of principles to one another and to their conclusions.⁽²⁾

(2) "Ordo, quem ratio considerando facit in proprio actu, puta cum ordinat conceptus suos ad invicem, et signa conceptuum, qui sunt voces significative [...]. Ordo autem quem

⁽¹⁾ On the object of logic in Aquinas see ROBERT SCHMIDT, *The Domain of Logic According to S. Thomas Aquinas* (The Hague: Martinus Nijhoff, 1966). See also MONDIN BATTISTA, "La logica di S. Tommaso d'Aquino" *Rivista Di Filosofia Neo-Scolastica*, vol. 60, no. 2/3, 1968, pp. 261-71. As example of a manual of Thomistic logic see JUAN JOSÉ SANGUINETI, *Logica e gnoseologia* (Rome: Urbaniana University Press, 1988), Regis Jolivet, *Trattato di filosofia*, 5 vol. Logica (Brescia: Morcelliana 1959-60), JUAN JOSÉ SANGUINETI, *Logica Filosofica* (Firenze: Le Monnier, 1987), ROGER VERNAUX, *Introduzione e Logica*, (Brescia: Paideia, 1966), MARIO RIGHETTI and ALBERTO STRUMIA, *L'arte del pensare* (Bologna: ESD, 1998).

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In this sense, logic studies⁽³⁾:

- the diverse types of speech;
- their parts, such as the noun, verb, genus, species;⁽⁴⁾
- and their composition (the process of reasoning understanding speech as an ordered whole in which it proceeds *ab uno in aliud*).⁽⁵⁾

All of these things – speech, terms, processes of reason etc. – are objects that only exist thanks to a cognitive and consequently linguistic act,⁽⁶⁾ regarding real beings.⁽⁷⁾ Take for example the syllogism "If every man is a rational animal and Socrates is a man, then Socrates is a rational animal" (cf. I.4.2). The terms "man" and "Socrates" exist only because there exist real beings that are given these names. For this reason, logic does not have natural beings as its direct object, but beings produced by knowledge and speech, or as Aquinas said "beings of reason". For the same reason, logic extends equally to everything that philosophy has as its object, that regards all beings:

There are two kinds of beings: beings of reason and real beings. The expression being of reason is applied properly to those notions which reason derives from the objects it considers, for example, the notions of genus, species and

- (4) Cf. In I Peri Herm. l. IV-V.
- (5) In I Post An. Proemium nn. 2-4 [2-4].

(6) On the topic of language and logic from a Thomistic perspective, see the volume A. Lobato (ed.), *Homo loquens* (Bologna: ESD, 1989).

(7) The bibliography on Thomistic realism is endless. However, the following volumes remain classics: Étienne Gilson, *Realismo tomista e critica della conoscenza* (Roma: Studium, 2012), original edition: ÉTIENNE GILSON, *Réalisme thomiste et critique de la connaissance* (Paris: Vrin, 1939), CORNELIO FABRO, *Percezione e Pensiero* (Milan: Vita e Pensiero, 1941-1949), CORNELIO FABRO, *Fenomenologia della percezione*, (Milan: SEI, 1941), JACQUES MARITAIN, *Distinguere per unire: i gradi del sapere*, 2nd ed. (Brescia: Morcelliana, 1981), original edition: JACQUES MARITAIN, *Distinguer pour unir* (Paris: Vrin, 1932). For an update on the current epistemological debate, cf. ALEXANDER MILLER, *Realism*, in *The Stanford Encyclopedia of Philosophy* (Winter 2014 Edition), Edward N. Zalta (ed.), URL = http://plato.stanford.edu/ archives/win2014/entries/realism/ (last revised Winter 2019).

ratio considerando facit in proprio actu, pertinet ad *rationalem philosophiam*, cuius est considerare ordinem partium orationis adinvicem, et ordinem principiorum adinvicem et ad conclusiones" (*In I Ethicorum* l. i nn. 1-2). Cited texts from Thomas Aquinas are based on the Leonine edition transcribed and revised by the Thomistic Institute available online at http:// www.aquinas.cc.

⁽³⁾ In I Peri Herm. l. I.

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the like, which are not found in reality but are a natural result of the consideration of reason. And this kind of being, i.e., being of reason, constitutes the proper subject of logic. But intellectual concepts of this kind are equal in extension to real beings, because all real beings fall under the consideration of reason. Hence the subject of logic extends to all things to which the expression real being is applied. His conclusion is, then, that the subject of logic is equal in extension to the subject of philosophy, which is real being.⁽⁸⁾

Logic, therefore, is a highly reflective knowledge, given that it examines speech and its parts produced through cognitive and linguistic acts, and thus reflects upon anything that is produced in knowledge. The signyfing terms that refer to natural beings are called *first impositions* or *first intentions (primae intentiones* or *impositiones*) while those which also signify things produced in knowledge and in speaking of things are called *second impositions/intentions.*⁽⁹⁾ Speech of the first imposition therefore signifies things (for example "Socrates", "man", "animal"). Meanwhile, speech of the second imposition is obtained thanks to a reflection on cognitive acts themselves (for example: singular name, universal name, species, genus).⁽¹⁰⁾

^{(8) &}quot;Ens est duplex: ens scilicet rationis et ens naturae. Ens autem rationis dicitur proprie de illis intentionibus, quas ratio adinvenit in rebus consideratis; sicut intentio generis, speciei et similium, quae quidem non inveniuntur in rerum natura, sed considerationis naturae consequuntur. Et hiusmodi, scilicet ens rationis, est proprie subiectum logicae. Huiusmodi autem intentiones intelligibiles, entibus naturae aequiparantur, eo quod omnia entia naturae sub consideratione rationis cadunt. Et ideo subiectum logicae ad omnia se extendit, de quibus ens nauturae praedicantur. Unde concludit, quod subiectum logicae aequiparatur subiecto philosophiae, quod est ens naturae" (*In IV Metaph.* 1. IV n. 574 [5]).

⁽⁹⁾ On the complex theme of imposition see GYULA KLIMA, "Theory of Language" in Brian Davis and Eleonore Stump (eds.), *The Oxford Handbook of Aquinas* (Oxford: Oxford University Press, 2012) 371-390, 372-376.

^{(10) &}quot;Person" is a term of first imposition in that speaks of the substance of a rational nature: if we affirm "Socrates is a person" by 'person' we mean precisely 'individual rational substance'; the term "singular" or "individuum" is instead of second intention, because it denotes a substance which could be called a *proper name*, that is an *ens rationis*. Similarly, the term *res naturae* is of primary intention (or imposition) while "suppositum" (the individual understood as a concrete whole that has both nature and accidents as parts, terms of primary intention: cf. 7.1), is of secondary intention "Therefore, in order that it may be known what must be conceded and what denied in these matters, it is necessary to consider which of the names pertain to individuation, whether they are names of first imposition, such as 'person' and 'hypostasis', which signify things themselves, or whether they are names of second imposition, such as 'individual', 'suppositum', and others of this kind, which signify the intention of individuality. Some of these pertain

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For this reason logic, according to Aquinas, is distinguishable from real or hard sciences such as physics, mathematics⁽¹¹⁾ and metaphysics, which concern an order that does not originate in intellectual acts.⁽¹²⁾ The fact that two apples are more than one apple, or that 2 is greater than 1, is a realisation of order that is not generated from intellectual acts. That the genus is able to be said of a species (in fact "every man is an animal" and not *vice versa*) is instead a relation of order that originated in the intellect that has known real beings, from which it has generated the names of second imposition of genus or species.

St. Thomas affirms that logic is also distinguished from psychology and epistemology in that it does not study the cognitive processes, but principally the product of these, or rather the significative voices. Logic, in fact, is interested in the connection between genus and species and not the epistemological processes through which consciousness is capable of knowing them.

For Aquinas, logic is also distinct from technical knowledge ("arts" for the ancients)⁽¹³⁾, because it doesn't aim to produce objects external

(11) On Aquinas's philosophy of mathematics, in addition to the fundamental studies of Basti (cf. GIANFRANCO BASTI, *L'ontologia formale del 'realismo naturale', cosmologia evolutiva e partecipazione dell'essere* in *Divus Thomas* (2014/02): 229-332, one can also consult: J. ALVAREZ LAZO, *La filosofias de las metematicas en Sancto Thomas* (Mexico: Editorial Jus., 1952), G. ISAYE, *La theorie de la misure et l'existence d'un maximum selon sait Thomas* (Paris: Beaucesne et ses Fils, 1940), R. GIRONELLA, *El teorema de Goedel e l'analogia del ser*, in *Espiritu*, XXVI (1977) 121-132. Also of great interest is this writing on Aristotle: J.E. HANNAS, *Aristotle's Metaphysics: Books M and N*, (Oxford: Oxford University Press, 1976), I. TOTH, *Aristotele e i fondamenti assiomatici della geometria* (Milan: Vita e Pensiero, 1997).

(12) In Boethii de Trinitate, l. II. q. 1 art. 1-2. It should be noted that for Aquinas mathematics extends equally to physics, so is a real science studying the category of quantity (*II Phys.* l. iii).

(13) On the subject of ancient and modern techniques, see: GIUSEPPE TRAINA, *La tecnica in grecia e a Roma* (Bari: Laterza, 1994), HANS JONAS, *Tecnica, medicina ed etica*, (Turin:

only to the genus of substance, such as 'suppositum' and 'hypostasis', which are not said of accidents, and person in a rational nature, and also a thing of nature." ("Quaedam vero pertinent ad individuationem in quocumque genere, sicut individuum, particulare et singulare, quae etiam in accidentibus dicuntur. Ut igitur sciri possit quid in talibus concedendum sit et quid negandum, considerandum est quod nominum ad individuationem pertinentium, sive sint nomina primae impositionis, sicut persona et hypostasis, quae significant res ipsas, sive sint nomina secundae impositionis sicut individuum, suppositum, et huiusmodi, quae significant intentionem individualitatis, quaedam eorum pertinent ad solum genus substantiae, sicut suppositum et hypostasis, quae de accidentibus non dicuntur, et persona in rationabili natura, et etiam res naturae" *De Unione Verbi Incarnati*, art 2 co; cf. *In I Sent.* ds. 26 q. 1 a. 1 ad 3).