WILLIAM A. WALLACE

Galileo and His Sources

Heritage of the Collegio Romano in Galileo's Science

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AND HIS SOURCES

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The Heritage of the Collegio Romano in Galileo's Science

William A. Wallace

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PREFACE

STUDIES of the life and works of Galileo Galilei have flourished throughout the twentieth century because of the splendid National Edition of his writings, edited by Antonio Favaro, whose twenty-one volumes were brought to completion in 1909. The edition has stood the test of time, except for two shortcomings detected only in the past decade. The first is the insufficient attention it paid to the manuscript fragments associated with the *Two New Sciences*, Galileo's masterwork of 1638 in which he laid the foundations of modern mechanics. These fragments have been the subject of intensive recent research. Through their study it is now known that most of the experimental work on which the new science of local motion was based had been completed some thirty years before the publication of that work, while Galileo was still a professor at the University of Padua. The second shortcoming is the treatment accorded by Favaro to Galileo's early Latin notebooks. One of these he regarded as a scholastic exercise and deemed it not worthy of inclusion in the National Edition; another he did include but as one of Galileo's *Juvenilia*, dating it from the latter's student days at the University of Pisa. The sources on which these were based, as those behind a third notebook containing writings on motion, eluded Favaro, but this was for him a trivial problem whose solution would have little bearing on the genesis of the new science.

These Latin notebooks of Galileo, and their sources, are the subject of detailed study in this volume. Contrary to Favaro's estimate, all three were written around 1590 while Galileo was embarking on his teaching career at the University of Pisa and were of seminal importance for his later work. More surprising still, the first two notebooks were effectively copied from the lecture notes of young Jesuit professors, all about Galileo's age and then teaching at the Collegio Romano, while the third employs concepts that derive unmistakably from the other two. Galileo's early science, on this accounting, was in essential continuity with that being developed contemporaneously by Jesuit scholastics. Many of the terms and expressions he uses in these notebooks continue to recur in his later manuscripts and published writings, so much so that one may rightfully regard them as the heritage of the Collegio Romano whose elements still survive in the *nuova scienza* of 1638.

These results obviously have profound implications for anyone interested in the origins of the Scientific Revolution, and particularly in the

continuity between late medieval or scholastic science and that of the early seventeenth century. They also may be expected to shed fuller light on Galileo's later relationships with the Jesuits, especially those surrounding his trial and condemnation by the Roman Inquisition in 1633. Neither of these topics, however, is addressed specifically in this volume. Its aim is rather to provide the groundwork on which such studies can be based by supplying hitherto unavailable evidence that serves to establish, beyond reasonable doubt, the sources and dating of Galileo's early Latin compositions.

To this end part 1 of the study is devoted exclusively to textual analysis, concerned mainly with the notebooks containing Galileo's logical and physical questions, and showing remarkable parallels that can be exhibited between these and Jesuit lecture notes. Part 2 expands the study to flesh out in fuller detail the logic and natural philosophy being taught at the Collegio Romano in the last decades of the sixteenth century; attention here is focused on methodological problems relating to Galileo's science and on the subject matter with which it was mainly concerned, local motion. Part 3 then applies these findings to a reexamination of all of Galileo's writings, divided into those before 1610 and those afterward, to show how his early concepts continue to reappear throughout, though undergoing gradual changes, until they emerge in revised form in the new science of 1638.

The literature of Galileo is vast, and a good part of it inevitably deals with his early period and his relationships to possible precursors and predecessors. Practically all of this was published without knowledge of the discoveries set forth in this volume. To attempt a revision or correction of alternative views on the subject would therefore be a thankless, if not hopeless, task. Because of this circumstance I have not attempted to juxtapose my thesis with divergent positions currently accepted or proposed by other historians and philosophers of science. My bibliographic references are sparse, limited for the most part to primary sources and to recently published materials that corroborate, or shed light on, my own findings.

The greatest difficulty in the research reported herein was that offered by the manuscript containing Galileo's logical questions, never transcribed by Favaro and thus not appearing in the National Edition. I had begun transcribing this myself when I heard that the work was already being done. Through the good services of Alistair C. Crombie I was put in contact with Adriano Carugo, who graciously made available his transcription of the manuscript. Later I found that the manuscript had been transcribed independently by William F. Edwards, who generously contributed the results of his work also. Readings of the manuscript

given in chapter 1 to show parallels with the source from which they derive are based on Edwards' transcription, which supplies line as well as folio numbers and thus is more suitable for purposes of references. All texts that are given, however, have been checked against the manuscript and represent my own readings. The punctuation, spelling, and paragraphing are also my own, usually adapted somewhat to agree with the parallel text against which the passage is exhibited. With regard to the manuscript containing the physical questions, I have already made an extensive paleographical study of this in conjunction with my English translation of it, and have used this fully in chapter 2 of the volume.

The Jesuit sources on which Galileo's notes are based are widely scattered, some preserved in printed editions and others only in manuscript form. Early on in my investigations I was assisted immeasurably by Edmond Lamalle, archivist of the Roman Archives of the Society of Jesus, who supplied me with a list of all manuscripts preserved in the Fondo Curia, many of which contain copies of lectures given in the early years of the Collegio Romano. Vincenzo Monachino, librarian of the Gregorian University in Rome, made the more relevant of these codices available for study, and later for microfilming, so that detailed comparisons could be made with Galileo's notes. Other lists were supplied by Charles H. Lohr, director of the Raimundus-Lullus-Institut of the University of Freiburg, which served to identify Collegio manuscripts now preserved in other European collections. Charles B. Schmitt, of the Warburg Institute of the University of London, supplied additional invaluable bibliographical information. All manuscripts cited in the bibliography have been studied by me *in situ*; some have further been microfilmed and later used to set up the textual parallels exhibited in part 1 of this study.

The particulars of the materials covered in courses at the Collegio Romano, discussed in part 2, are summarized from printed sources or from the manuscripts treated in part 1. For those that have pagination or foliation, appropriate references are given in the standard manner. Many of the codices, unfortunately, lack foliation, and these are cited in terms of the major divisions of the subjects treated, so as to facilitate verification and further study by those who may be interested.

In part 3 the major project is to show how the terminology and conceptual structures of Galileo's Pisan manuscripts are preserved, and continue to be used and developed, in his later writings, both Latin and Italian. Modern English translations are not helpful for this task, and on that account I have paraphrased most of the passages to which I would direct attention, and then have given, in parentheses, Galileo's wording in its original language. Extensive use has been made of the National Edition for this purpose. In order to facilitate reference and at the same

time reduce the number of notes, citations of that edition are given parenthetically in the text by volume, page, and line number.

My debts are many. Apart from the persons I already mentioned, I am deeply grateful to the librarians and curators of the collections with which I have worked, who have rendered invaluable assistance in making their materials available for study. To the many Galileo scholars here and abroad who are my coworkers in uncovering and interpreting manuscripts in the Galileiana font of the Biblioteca Nazionale in Florence, I offer sincere thanks and appreciation for being able to use the result of their labors. Helpful suggestions for the improvement of the volume have been given by Jean Dietz Moss, of the Department of English, and Bernard K. Harkins, of the Leonine Commission, of The Catholic University of America. Finally, the financial assistance of the National Science Foundation, through Research Grant No. SES 79-24825 and previous awards, has borne the major portion of the expenses incurred throughout the study; without its help the study could never have been undertaken.

Washington, D.C. William A. Wallace
November 7, 1983

PART ONE
Textual Analysis

CHAPTER 1

Sources of Galileo's Logical Questions

MUCH is already known about the life of Galileo Galilei, particularly his discoveries and the polemics surrounding the publication of his principal works on astronomy and the science of mechanics. Considerably less is known about his early period, that from his birth at Pisa in 1564 to his perfection of the telescope at Padua in 1609, when the intellectual foundations were laid for most of his later work. Historians are aware that his preliminary studies were made at the Monastery of Vallombrosa near Florence, after which he entered the University of Pisa in 1581 with the intention of pursuing a career in medicine. It is known that he left the University of Pisa in 1585 without obtaining a degree, apparently to pursue a new-found interest in mathematics. By 1589 he had achieved sufficient status to obtain a lectureship in mathematics at the University of Pisa, where he taught until 1591. The next year he moved to the University of Padua as professor of mathematics, to succeed Giuseppi Moleti, and there he remained for eighteen years, doing research on the science of motion that has recently been fairly well documented.[1] What he accomplished before he moved to Padua is considerably more problematic. Several treatises ostensibly composed by him at Pisa are still extant: a mathematical treatise, in Latin, on the center of gravity of solids; a smaller work, in Italian, on "the little balance" (*La Bilancetta*); some measurements of specific gravities and a few notations on a text of Archimedes; and, finally, a fairly extensive series of Latin compositions dealing with questions on logic, on the universe and the elements, and on local motion.

These last-named Latin compositions have been the subject of recent

[1] The best account of the chronology and details of Galileo's scientific work is Stillman Drake, *Galileo at Work: His Scientific Biography* (Chicago-London: The University of Chicago Press, 1978), which should be consulted to flesh out the information provided throughout this volume. Drake did the pioneering work to remedy the first shortcoming in Favaro's National Edition mentioned in the preface, and reports most of his findings in *Galileo at Work*. At the time of its writing, however, the research that would detect the second shortcoming was not yet completed, and his book takes no account of the findings reported herein.

study, the fruits of which set the theme for this volume.[2] They are conserved in three manuscripts now in the Galileiana Collection of the Biblioteca Nazionale in Florence, all written in Galileo's hand. These are: MS 27, containing questions based on Aristotle's *Posterior Analytics*, henceforth referred to as the logical questions (LQ); MS 46, containing questions relating to Aristotle's *De caelo* and *De generatione*, henceforth referred to as the physical questions (PQ), and some memoranda on motion; and MS 71, containing drafts of a dialogue and some treatises on local motion, usually referred to as the *De motu antiquiora* so as to distinguish it from other tracts *De motu* composed by Galileo in later life. The first two manuscripts show signs of being derived and possibly copied from other sources, whereas the third contains more independent compositions, though these are now known to draw extensively on the memoranda on motion in the second manuscript.

The previously accepted evaluation of these three manuscripts—one requiring substantial revision in light of the latest research—derives from Antonio Favaro, the editor of the National Edition of *Le Opere* of Galileo, whose first volume appeared in 1890.[3] In that volume Favaro decided to publish only the second and third manuscripts, the second (MS 46) under the title *Juvenilia* and the third (MS 71) under the title *De motu*.[4] The first manuscript (MS 27), for reasons that historians of medieval and Renaissance science find hard to understand, he effectively excluded from the National Edition, providing only a brief description and some excerpts in volume 9 under the title *Saggio di alcune esercitazioni scolastiche di Galileo*.[5] Apparently Favaro was himself unacquainted with Aristotle's *Posterior Analytics* and we knew nothing of the role played by this work in the development of scientific methodology. Reading Viviani's reconstruction of Galileo's life, written in 1654, he therefore focused on a statement to

[2] The researchers who have contributed most substantially, apart from the author, are Raymond Fredette for his work on the *De motu antiquiora* manuscripts and Alistair Crombie and Adriano Carugo for their work on the manuscripts dealing with logic and the questions on the universe and the elements.

[3] Antonio Favaro, ed., *Le Opere di Galileo Galilei*, 20 vols. in 21 (Florence: G. Barbèra Editore, 1890-1909).

[4] Favaro, *Le Opere di Galileo Galilei*, vol. 1, pp. 7-177 and 243-419, henceforth cited as *Opere* 1:7-177 and 1:243-419, respectively.

[5] *Opere* 9:273-292. Whether Favaro was completely honest in this exclusion, or whether he was motivated by an anti-clerical and anti-medieval bias, has not yet been fully investigated. Some remarks bearing on his rejection of the works of Raffaello Caverni and Pierre Duhem that might suggest the latter are given in W. L. Wisan, "The New Science of Motion: A Study of Galileo's *De motu locali*," *Archive for History of Exact Sciences* 13 (1974): 109, 146, 153.

the effect that Galileo received instruction in logic from a priest-instructor of Vallombrosa (*un Padre Maestro Volambrosano*), but that his fine intellect found such matter tedious, fruitless, and unsatisfying.[6] This, plus a few errors in Latinity, persuaded Favaro that these were merely scholastic exercises and thus of no value in understanding Galileo's later work. The second manuscript (MS 46) he accorded slightly more value because he believed that it could be dated, on the basis of internal evidence, as written in 1584, while Galileo was a student at the University of Pisa. Thus he transcribed and published it as a "youthful work," which he believed was based on lectures of Francesco Buonamici and other professors who taught at Pisa while Galileo was studying there.[7] Only the third manuscript (MS 71) did Favaro regard as meriting serious attention, since it was clearly related to Galileo's later work on motion. This he dated, following a well-documented tradition, as written "around 1590," while Galileo was already teaching mathematics at the University of Pisa.[8]

The surprising discovery of the past two decades is that the foregoing chronology is quite wrong. Rather than have the three manuscripts date from various periods in Galileo's life at which he would have been 15, 20, and 26 years of age, respectively, there is now considerable evidence to show that they were all written in conjunction with his first teaching appointment at the University of Pisa and so date from the years 1589 to 1591. This revision leaves intact the time of composition of MS 71 as "around 1590," but it reinstates the notation of an early curator of the Galileiana manuscripts to the effect that the physical questions of MS 46 were composed "around 1590" also.[9] The logical questions of MS 27, finally, must have preceded the contents of the other two manuscripts, but not by much, since it can be shown that they could not have been written before late 1588 or early 1589. Such proximity in time of composition encourages one to investigate the many internal relationships between them, as well as their cumulative influence on Galileo's later writings, and it is such an investigation that constitutes the burden of this volume.

The evidence for the new datings of MSS 27 and 46 is quite complex, requiring considerable textual analysis and comparison to give it probative force. Since the character of this evidence changes for the two manuscripts, it is thought best to present it in two chapters: that for the logical questions in this first chapter and that for the physical questions in the next. This procedure has the advantage that material common to both analyses can be covered at the outset, and the evidence for dating

[6] *Opere* 9:279.
[7] *Opere* 1:9-13.
[8] *Opere* 1:245-249.
[9] *Opere* 1:9.

the logical questions can then be added to that for dating the physical questions, which offers slightly more difficulty and so can benefit from this help. The accepted dating of MS 71 is not at question here, as already noted, and thus discussion of that manuscript is reserved for part 3 of this study, where it is situated with respect to Galileo's other early writings.[10]

The technique employed in these two chapters of part 1 consists of showing that both sets of questions are derived or extracted from various writings of Jesuit professors at the Collegio Romano dating from the last decades of the sixteenth century. These Jesuit writings are numerous and fall into two categories: some are printed books, others are manuscripts containing lecture notes for the courses then being taught at the Collegio. For the first, the authors and the dates of publication are easy enough to identify, although there is one case of plagiarism pertaining to the logical questions that complicates the reasoning employed in its instance. For the second, the problems are more numerous: the possible manuscript sources are many; in a few instances their authors or their dates of composition are uncertain; and it is quite likely that the manuscripts thus far discovered represent but a small fraction of those that were at one time available. Such difficulties effectively rule out definitive proof that Galileo took his notes from any one Jesuit manuscript or book. The many textual parallels between Galileo's writings and these possible sources, however, leave little doubt, as will be seen, that the logical questions were written around 1589 and the physical questions around 1590. Although printed books have been helpful in establishing the provenance of these questions, the evidence also points to Galileo's having used handwritten rather than printed sources in the composition of both, as will be explained in what follows.[11]

1. Logic at the Collegio Romano

The philosophy curriculum at the Collegio Romano during the period of interest was taught in a three-year cycle, with logic occupying the first year of the cycle, natural philosophy the second, and metaphysics the third.[12] As can be seen from data presented in table 1, it was more

[10] See chap. 5, sec. 2, henceforth abbreviated as sec. 5.2.

[11] See chap. 1, sec 3, subsec a, henceforth abbreviated as sec. 1.3.a; also sec. 2.4.

[12] See R. G. Villoslada, *Storia del Collegio Romano dal suo inizio (1551) alla soppressione della Compagnia di Gesù (1773)*, Analecta Gregoriana, (Rome: Apud Aedes Universitatis Gregorianae, 1954), vol. 66, pp. 84-115, for details of the program in philosophy at the Collegio Romano.

TABLE I

PROFESSORS AND COURSES IN PHILOSOPHY OFFERED AT THE COLLEGIO ROMANO IN THE ACADEMIC YEARS 1559 THROUGH 1598

Years	Logic	Natural Philosophy	Metaphysics	Mathematics
1559-1560	F. Toletus	H. Torres	B. Pererius	B. Torres
1560-1561	P. Parra	F. Toletus	B. Pererius	B. Torres
1561-1562	B. Pererius	P. Parra	F. Toletus	
1562-1563	I. Acosta	B. Pererius	P. Parra	
1563-1564	A. Gagliardi	I. Acosta	B. Pererius	
1564-1565	B. Pererius	A. Gagliardi	I. Acosta	C. Clavius
1565-1566	I. Ricasoli	B. Pererius	A. Gagliardi	C. Clavius
1566-1567	H. Sorian	I. Ricasoli	B. Pererius	C. Clavius
1567-1568	B. Sardi	H. De Gregorio	I. Ricasoli	C. Clavius
1568-1569	F. Ribera	B. Sardi	H. De Gregorio	C. Clavius
1569-1570	I. Della Croce	L. Maselli	B. Sardi	C. Clavius
1570-1571	A. Lisi	I. Della Croce	L. Maselli	C. Clavius
1571-1572	L. Romano	A. Lisi	I. Della Croce	B. Ricci
. . .				
1577-1578		A. Menu		C. Clavius
1578-1579			A. Menu	C. Clavius
1579-1580	A. Menu			C. Clavius
1580-1581		A. Menu		C. Clavius
1581-1582			A. Menu	C. Clavius
1582-1583				C. Clavius
1583-1584	I. Lorinus		A. Parentucelli	C. Clavius
1584-1585		M. De Angelis	A. Parentucelli	R. Gibbone
1585-1586	I. Lorinus	M. De Angelis	P. Valla	F. Fuligati
1586-1587	I. Caribdi	M. De Angelis	P. Valla	F. Fuligati
1587-1588	P. Valla	I. Caribdi	M. De Angelis	C. Clavius
1588-1589	M. Vitelleschi	P. Valla	I. Caribdi	C. Clavius
1589-1590	L. Rugerius	M. Vitelleschi	P. Valla	C. Clavius
1590-1591	A. De Angelis	L. Rugerius	M. Vitelleschi	C. Clavius
1591-1592	R. Jones	A. De Angelis	L. Rugerius	C. Clavius
1592-1593	F. Raimondi	R. Jones	A. De Angelis	C. Clavius
1593-1594	A. De Angelis	F. Raimondi	R. Jones	C. Clavius
1594-1595	R. Ciamberlini	A. De Angelis	F. Raimondi	C. Clavius
1595-1596	S. Del Bufalo	R. Ciamberlini	A. De Angelis	C. Grienberger
1596-1597	A. Eudaemon	S. Del Bufalo	R. Ciamberlini	C. Grienberger
1597-1598	R. Ciamberlini	A. Eudaemon	S. Del Bufalo	C. Grienberger

or less customary for a professor to begin the cycle with a particular class and then continue along with them throughout the remaining two years. This assured greater continuity in the course, and even allowed a professor to make up, in a following year, material he had been unable to cover in the year assigned. Mathematics was usually studied in the second year, and this additional load, together with the large amount of natural philosophy that was assigned, resulted in a fair amount of that discipline being left over for the third year. Textbooks were probably available for all the courses, but most professors preferred their own teaching notes, and students were encouraged to make *reportationes* of them for their personal use. Time was in fact set aside for Jesuit scholastics to complete their class notes by referring to those of the professor and other sources.[13] It seems likely that most professors deposited a finished set of lectures in the Collegio library after their course was completed; if so, repeated copying of such codices would explain the large number of *reportationes* of lectures from the Collegio Romano that are now found in European libraries.

A summary of the best available information about the professors, the courses they taught, and the years in which they taught them at the Collegio is assembled in table 1.[14] A gap of five years in the *rotulus* of professors occurs between the years 1572 and 1577, and there are occasional other *lacunae* down to 1585, after which the list is complete.

For logic, the first professor on the list is Franciscus Toletus (Toledo), who taught philosophy at the University of Salamanca previous to his entry into the Jesuits in 1558, and had come to Rome while still a novice in the Society to teach logic in the academic year 1559-1560. Toletus is of importance in that his teaching resulted in a series of textbooks, including a complete logic course that became available in 1576 and was reprinted many times to the end of the sixteenth century. This undoubtedly served as the basic text for lecturers at the Collegio during the two decades that followed its initial printing.[15] It also was expanded or supplemented by Ludovicus Carbone of Costacciora, one-time professor at Perugia, who reprinted the text along with his putative emendations

[13] Ibid., p. 89; see also pp. 85 and 107.

[14] Most of the information in this list is taken from the Elencho dei Professori of the Collegio prepared by Ignazio Iparraguirre and appended to Villoslada's *Storia del Collegio Romano*, pp. 321-336; some additions have been made by the author on the basis of manuscripts of lecture notes he uncovered in his researches. The names are generally given in Latin, following the usage of the *rotulus* of professors at the Collegio and the manuscripts studied. For purposes of uniformity, considering the multiple ways some of the names are rendered in the vernacular, the versions of the names recorded in the table are used throughout this work. All vernacular variants, however, are listed in the index.

[15] Villoslada, *Storia del Collegio Romano*, pp. 51-52, 99, 102.

under the title *Additamenta ad commentaria doctoris Francisci Toleti in logicam Aristotelis* at Venice in 1597. The *Additamenta*, as will be seen, was plagiarized from a course given by Paulus Valla at the Collegio Romano in the academic year 1587-1588. It assumes great importance in this study from the fact that Galileo apparently used the very set of notes Carbone plagiarized when preparing the logical questions of MS 27. Indeed, establishing this connection between Galileo and Valla *via* Carbone is the primary goal of the textual analyses offered in this chapter.

Considering the large number of professors and the many times logic was taught at the Collegio between 1559 and the end of the century, a surprisingly small number of lecture notes or printed editions have survived to the present day. Those that are known are given in table 2, with an indication of the year in which they were taught, the professor who gave the course, and whether it survives in manuscript or printed form or both.[16] The course offered by Ioannes Lorinus is the only one now extant both in manuscript and in print, and the two versions are practically identical—rather remarkable considering their separation by an interval of some thirty-six years. Valla's printed course, on the other hand, is known to be different from the manuscript version (now lost) that antedated it by some thirty-four years, for reasons that will be explained presently. It is the most complete of the printed texts, filling two large folio volumes and treating in detail practically every subject that can be considered in logic. The remaining courses, those of Vitelleschi, Rugerius, Jones, and Eudaemon, are not as compendious as Valla's, although Rugerius comes closest to it in the quantity of material he

TABLE 2
EXTANT VERSIONS OF LOGIC COURSES TAUGHT AT THE COLLEGIO ROMANO, 1559 TO 1597

Years	Professor	Manuscript	Printed Edition
1559-1560	F. Toletus	—	Venice 1576
	[L. Carbone: Additamenta]	—	Venice 1597
1583-1584	I. Lorini	1584	Cologne 1620
1587-1588	P. Valla	—	Lyons 1622
1588-1589	M. Vitelleschi	1589	—
1589-1590	L. Rugerius	1590	—
1591-1592	R. Jones	1592	—
1596-1597	A. Eudaemon	1597	—

[16] Details pertaining to the manuscripts and printed books indicated in the table are given in the bibliography at the end of this volume.

covered. Vitelleschi and Jones approximate Lorinus's course in content, though with somewhat different emphases, and Eudaemon offers a less developed treatment, covering the subject in the most cursory fashion of all.

Since each of these courses sheds light on the way logic was taught at the Collegio, and on this account can aid in understanding the materials used by Galileo when writing his logical questions, their respective contents will be sketched before examining Galileo's manuscript in the following section.

a TOLETUS AND CARBONE

Toletus was one of the earliest philosophy professors at the Collegio Romano.[17] There he taught logic, as already noted, in 1559-1560, and then continued on in the philosophy cycle, teaching natural philosophy in 1560-1561 and metaphysics in 1561-1562, after which he passed to the teaching of theology. He achieved great eminence as a theologian and was made a cardinal in 1594, two years before his death. Some of his manuscripts are preserved in the archives of the Gregorian University in Rome, including a commentary on the *Posterior Analytics* of Aristotle.[18] This is not as complete as the similar commentary contained in the printed edition, and has little interest for its relation to Galileo's text on that account. The logic course that was printed, however, gives a good idea of the extent of the teaching of this subject at the Collegio, and apparently set the syllabus there for the last three decades of the sixteenth century.

Toletus's logic usually appeared in two volumes, the first a slim book of less than one hundred pages entitled *Introductio in dialecticam Aristotelis*, which contained a quick overview of all of logic, including the essentials of formal logic and topics similar to those contained in the *Summulae* tradition, and the second a book of some four or five hundred pages entitled *Commentaria una cum quaestionibus in universam Aristotelis logicam*, which detailed all topics in logic of philosophical interest.[19] As the course at the Collegio developed, the first volume formed the basis for a two- or three-week introduction to the science of logic in which the students were drilled in the uses of terms and the forms of reasoning, so that they

[17] For some particulars of Toletus's life and works, see Carlos Sommervogel et al., *Bibliothèque de la Compagnie de Jésus*, 11 vols. (Brussels-Paris: Alphonse Picard, 1890-1932), vol. 8, cols. 64-82; his role at the Collegio Romano is covered in Villoslada, *Storia del Collegio Romano*, passim.

[18] Archivum Pontificiae Universitatis Gregorianae, Fondo Curia (henceforth abbreviated as APUG-FC), Cod. 37, In libros Posteriorum.

[19] These were printed at Venice, Apud Iuntas, in 1576 and went through many printings thereafter. Details are given in Sommervogel, *Bibliothèque*, note 17 *supra*.

would have a general familiarity with the terminology and procedures employed by the logician. The second volume then enabled the professor to build on this foundation and at the same time cover most of the classical texts in logic in lectures extending over the remainder of the academic year. The structure of the second volume is of interest for what follows, and thus is indicated below in schematic form, with an indication of the approximate number of pages allotted to each tract:

A general division of the arts and the sciences, followed by five questions on the nature of logic as a science. (20 pages)

An introduction to the *Isagoge* of Porphyry, concerned with the "five universals," including a brief commentary on the text, interspersed with questions on the following topics:

Four questions on universals.

Two questions on first and second intentions.

Three questions on the subject of the book, viz., predicables, and how these are divided.

Five questions on genus, two on the individual, one on species, and discussions of disputed points on property and accident. (60 pages)

An exposition of the *Categories* of Aristotle, including a general discussion of the categories (more frequently called "predicaments") and their relation to metaphysics, and then detailed discussions of the antepredicaments, each of the predicaments in particular, and the postpredicaments. Among the questions relating to the predicaments are the following:

Six questions on substance.

Two questions on quantity.

Four questions on relation.

Five questions on quality.

Eight questions on the last six predicaments. (120 pages)

A very brief discussion of Gilbert de la Porrée's *De sex principiis*. (8 pages)

An exposition of Aristotle's *Perihermenias*, including a commentary and questions on various topics, with particular attention being devoted to questions of signification and truth, the noun, the verb, the expression (*oratio*), the enunciation or proposition and its various kinds, and modes and modal propositions. (70 pages)

A commentary with a large number of questions on the two books of Aristotle's *Posterior Analytics*; the questions are not numbered systematically as in the earlier expositions of the *Isagoge* and the *Categories*,

but are interspersed at their proper places in the commentary. The more noteworthy topics that are discussed include:

First book: the structure of the treatise, the foreknowledge required for demonstration, the demonstrative regress, the requirements for demonstration, its kinds, and comparisons between them.

Second book: the kinds of scientific question, the relation between demonstration and definition, definitions and their relations to causes, and principles and how they are known. (200 pages)

It may be observed that Toletus covered the major classical texts in this way, with the possible exception of Aristotle's *Prior Analytics.* The omission is only apparent, however, since the main topic discussed in that work—the syllogism and its various figures and modes—is covered in the first volume already mentioned, where some twenty pages are allotted to this topic. Likewise, the discussion of probable argument and of fallacies, corresponding to Aristotle's *Topics* and *De sophisticis elenchis*, is covered there in very summary fashion, receiving a combined treatment of some twenty pages also.

Undoubtedly this presentation was improved upon by later authors who either worked up new sets of notes or else composed additions that would serve as supplements to Toletus's basic texts. One such author, as already mentioned, was Ludovicus Carbone, who published a number of emendations in his *Additamenta* of 1597.[20] The date of publication of this work is clearly not that of its composition, for Carbone notes in his preface that he is having these additions printed in order to make them available to others, lest they never see the light of day, although he had been holding them in the hopes of eventually producing a complete logic text himself.[21] At the same time he published an *Introductio in logicam*

[20] The full title reads: *Additamenta ad commentaria D Francisci Toleti in Logicam Aristotelis. Praeludia in libros Priores Analyticos, Tractatio de Syllogismo; de Instrumentis sciendi; et de Praecognitionibus, atque Praecognitis.* Auctore Ludovico Carbone a Costacciaro, Academico Parthenio, et in Almo Gymnasio Perusino olim publico Magistro. Cum Privilegiis (Venetiis, Apud Georgium Angelerium, 1597), henceforth cited as *Additamenta.*

[21] Ibid., Auctor lectori, fol. a2r-v. The Latin reads as follows. "Additamenta haec, amice Lector, ut minus elaborata atque polita, nunquam mihi e manibus extorqueri permisissem, ni plus aliis, quam mihi soli viverem: quod qui faciunt, ea saepe faciunt, quae alias facturi non essent. Ut itaque nonnullorum votis satisfacerem, ea in lucem publicam venire permisi, quae una cum completo de re Logica opere, alio tempore, edere cogitabam. Habeo enim Commentaria in omnes libros Logicos non poenitenda, quibus, dum gravioribus operibus scribendis sum addictus, extremam manum imponere non queo: faciam tamen aliquando, favente Deo. Interim ab horum additamentorum editione, occasione sumpta, eodem tempore Introductionem in Logicam, seu totius Logicae Compendium, ni fallor, absolutum, foras dedi. Uno etenim opusculo, quod nunc sub praelo est, non solum quae in universo Aristotelis Organo continentur; sed etiam omnia quae ab ipso praetermissa, et ab aliis superaddita fuere, complexi sumus Quare, qui nostra leget, disciplinam, alias Tironibus non facilem, facile sibi comparare poterit; si ea quae Aristoteles ad iuvenum ingenia minus

(Venice, 1597), apparently for the same reason, and released for publication a similar work, *Introductio in universam philosophiam*, which appeared in 1599—perhaps posthumously, as he seems to have died in 1597.[22] A prolific writer, Carbone issued a large number of works on theology and rhetoric between 1587 and 1597, including an *Introductio in sacram theologiam* in 1589 and an edition of Toletus's *Introductio in dialecticam* in 1588.[23] He was not a Jesuit, but he studied at the Collegio Germanico annexed to the Collegio Romano and probably had access to the materials taught there. Despite the late date of their printing, there is good evidence that the additions were composed a full decade earlier—surely after 1576, since this was the date of publication of the work for which they are seen as supplements, and most probably around 1588, when Carbone was reissuing the first part of Toletus's course, for reasons that will be explained presently.

Carbone's *Additamenta* is proposed as an aid to the study of the two

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accommodate scripsit, praetermittere, et ad alias artes se conferre volet: cum quae ille fuse et obscure docuit, nos breviter, et perspicue, quantum per rem ipsam licuit, et quae ille omisit, nova quadam ratione, novis in re Logica ingeniis accommodata, tradiderimus. Etenim, logicis tradendis, eam tenere solemus viam, atque rationem, quae multorum annorum experientia edocti, iis qui primo ad Dialecticam cognoscendam accedunt, maximam lucem affert, et ad reconditas difficultates, quae in disserendi ratione tractantur intelligendas, maxime idoneos reddit. Quam, non modo discipuli, eius utilitates animadvertentes, saepe approbarunt, sed etiam viri eruditi, ut hoc dicam, et vere quidem, commendarunt. Et ne, dum haec nostra rudia Additamenta excusare deberem, aliud opusculum laudare velle videat, qui eo uti voluerint, nos in tanta de eadem re librorum multitudine, non omnino frustra tempus, operamque consumpsisse facile animadvertet. Ideo autem, de hac lucubratione in praesenti meminisse volui, ut multa quae in tractatio de Syllogismo hic omisi, ex ea promenda esse monerem. Ibi enim de Syllogismorum regulis communibus, de formis, et speciebus in particulari, deque aliis argumentationum speciebus scripsimus, de quibus hoc loco fere nihil Illud ad extremum Lectorem monuerim, in his Additamentis, interdum me dicere, de re aliqua, alias dixisse, aut esse dicturum, de qua in eis non egi, innuendo ea commentaria, de quibus supra dicebam: quae faxit Deus, ut in eius gloriam et studiosorum utilitatem aliquando cedant: in quos fines, quidquid elaboramus, cedere percupimus."

[22] Charles H. Lohr, in his "Renaissance Latin Aristotle Commentaries," *Renaissance Quarterly* 28 (1975): 698, indicates that he died at Venice after 1597; the card file at the Vatican Library gives his date of death as 1597. Bibliographic references are given by Lohr, ibid.

[23] Ibid., pp. 698-699. His other titles, all preserved in the Vatican Library, include: *Fons vitae et sapientiae, vel ad veram sapientiam acquirendam hortatio* (Venice, 1588); *De praeceptis Ecclesiae opusculum utilissimum* (Venice 1590); *De dispositione oratoria, disputationes xxx* (Venice, 1590); *De elocutione oratoria libri iiii* (Venice, 1592); *De octo partium orationis constructione libellus* (Venice, 1592); *De caussis eloquentiae libri iiii* (Venice, 1593); *Divinus orator, vel De rhetorica divina libri septem* (Venice, 1595); and *Introductio ad catechismum sive doctrinam Christianam* (Venice, 1596).

Analytics and deals with topics that are only summarily treated in Toletus's *Introductio* and *Commentaria*. The work contains an introduction in nine chapters, or questions, dealing with the nature of analysis and how it is covered in the *Prior* and the *Posterior Analytics*, after which come three lengthy treatises, one on the syllogism, another on instruments of knowing, and the final one on the foreknowledge required for demonstration. The *Tractatio de syllogismo* comprises fourteen chapters or questions, the *Tractatio de instrumentis sciendi*, sixteen, and the *Tractatio de praecognitionibus et praecognitis*, twenty-five. The latter treatise is particularly full, and contains much matter that is almost identical with that found in Galileo's logical questions, as will be shown in detail later. It is also noteworthy that Carbone's *Introductio in universam philosophiam* devotes over two hundred pages to a treatise, *De scientia*, that is very similar to matter covered in logic courses at the Collegio during the period of interest here, and that could have been worked up at the same time as the additions to Toletus's logic.

b. LORINUS

Ioannes Lorinus (Laurinis, de Lorini, 1559-1634) was born in Avignon, entered the Society of Jesus, and at the age of twenty-four or twenty-five taught the course in logic at the Collegio Romano during the academic year 1583-1584.[24] A codex containing his lecture notes, dated 1584, is preserved in the Vatican Library; the inscription on the first folio bears the legend "Ioannis Laurinis, S.I., Logica," but the "au" in his family name is crossed out (in another hand) and the letter "o" written over it.[25] This change in spelling is significant, for Villoslada lists a Ioannes Lacerino as teaching logic at the Collegio in 1585-1586, and his "Lacerino" is evidently a misreading of Laurino as originally inscribed in the rotulus of professors. In later documents at the Collegio Romano, Lorinus, who enjoyed a long and fruitful career there as a professor of Scripture, is usually referred to as Lorino, or Lorini, or de Lorini. His logic course, as already observed, was published subsequently under the title *In universam Aristotelis logicam* (Cologne, 1620).

The *reportatio* of the 1584 course is lengthy, containing 560 folios, the first half of which follows pretty much the outlines of Toletus's coverage of logic up to the *Posterior Analytics*. The exposition of the latter work begins on fol. 283v and continues until fol. 418r, where the notation is made: Posteriorum analyticorum quaestionum finis. Following this comes

[24] See Lohr, "Renaissance Latin Aristotle Commentaries," *Renaissance Quarterly* 31 (1978): 544, for biographical and bibliographical references.

[25] Biblioteca Apostolica Vaticana, Cod. Urb. Lat. 1471.

a treatise *De scientia* (fols. 420r-509r) and then a disputation *De definitione* (fols. 513r-560r), with which the course concludes. The hand in which the manuscript is written is poor, and thus it is fortunate that its entire contents are reproduced, almost verbatim, in the printed edition of 1620, itself a quarto volume of 691 pages. Since the published work is more readily available, and certainly more readable, than the manuscript, the former has been used to provide the following outline of the course:

An introduction to logic generally, based mainly on the three acts of the mind (pp. 1-55).

A disputation on the nature of logic (pp. 56-88).

An exposition of Porphyry's teachings, interspersed with commentary, including:
- An introduction (pp. 89-92).
- Ten questions on universals (pp. 92-115).
- Seven questions on genus, two on species, five each on difference, property, and accident (pp. 115-162).

A summary of the *Praedicamenta* of Aristotle, comprising:
- An introduction on the nature of the categories (pp. 163-181).
- A discourse on the antepredicaments, focusing mainly on analogy (pp. 182-203).
- Treatments of the individual predicaments, including twelve questions on relation (pp. 204-275).
- A discourse on the postpredicaments, centered on the concept of opposition (pp. 276-299).

A commentary on Aristotle's *Perihermenias*, detailing the contents of the chapters of each book (pp. 300-343).

A commentary on the *Prior Analytics* of Aristotle containing two disputations, one on the syllogism in general and the other on its various figures (pp. 344-378).

A commentary, with questions, on the *Posterior Analytics* of Aristotle, containing:
- An exposition of the text (pp. 379-410).
- A treatise on demonstration, made up of disputations or parts concerned with foreknowledge and its various kinds (pp. 411-457), with the nature of demonstration (pp. 458-523), with the species or kinds of demonstration (pp. 524-552), and with the properties of demonstration, focusing mainly on the demonstrative regress (pp. 553-557).

A treatise on science, made up of disputations or parts dealing with its existence (pp. 559-581), with science as an act (pp. 582-585), with science as a habit, including the various kinds of science, comparisons between them, and how they are subalternated one to the other (pp. 585-621), and with science as compared to other intellectual habits (pp. 622-639).

A treatise on definition, made up of sections dealing with its existence as an instrument of knowing (pp. 640-648), with its nature and kinds (pp. 649-659), with its relationships to the thing defined (pp. 660-676), with methods of defining (pp. 677-684), and with comparisons between definition and demonstration (pp. 685-691).

From the above list it can be seen that Lorinus structured his entire treatment of the *Posterior Analytics* as though it were a tract on demonstration, apparently not adverting to the fact that the second book of that work is also concerned with definition, as Toletus was clearly aware, and so reserving his own treatment of definition for the last part of his course on logic. He does have an extensive treatment of foreknowledge, moreover, and touches on many of the topics related to it that are taken up by Carbone in his additions to Toletus's text. And if one compares the amount of space he devotes to foreknowledge and to demonstration, respectively, approximately in the ratio of 1 to 2, one will find that this is precisely the ratio that governs the distribution of similar matter in Galileo's logical questions. Thus, as will become clear in what follows, these notes composed in 1584 and subsequently published in 1620 show similarities with Galileo's composition and probably represent, in their manuscript form, an intermediate stage of development for the notes on which he ultimately drew.

c. VALLA AND CARBONE

Paulus Valla (de Valle, Vallius, the latter being the spelling he employed in the printed version of his logic course), began to teach at the Collegio at the age of twenty-four, when he commenced the course in metaphysics in 1585.[26] The problems relating to his teaching of natural philosophy and to his composition of the *Tractatus de elementis* will be discussed at length in the following chapter.[27] Suffice it to mention here that his treatment of the elements and their qualities shows the closest agreement with Galileo's physical questions of any extant *reportatio*. In fact, although he does not have the scope of coverage of other authors,

[26] Sommervogel, *Bibliothèque*, vol. 8, col. 418.

[27] Secs. 2.1.b, 2.3.a, and 2.3.b.

in the portions that survive his composition is the best candidate for being the exemplar Galileo used in composing the portions of the physical questions dealing with the elements and their qualities. Unfortunately, none of his logic course, which he taught in 1587-1588, is now available in manuscript form. There are some very helpful remarks in the prefaces he wrote to the two volumes of his *Logica*, however, that shed light on this and other materials pertaining to his teaching at the Collegio Romano, and these deserve careful examination.[28]

The first volume, which was printed at Lyons along with the second volume in 1622, bears the inscription that it is concerned with the "old logic" whereas the second is concerned with the "new." Both are large folio volumes with relatively small print and contain seven hundred pages each. In his preface to volume 1, Valla first notes the procedure he will use in presenting each tract, explaining that he will start with various opinions and the reasons offered in their support, then present the position he regards as true (explaining Aristotle's text and the teaching of St. Thomas in the process), and finally show how all the divergent opinions can be explained in the light of his solution. He goes on to say that he plans to put out an entire course in philosophy along these lines, which will be made up of ten, or perhaps twelve, similar volumes. The first two are the logic volumes being introduced; following these will come two more expounding the *Physics*; then one each devoted to the *De caelo*, the *De generatione* (this containing everything pertaining to the elements, their qualities, and their motions), and the *Meteorology*; and finally three explaining the teaching of the *De anima* and the *Parva naturalia*, one on the soul in general and the vegetative soul, another on the sensitive soul, and a concluding one on the intellective soul. All of these are now ready to be printed, he writes, but he would like to add to them two more volumes expounding the *Metaphysics*, and then the entire course will be complete. Unfortunately Valla died in 1622, the year in which the logic volumes were printed. The latter, it may be noted, were approved for publication by two Jesuit censors, Ioannes Chamerota and Ioannes Lorinus, on June 24, 1612.[29] Some notations from a censorship report on his commentary on the *Physics*, dated September 18, 1621, and signed by Marcus Van Doorne, Ioannes Lorinus, and Ioannes Chamerota,

[28] The first volume is entitled *Logica Pauli Vallii Societatis Iesu duobus tomis distincta: Quorum primus artem veterem, secundus novam comprehendit. Tomus Primus. Quid in universo hoc opere praestetur sequens Epistola ad Lectorem docebit. Cum privilegio Regis* (Lugduni: Sumptibus Ludovici Prost, Haeredis Rouille, 1622), henceforth cited as *Logica*. The preface is on fols. 3r-4v. The title of the second volume is similar, except that it reads: *Tomus secundus. Quid hoc secundo tomo contineatur, sequens pagina docebit*. The preface follows the title page. Excerpts from both prefaces are translated *infra*, at notes 32-34.

[29] Archivum Romanum Societatis Iesu, Fondo Gesuitico, Cod. 654, fols. 275-281.

are preserved in the Roman Archives of the Society of Jesus.[30] An early bibliographical register lists this commentary as printed at Lyons in 1624, but its existence has not been definitively established.[31]

In addition to these remarks *Ad lectorem*, Valla outlines the contents of the two volumes and then explains that he will start by prefacing a brief introduction to the whole of logic. Of this he writes:

> We preface, I say, an *Introductio* that was explained by us thirty-four years ago [i.e., 1588] in the Collegio Romano and given to our hearers shortly thereafter. This work, with very little of the fruits of our labors changed in it, was published at Venice by some good author, who added some preliminary matter and made some inversions (or rather perversions) of its order that, in my judgment, achieve no better result. We wish to warn you the reader of this, so that, should you come across this book, you will recall that he took it from us. And since he stole this and similar matter from us and from the writings of our Fathers [i.e., other Jesuits], perhaps he should have added the author's name to these books, had he known it or thought it due us.[32]

Valla then announces that his second volume will contain his expositions of the *Prior* and *Posterior Analytics*, and to this he will add a *Disputatio de scientia*, of which he further remarks:

> The same thing happened to this *Disputatio* as I explained happened to the *Introductio*. But this we have now so enlarged and perfected that it would hardly be recognized by anyone except the author as the fetus of the same.[33]

This intimation of plagiarism is, of course, most interesting, but no less so than the additional charges Valla makes in the preface to the second volume of his *Logica*. By the time he came to its composition he had decided to append four complete tractates to his commentaries on the *Analytics* rather than the *De scientia* alone. These he enumerates as *De*

[30] Ibid., Cod. 644, fols. 464-467. The author wishes to thank Edmond Lamalle for furnishing him with copies of both these censorship reports.

[31] Lohr, "Renaissance Latin Aristotle Commentaries: Authors So-Z," *Renaissance Quarterly* 35 (1982): 209. In a private communication to the author, Dr. Lohr has expressed doubt that the printed work ever existed.

[32] *Logica*, vol. 1, fol. 4r. The Latin reads as follows. "Illam inquam praemittemus introductionem, quam ante annos quatuor, et triginta Romano in Collegio a nobis explicatam, Auditoribusque traditam non multo post, ab Auctore valde sane pio, nostrique laboris peramico paucissimis immutatis, Venetiis editam in lucem cognovi, Prooemiolis quibusdam additis, nonnullisque inversis, vel potius perversis, quod ad ordinem attinet (meo iudicio) non meliorem effectam, de quo te lectorem monitum voluimus, ne si forte in libellum illum incidas, veniat in animum, haec nos ab illo detraxisse, cum tamen ille vero haec, et alia huiusmodi a nostris, nostrorumque Patrum scriptis arripuerit, additurus forte, et Auctoris nomen illis in libellis, vel cognovisset, vel si id nobis gratum existimasset."

[33] Ibid. ". . .illud idem cum eodem accidit, quod in Introductione accidisse exposui. Verum ita nunc locupletavimus, melioremque effecimus, ut vis ab alio quam ab ipso Auctore, idem tamquam foetus dignosci valeat."

praecognitionibus, De demonstratione, De definitione, and *De scientia.* Concerning the order of these tractates, he now alerts the reader to the following:

> About twenty years ago [i.e., around 1602], a certain individual—possessing a doctorate, having published a number of small books, and being otherwise well known—had a book printed at Venice in which he took over and brought out under his own name a good part of what we had composed in our *De scientia* and had taught at one time, thirty-four years before this date [i.e., in 1588], in the Roman *gymnasio.* And having done this, this good man thought so much of other matters we had covered in our lectures that he took from them, and claimed under his own name, a large part of *De syllogismo, De reductione, De praecognitionibus,* and *De instrumentis sciendi,* and proposed these as kinds of *Additamenta* to the logic of Toletus, especially to the books of the *Prior Analytics.* He further saw fit to publish, again under his own name, our *Introductio* to the whole of logic, having changed only the ordering (disordering it, in my judgment), along with the introductions and conclusions. I wish you to know this, my reader, so that, should you see anything in either, you will know the author. I say, "should you see anything in either," for we have so expanded our entire composition that, if you except only the opinions (which once explained we have not changed), hardly anything similar can you see in either. So in those works you have what he took from me, in this what I have prepared more fully and at length.[34]

The import of these statements for fixing the date of Galileo's logical questions, needless to say, cannot be overestimated. Earlier it was remarked that Carbone's treatment of *De praecognitionibus* in his *Additamenta* of 1597 is very similar to Galileo's corresponding tract in his logical questions. Now Valla is attesting, in no uncertain terms, that most of that tract was plagiarized by Carbone from lecture notes that he himself had made available to students at the Collegio Romano in 1588 or shortly thereafter. For Carbone is the only person who could possibly fit the description of the unnamed "good man" in Valla's two prefaces. As has previously been indicated, Carbone's *Additamenta* to Toletus's logic contains treatises entitled *De syllogismo, De instrumentis sciendi,* and *De prae-*

[34] Vol. 2, fol. 1. "Annos fere ante viginti, Vir quidam, doctoris etiam laurea donatus, variisque in lucem editis libellis, satis notus, impressum Venetiis libellum, in lucem edidit, in quo multa, ex nostris de Scientia lucubrationibus, Romae olim, quatuor fere, et triginta ante hanc diem annos, in Romano gymnasio expositis, transtulit, suoque nomine evulgavit; quod etiam factu dignum existimavit, vir probus, aliis in nostris Romanis praelectionibus. Quare ex iis additiones quasdam in logicam Toleti, ad libros praesertim Priores, multa de syllogismo, resolutione, praecognitionibus et instrumentis sciendi, sibi, suoque nomini vindicavit, vel usurpavit: immo vero, et Introductionem nostram, in totam logicam, mutato, immo potius (meo iudicio) perturbato ordine, ac prooemiolis, et epilogis auctam, suo etiam nomine, imprimendam censuit. Hoc tibi notum volui, lector, ut si quid in utroque videris, Autorem noveris. Dixi si quid in utroque videris; ita enim locupletavimus omnia, ut sententias, (quas semel bene susceptas non immutavimus) si excipias; vix quid simile in utro videre possis. Habeat igitur ille, quae sibi usurpavit, habeas tu haec, quae longe meliora paravimus."

cognitionibus, precisely those alleged to be stolen, and his little book, fitting Valla's term *libellus* and entitled *Introductio in universam philosophiam* (printed in 1599, twenty-three years earlier than Valla's *Logica*), has the treatise *De scientia*, which, in Valla's recollection, was printed by this person under his own name "about twenty years ago." Valla admits that Carbone might have made a few changes in the notes, and also insinuates that he helped himself freely to the notes of other Jesuits, undoubtedly of the Collegio also, but otherwise he is clearly claiming that most of his materials are Valla's own. Not only this, but because of Carbone's plagiarism, Valla has felt compelled to change his own expression and to develop his treatises beyond the state in which they were when Carbone had access to them. It goes without saying that these are invaluable pieces of information to take into account when setting up textual comparisons between Galileo and Valla and Carbone, and thus for determining the date of Galileo's writing of the logical questions. And, so far as the content is concerned, even though the wording has been changed and the treatises expanded, one will henceforth expect a consistent uniformity of teaching in the logical writings of Valla, Carbone, and the young Galileo.

In view of the importance of Valla's textbook, a summary of the contents of the two volumes is given here in schematic form, similar to those already provided for the works of Toletus and Lorinus, after which follows a more detailed description of his treatise *De praecognitionibus*.

Volume 1. The Old Logic

An introduction, giving a brief description of logic, and then a summary treatment of the three operations of the mind, namely, that dealing with the term and definition (18 chapters), that dealing with the proposition and its various types (22 chapters), and that dealing with the syllogism, including the topical and sophistical (25 chapters).

Prolegomena to the study of logic as a science, divided into two parts containing, respectively:

Four questions on the nature of a "second intention" or of an *ens rationis*.

Four questions on the nature of logic as a science (the third question, on the object of logic, consists of 27 chapters and is an extremely full treatment of the subject). (43 pages)

An exposition of the *Predicables* of Porphyry, consisting of three parts containing, respectively:

Six questions on universals in general.

An extensive treatment of the various predicables, discussed under

the rubric of "universals in particular," containing two questions on genus, four on species, two on difference, and one on property and accident.

A discussion of the points predicables have in common, and those in which they differ. (134 pages)

An exposition of the *Praedicamenta* of Aristotle, containing:

A prologue, with two questions, inquiring about the purpose of the book and its relation to logic.

A treatise on the antepredicaments, containing two questions on equivocation and analogy and six questions on what can be located in the predicaments.

A detailed examination of each of the predicaments or categories, with:

Nine questions on substance.

Nine questions on quantity.

Eleven questions on relation.

Three questions on quality.

One question on the remaining six predicaments.

A treatise on the postpredicaments, discussing mainly the various kinds of opposition and contrariety. (349 pages)

An exposition of the *De interpretatione* or *Perihermenias* of Aristotle, made up of three parts, as follows:

Three questions on vocal expression (*vox*) and truth.

Five questions on the noun and the verb.

Five questions on enunciations, their properties, and their opposition. (92 pages)

Volume 2. The New Logic

An exposition of the two books of the *Prior Analytics* of Aristotle, as follows:

An introduction, containing three questions, discussing the nature of, and the connection between, the books of the *Analytics* in general.

An explanation of the teachings of the first book, containing:

Three questions on the syllogism.

Three questions on the conversion of propositions.

Three questions on the figures of syllogisms and their contents.

An explanation of the second book, mainly in the form of an exposition, in 35 chapters, of the uses and defects of various figures of the syllogism. (119 pages)

An introduction to the first book of the *Posterior Analytics*, containing two questions on the object of the books and a brief exposition of the first chapter. (16 pages)

A disputation on foreknowledge (*De praecognitionibus*), made up of:

Three questions on foreknowledge and the foreknown, in general.
Five questions on the foreknowledge of principles.
Two questions on the foreknowledge of properties.
Two questions on the foreknowledge of subjects.
Two questions on the sources of assent to knowledge in general. (39 pages)

Exposition of the remainder of the first book. (12 pages)

A disputation on demonstration (*De demonstratione*), made up of:

Five questions on the principles of demonstration in general.
Twenty-five questions on the nature and conditions of demonstration.
Five questions on the kinds of demonstration.
Three questions on demonstrative regress and circularity in argument. (162 pages)

Exposition of the second book of the *Posterior Analytics*. (25 pages)

A disputation on definition (*De definitione*), made up of:

Seven questions on the nature of definition.
Three questions on the properties of definition as an instrument of knowing. (32 pages)

A disputation on science (*De scientia*), made up of:

Twelve questions on habits in general.
Seven questions on the essence or quiddity of science.
Five questions on the properties of science.
Nine questions on the divisions of sciences and their subalternation.
Seven questions on the comparison of science with other intellectual habits. (286 pages)

In the above listing, it can be seen that Valla devoted fourteen questions to his *Disputatio de praecognitionibus* and that these cover thirty-nine pages of text. Actually each question is made up of a number of chapters, with the result that there are sixty-nine chapters in the disputation as a whole. We will recall that Carbone's *Tractatio de praecognitionibus* contains only twenty-five chapters; each of these poses a single question, and the whole

covers twenty pages of text in a smaller format. Thus Valla's claim to have expanded his treatment over what was available to Carbone is borne out. A comparison of the specific queries in their respective treatises *De praecognitionibus*, moreover, shows that Carbone's first six questions (1-6) treat essentially the same matters as Valla's questions on foreknowledge in general; his next five (7-11) correspond to Valla's questions on the foreknowledge of principles; his next two (12-13), to the foreknowledge of properties; his next six (14-19), to the foreknowledge of subjects; and his final six (20-25), to the sources of assent to knowledge in general. The material has been rearranged slightly, but there can be no doubt that the teaching is the same, and ultimately derives from the same source.[35]

d. VITELLESCHI

Mutius Vitelleschi (Vitelleschus) began his teaching career at the Collegio at about the same age as Lorinus and Valla, namely, at twenty-five, being entrusted with the logic course in 1588-1589, which launched him on his illustrious career in the Society of Jesus.[36] (It is perhaps noteworthy that Vitelleschi was born in 1563 and so was only one year older than Galileo; thus he would have been teaching this matter at approximately the same age as Galileo was appropriating it from whatever exemplar was available to him.) A manuscript of Vitelleschi's logic course is preserved in the Vatican Library, and this shows that he covered essentially the same content as Lorinus and Valla, though in slightly less detail than either.[37] The *reportatio* was made by a student of his, Torquatus Ricci, in a codex of 445 folios. The first 33 of these present the customary introduction to all of logic, including the syllogism with its various figures and modes, after which come 52 folios on the nature of logic as a science. Following this, Vitelleschi devotes 69 folios to Porphyry and the predicables, 86 folios to the *Categories* of Aristotle, and 45 folios to the *Perihermenias*. Unlike most of his predecessors, at this point he goes into the *Prior Analytics*, and explains its subject matter in 34 folios, 22 of which are devoted to the syllogism. Then he embarks on the *Posterior Analytics*, covering this in 87 folios, practically all of which are devoted to the first book; into his exposition he has inserted a brief treatise *De scientia* of some 13 folios. The concluding tract takes up the division of the sciences in 15 folios, obviously intended to complement the earlier insertion of *De scientia*. It seems doubtful that Vitelleschi covered all of this material in the year devoted to logic, for his course in natural phi-

[35] Sec. 1.1.a.

[36] Sommervogel, *Bibliothèque*, vol. 8, cols. 848-852.

[37] Biblioteca Apostolica Vaticana, Cod. Borgh. Lat. 197.

losophy, taught the following year at the Collegio, begins with the same *Tractatio de scientiarum divisione*—an indication that he probably resumed with matter he was unable to finish the previous year.

Vitelleschi's treatment of *De praecognitionibus* is very brief, and shows little similarity with the corresponding portions of Galileo's logical questions. His treatise *De demonstratione*, on the other hand, is quite full, and contains a number of parallels with Galileo's corresponding questions. Since similar parallels are also to be found in the writings of Lorinus and Valla on this subject, there seems little reason to regard Vitelleschi's notes as an independent source of Galileo's composition.

e. RUGERIUS

Ludovicus Rugerius (de Rugeriis, Ruggiero, Rugerio) taught the logic course at the Collegio in 1589-1590 and has left one of the most complete records of his teaching among all of the materials that have been preserved.[38] The notes of his *Logica* are bound in two codices, the folios of which are numbered consecutively, and each of which give indications of the numbers of lectures delivered and the dates on which the principal tracts were begun.[39] His course followed the tradition already sketched, but develops each portion of it in considerable depth. Valla's course could well have been the inspiration behind his work, for, of all the surviving notes, those of Rugerius come closest to the scope and detail of the *Logica* Valla eventually printed. The following summary, similar to that already given of Valla's work, conveys some idea of its contents:

Volume 1

Compendium of logic: begun November 3, 1589, containing 29 lectures summarized in 48 folios, treating of the three operations of the mind, methodology in general, and ways of finding middle terms.

First disputation. On the nature of logic: begun November 27, 1589, containing 30 lectures summarized in 50 folios, discussing the type of knowledge logic is, its object, and its end.

Second disputation. On universals: begun December 22, 1589, containing 32 lectures summarized in 57 folios, interpreting the *Isagoge* of Porphyry and explaining universals in general as well as the five individual types, namely, genus, species, difference, property, and accident.

[38] Lohr, "Renaissance Latin Aristotle Commentaries," *Renaissance Quarterly* 33 (1980): 705.

[39] Staatsbibliothek Bamberg, Msc. Class., Cod. 62-1 and 62-2. The remainder of his philosophy course follows in Cod. 62-3 through 62-7.