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KIDWELL, Clara Sue, 1941-
THE ACCADEMIA DEI LINCEI AND THE APIARIUM: A CASE STUDY OF THE ACTIVITIES OF A SEVENTEENTH CENTURY SCIENTIFIC SOCIETY.

The University of Oklahoma, Ph.D., 1970
History, modern

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THE UNIVERSITY OF OKLAHOMA

GRADUATE COLLEGE

THE ACCADEMIA DEI LINCEI AND THE APIARIUM: A CASE STUDY OF THE ACTIVITIES OF A SEVENTEENTH CENTURY SCIENTIFIC SOCIETY

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

in partial fulfillment of the requirements for the

degree of

DOCTOR OF PHILOSOPHY

BY

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Norman, Oklahoma

1970

THE ACCADEMIA DEI LINCEI AND THE APIARIUM: A CASE STUDY OF THE ACTIVITIES OF A SEVENTEENTH CENTURY SCIENTIFIC SOCIETY

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ACKNOWLEDGMENTS

I wish to acknowledge the aid of the members of my dissertation committee; Dr. David B. Kitts, David Ross Boyd Professor of Geology, Dr. Philip Nolan, Professor of Classics, Dr. David B. Wilson, Assistant Professor of the History of Science, and Dr. Kenneth L. Taylor, Assistant Professor of the History of Science. Their comments and criticisms have been most helpful.

My special thanks goes to the chairman of my committee, Dr. Thomas M. Smith, Professor the History of Science, without whose aid and encouragement this dissertation could not have been completed. I must also thank Dr. Duane H. D. Roller, McCasland Professor of the History of Science for his encouragement and support.

This dissertation is the result of graduate study supported by a National Defense Education Act Title IV Fellowship and a John Hay Whitney Foundation Opportunity Fellowship.

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THE ACCADEMIA DEI LINCEI AND THE APIARIUM: A CASE STUDY OF THE ACTIVITIES OF A SEVENTEENTH CENTURY SCIENTIFIC SOCIETY

CHAPTER I

INTRODUCTION

In 1625 an Italian nobleman, Prince Federico Cesi (1585-1630) wrote a treatise on bees, which was appropriately entitled Apiarium.[1] The work, which enjoyed only a limited circulation and which remained relatively obscure in its own time, is today very rare and still relatively obscure. It has acquired its historical reputation because it is considered the first published work which records observations made with a microscope.[2] There are, however, larger implications in the

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[1]Federico Cesi, Apiarium ex frontispiciis naturalis theatri Principis Federici Caesii Lyncei S. Angeli et S. Poli princ. I. March. M. Caelii. II. G. C. Baron. Roman. depromptum, quo universa melificium familia ab suis prae-generibus derivata in suas species ac differentias distributa in physicum conspectum addicitur (Rome: Ex typographio Iacobi Mascardi, 1625).

[2]Victor Carus, Histoire de la zoologie depuis l'antiquité jusqu'au XIXe siècle, trans. P.-O. Hagenmuller (Paris: Librairie J.-B. Baillière et Fils, 1880), p. 310; R. Taton, Reason and Chance in Scientific Discovery, trans. A. J. Pomerans (New York: Philosophical Library, 1957), p. 61; Erik Nordenskiöld, The History of Biology, trans. Leonard Bucknall Eyre (New York: Tudor Publishing Co., 1949), pp. 158-59; Charles Singer, "The Earliest Figures of Microscopic Objects," Endeavor, XII (October, 1953), 198; A. Schierbeek and Maria Rooseboom, Measuring the Invisible World: The Life and Works of Antoni van Leeuwenhoek F.R.S. (London: Abelard-Schuman, 1959), p. 43.

existence of this work beyond the mere opinion of a historical "first." It may be used to obtain insight into the activities of the Accademia dei Lincei, a scientific society founded by Prince Cesi which, like the Apiarium, has acquired its greatest historical reputation as the first of its kind--the first modern scientific society.[3]

Italy, during the early seventeenth century, saw the birth of a number of societies of learned men: the Lunatici of Naples, the Umidi, the Scamposti, and the Otiosi, as the members of Giambattista Della Porta's Academia Secretorum Naturae were called.[4] These societies arose, according to Santillana, because of the "sterility of the universities, the inadequacy of their curriculum, and the resistance of official scholarship to the new ideas."[5] According to Ornstein the universities offered no opportunities to men in the field of science.

> It would thus seem from the slight progress of the universities along lines of experimental science, from the fact that the greatest scientists of the age were not affiliated with them, from the many criticisms leveled against them, and from actual evidences of their conservatism, extending even into the eighteenth century, that the universities in the seventeenth century did not lend to science that encouragement which it needed in order to take root in them.[6]

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[3]F[rancis] S[torr], "Academies," Encyclopedia Britannica, 11th ed., I, 99; R. Morghen, "The Academy of the Lincei and Galileo Galilei," Cahiers d'histoire mondiale, VII, Part 2 (1963), 365-66; Fabio Colonna, Fabi Columnae Lyncei ΦΥΤΟΒΑΣΑΝΟΣ cui accessit vita Fabi et Lynceorum notitia adnotationesque in ΦΥΤΟΒΑΣΑΝΟΝ Iano Planco Ariminensi auctore et in Senensi academia anatomes publico professore (Florence: I. P. Aere, & Typis Petri Caietani Viviani, 1744), p. xiv.

[4]S[torr], pp. 99, 102.

[5]Giorgio de Santillana, The Crime of Galileo (Chicago: The University of Chicago Press, 1955), p. 24.

[6]Martha Ornstein, The Rôle of Scientific Societies in the Seventeenth Century (Chicago: The University of Chicago Press, 1938), p. 259.

It was, therefore, in the new scientific societies and the societies of learned men that the theories of science were most often set forth and its practice undertaken. Ornstein provides a statement of the characteristics and functions of the scientific societies, saying that their every activity was devoted to fostering the cause of experimental science. She epitomizes their efforts as follows:

> The societies concentrated considerable groups of scientists, performed experiments and investigations impossible to individual effort, encouraged individual scientists and gave them both opportunity and leisure, often through financial support, for scientific work. They became centers of scientific information, published and translated scientific books, promulgated periodically scientific discoveries, and thus co-ordinated the scientific efforts of the various progressive European countries.[7]

The learned societies of Italy, coming into being to fulfill needs not met by the universities of the time, sought to serve their role by fostering communication, by lending their moral, and in the case of Cesi's Lincei, financial support to the cause of learning, and by encouraging the freedom of expression. The Praescriptiones, an epitome of Cesi's constitution for the Lincei, stated the goals of the group.

> In sapientiae autem pio semper, & in Dei Optimi Maximi laudes studio, observationi Primum, & contemplationi, post scriptioni, ac inde tandem editioni incumbendum: neque enim recitationibus, declamationibus, aut cathedralibus disceptationibus vacare Lyncei erit instituti non etiam frequenter, & numerose convenire. . . .[8]

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[7] Ibid., pp. 259-60.

[8] D. Baldassare Odescalchi, Memorie istorico critiche dell'Accademia de'Lincei e del Principe Federico Cesi Secondo Duca d'Acquasparta fondatore e principe della medesima raccolte e scritta da D. Baldassare Odescalchi Duca di Ceri (Rome: Nella Stamperia di Luigi Perego Salvioni, 1806), p. 309. "Always in the virtue of wisdom, and in the desire of praising the best and greatest God, [there are] first observations, and contemplations, then writing, and finally editions of books: the

The Accademia, therefore, in its stated intent had many of the characteristics which Ornstein assigns to scientific societies. It encouraged study and publication, and through its publications it aided the dissemination of scientific knowledge in the seventeenth century. It encouraged the efforts of its individual members, but it also fostered joint efforts by its members. An outstanding example of the cooperative efforts of part of the group is the Rerum medicarum, a work on the flora and fauna of the New World.[9] Through the financial assistance of Cesi and the support of his fellow Lincei, two of Galileo Galilei's most important books were published.[10]

The Apiarium is an example of the work done by members of the Lincei, and particularly Cesi, both in championing the cause of freedom

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[Accademia dei] Lincei was founded not for recitations, declamations or learned debates, nor even for frequent and numerous gatherings. . . ."

[9]Francisco Hernandez, Rerum medicarum novae Hispaniae thesaurus seu plantarum animalium mineralium Mexicanorum historia ex Francisci Hernandi novi orbis medici primarii relationibus in ipsa Mexicana urbe conscriptis a Nardo Antonio Recchio Monte Corvinate Cath. maiest. medico et Neap. regni archiatro generali iussu Philippi II Hisp. Indar. regis collecta ac in ordinem digesta a Ioanne Terrentio Lynceo Constantiense Germ.° Phõ. ac medicõ notis illustrata nunc primum in naturaliũ rerũ studiosor gratia et utilitate studio et impensis Lynceorum. Publici iuris facta Philippo IV magno dicata (Rome: Ex Typographico Iacobi Mascardi, 1628).

[10]Galileo Galilei, Istoria e dimostrazioni intorno alle macchie solare e loro accidenti compreso in tre lettere scritte all'Illustrissimo Signor Marco Velseri Linceo dumviro d'Augusta consigliero di Sua Maesta Cesarea dal Signor Galileo Galilei Linceo nobil Fiorentino, filosofo, e matematico primario del Sereniss. D. Cosimo II, Gran Duca di Toscana, si aggiungono nel fine le lettere e disquisizioni del finto Apelle (Rome: Appresso Giacomo Mascardi, 1613); Galileo Galilei, Il saggiatore nel quale conbilancia esquisita e giusta si ponderano le cose contenute nella Libra Filosofica di Lotario Sarsi sigensano scritto in forma di lettera all'Ill.mo et Rever.mo Mons.re D. Virginio Cesarini Acc.° Linceo M.° di Camera di N. S. dal Sig. Galileo Galilei Acc.° Linceo nobile Fiorentino filosofo e matematico primario del Ser.mo Gran Duca di Toscana (Rome: Appresso Giacomo Mascardi, 1623).

of scientific expression and in communicating the use of a new scientific instrument, the microscope, which had come to Cesi's attention through his friendship with Galileo. The friendship began in 1611 when Galileo became a member of the Lincei,[11] and it continued until Cesi's death in 1630. Cesi was one of Galileo's most ardent supporters after Galileo had encountered the opposition of the Catholic Church to the teaching of the Copernican system of the heliocentric universe. When Galileo sent Cesi a microscope, Cesi used it to study bees, and to Pope Urban VIII he presented the Apiarium, a panegyric on the bee, the animal that decorated Urban's family crest. It was Urban who had, in 1624, refused to reverse the Catholic Church's position concerning the Copernican doctrine.

An exhaustive treatment of the Accademia dei Lincei is outside the scope of this dissertation. The purpose is not to provide a definitive work on the activities of the group or on the life of Federico Cesi but rather to examine Cesi and the Lincei as they are revealed in the light of one specific aspect of their activities. A fairly detailed study of the activities of the group within the context of Santillana's reason for the rise of learned societies and Ornstein's statement of the characteristics of scientific societies will show how that organization fulfilled its role as a scientific society. The production of the Apiarium will serve as a case study of the particular activities of the Lincei, the cooperation of its members, and the communication of new scientific information.

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[11]Giuseppe Gabrieli, "Federico Cesi Lincei," Nuova antologia, series 7, CCLXXII (luglio-agosto, 1930), 359.

CHAPTER II

THE ACCADEMIA DEI LINCEI: ACTIVITIES FROM 1603 TO 1609

The history of the Accademia dei Lincei is inextricably tied to the personality and the personal life of its founder, Federico Cesi, Marchese of Monticelli, Duke of Acquasparta, Prince of Sant'Angelo and San Polo.[1] Cesi was born in the Cesi family palace on the Via Maschera d'Oro in Rome on February 26, 1585.[2] His family was of ancient and noble

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[1]For the historiography of the Lincei and for a list of published sources, see the following: Giuseppe Gabrieli, "Gli storiografi della prima Accademia Lincea," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, V (1929), 58-95; Giuseppe Gabrieli, "Indice analitico e topografico dei materiali ancora esistenti per la storia della prima Accademia Lincea," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, VI (1930), 195-230; Giuseppe Gabrieli, "Indice cronologico e topografico del carteggio Linceo preliminaremente redatto per la disegnata pubblicazione della corrispondenza epistolae scientifica ed accademica, fra i primi Lincei," Atti della Reale Accademia Nazionale dei Lincei, Memorie della classe di scienze morali, storiche e filologiche, series 6, III (1930), 1-84; Giuseppe Gabrieli, "La parte già nota e quella già pubblicata del carteggio Linceo," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, IV (1928), 133-41; Giuseppe Gabrieli, "Per una storia critica e documentaria della prima Accademia Lincea. Idea e disegno preliminare," Archivio di storia della scienze, VI (1925), 153-58; Giuseppe Gabrieli, "Ricerche e carte di A. Statuti sulla storia della prima Accademia Lincea," Memorie Pontificia Accademia delle Scienze, i nuovi Lincei, VIII (1925), 401-54.

[2]Giuseppe Gabrieli, "La data precisa della nascita di Federico Cesi: 26 Febraio 1585," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, VIII (1932), 3-8.

lineage, having produced a number of cardinals, prelates, and according to Giambattista della Porta, one Pope, Sylvester II,[3] but at the time of Cesi's birth the family possessed only a meager fortune. His father, after whom he was named, was an uncontrolled spendthrift. His mother was a deeply pious woman who lived the life of a model Christian, and her influence probably shaped the strongly religious nature of her son[4] although that influence was to work to his detriment at a later time.

Little is known of Cesi's youth or his education. He was privately educated by a tutor named Don Alessandro and also by an Arab who taught him the rudiments of the Arabic language.[5] There is no record that he ever attended a university. Much of his inclination toward archeology was due to the fact that he had access to the libraries and

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[3]Della Porta wrote a history of the Cesi family in which he makes this assertion. See Giuseppe Gabrieli, "Bibliografia Lincea I: Giambattista della Porta. Notizia bibliografica dei suoi mss. e libri edizioni ecc. con documenti inediti," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, VIII (1932), 270. Stelluti repeats this bit of information. See [Aulus Persius Flaccus], Persio tradotto in verso sciolto e dichiarato da Francesco Stelluti Accad. Linceo da Fabriano all'Illmo et R.^mo Sig.^r il Sig. Cardinale Barberino (Rome: Appresso Giacomo Mascardi, 1630), p. 192. However, Sylvester II (999-1003), whose family name was Gerbert, was born in France, and the Biographie universelle makes no mention of any connection with the Cesi family. See Biographie universelle, ancienne et moderne, ou histoire, par ordre alphabétique, de la vie publique et privée de tous les hommes qui se sont fait remarquer par leurs écrits, leurs actions, leurs talents, leurs vertus ou leurs crimes (52 vols.; Paris: Vols. I-X, Michaud Frères, 1811-1813; Vols. XI-LII, L. G. Michaud, 1814-1828), XLIV, 323-24. (Hereinafter referred to as Biographie universelle.)

[4]Giuseppe Gabrieli, "Federico Cesi Lincei," Nuova antologia, series 7, CCLXXII (luglio-agosto, 1930), 353.

[5]D. Baldassare Odescalchi, Memorie istorico critiche dell'Accademia de'Lincei e del Principe Federico Cesi Secondo Duca d'Acquasparta fondatore e principe della medesima raccolte e scritta da D. Baldassare Odescalchi Duca di Ceri (Rome: Nella Stamperia di Luigi Perego Salvioni, 1806), p. 9; Gabrieli, "Cesi," p. 353.

the extensive collection of art and antique objects owned by his great-uncle, Cardinal Paolo Cesi, in Rome.[6]

It was in 1603, when Cesi was eighteen, that he first met a young Dutchman with an imperious temper and a reputation for learning, whose friendship was to have a great impact on his life. Johannes Heck (Giovanni Ecchio, 1577-1620?) was a native of Deventer in Holland. He had taken a degree in medicine at the Italian university of Perugia in 1601, and in the following year he set up a practice in the Italian town of Scandriglia. A real or supposed slight from a pharmacist in the town provoked Ecchio into a duel with the man, who died as a result. Ecchio then fled to Rome but was arrested there and imprisoned for murder.[7] Word of his reputation as a learned man came to the attention of Cesi, who went to the prison, befriended him, helped him prove that the killing had been in self defense, and took him into the Cesi household as his friend and companion.[8]

Another close friend of Cesi who spent much time at the palace on the Via Maschera d'Oro was Francesco Stelluti (1577-1651), a young mathematician from Fabriano.[9] Ecchio and Stelluti were both learned men, and in their company, Cesi's studiousness and love of learning were surely encouraged.

Ecchio's chief interest lay in the study of Platonic philosophy and astronomy, and in the course of the discussions that he carried on

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[6]Odescalchi, Memorie istorico, p. 7; [Persius], Persio, p. 186.

[7]C. E. Daniëls, "Heck, Johannes H.," Biographisches Lexikon der Hervorragenden Aertze aller Zeiten und Völker, Dritter Band Haab-Lindsley (Vienna and Leipzig: Urban & Schwarzenberg, 1886), p. 99.

[8]Gabrieli, "Cesi," p. 355. [9]Ibid.

with Stelluti and Cesi he proposed the building of a "planisfero," or astrolabe, an instrument that would reduce the study of the constellations and planets to a single plane.[10] The need of a skilled engineer to build such an instrument led Cesi to invite to his home his kinsman, Anastasio de Filiis of Terni (1577-1608), a young man skilled in the arts of mechanics.[11] He came to live with Cesi in Rome and became the fourth participant in the discussions that went on at the Cesi palace.[12]

The young marchese, a precocious boy just barely eighteen, and his three friends, all of whom were twenty-six, were deeply interested in science and philosophy. With youthful idealism and religious zeal Cesi undertook the project of creating a society for the study of science and the humanities. He was supported by his three companions, and on August 17, 1603, the Accademia dei Lincei (Academy of the Lynx-Eyed) was officially founded in Rome.[13] The name of the lynx was taken because of the legendary keenness of sight for which that animal was

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[10]Giuseppe Gabrieli, "Alla ricerca de alcuni cimelii Lincei (1. Astrolabio Lincei. 2. Il ms. originale del "Tesoro Messicano," 3. La grand opera sui funghi. 4. L'opera del Terrenzio sulla storia naturale della Cina," Archivio di storia della scienze, IX (1928), 225.

[11]Giuseppe Gabrieli, "Il carteggio scientifico ed accademico tra i primi Lincei. Per la restituzione e la publicazione del carteggio fra i primi Lincei," Atti della Reale Accademia Nazionale dei Lincei anno CCCXXII, 1925. Serie sesta, memorie della classe di scienze morali, storiche e filologiche, series 6, I (1925), 149.

[12]Gabrieli, "Cesi," p. 355.

[13]Giuseppe Gabrieli, "Verbali delle adunanze e cronaca della prima Accademia Lincea (1603-1630)," Atti della Reale Accademia Nazionale dei Lincei anno CCCXXIII, 1926. Serie sesta, memorie della classe di scienze morali, storiche e filologiche, series 6, II (1926), 469.

noted. It was the intent of the four Lincei to see nature with the clear and penetrating eyes of the lynx rather than to observe nature according to prejudged or settled theories.[14] The symbol adopted by the academicians was a lynx with upturned eyes tearing a Cerberus with its claws, a device which symbolized the struggle between knowledge and ignorance.[15]

The Accademia dei Lincei in its early years bore little resemblance to the organization that was to play so important a part in advancing the cause of science in the seventeenth century. As it emerged from the fertile mind of Cesi, it bore the marks of that idealism and zeal which impelled him to its founding. The bare outlines of the organization existed in 1603. Cesi envisioned a society similar to a monastic order whose members would be devoted to secular rather than religious learning. He saw a network of houses set up in all the major cities of the world, their inhabitants living in monastic seclusion, studying together and communicating the results of their studies to all the members of the group. Each house was to be self-contained, having its own library, laboratories, and botanical gardens.[16]

The group had all the earmarks of a secret society. Each member adopted a device and a Latin name appropriate to his role in the organization. Cesi's device was an eagle flying in the vault of the

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[14]Fabio Colonna, Fabi Columnae Lyncei ΦΥΤΟΒΑΣΑΝΟΣ cui accessit vita Fabi et Lynceorum notitia adnotationesque in ΦΥΤΟΒΑΣΑΝΟΝ Iano Planco Ariminensi Auctore et in Senensi academia anatomes publico professore (Florence: I. P. Aere, & Typis Petri Caietani Viviani, 1744), p. xiv.

[15]Giuseppe Gabrieli, "Emblematica Lincea," Rendiconti della Reale Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, X (1934), 275.

[16]Gabrieli, "Cesi," p. 356.

sky and clutching in its claws the globe of the world. The inscription on it was utrumque (on either side), and the name he adopted was Coelivagus (sky wanderer). Ecchio's device was the sun illuminating the half moon, both of which were set inside a triangle. His motto was A patre luminum (light from the father), and his name was Illuminatus (the enlightened one), a subtle pun perhaps on his interest in astronomy as well as on the fact that he was the most learned of the four. Stelluti's symbol was the planet Saturn, the one slowest in its revolution about the sun, and his motto was quo serius eo citius (because he is more serious than he is quick). He took the name Tardigradus (by slow steps) because he was more inclined to deliberate action than to quick judgments. De Filiis used as his symbol the earth in a position of eclipse between the moon and the sun. His motto was spero lucem (I hope for light), and his name was Eclipsatus (the obscured one) because his knowledge was eclipsed by that of the others and he hoped to be instructed by them.[17]

Each member was to teach the science in which he was most skilled. Ecchio taught Platonic philosophy and astronomy and lectured on those things related to medicine. Cesi taught philosophy and provided for the physical needs of the academy. Stelluti proposed machines and instruments that would be of interest and also taught geometry, explaining the Elements of Euclid. He observed the stars to test the theories of Ecchio and to support them with physical facts. De Filiis taught history and kept the journal of the academy.[18] Lessons were to be

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[17]Gabrieli, "Il carteggio scientifico," p. 149.

[18]Gabrieli, "Verbali," p. 472.

given on three days of the week, Sunday, Tuesday, and Thursday. On each of these days five lessons would be given, the first two by Ecchio, the third by Stelluti, the fourth by Cesi, and the fifth by de Filiis. The other days of the week would be devoted to experiments related to these lessons. This plan of study was laid out at the first "consilium Lynceorum," which took place on October 12, 1603.[19] The first disputation had already taken place on August 19 between Cesi and Ecchio concerning Platonic philosophy.[20]

With the regimen established, the academy began to function. Cesi fulfilled his task of providing for the physical needs of the group by planting a botanical garden at the palace, setting up a library, and beginning a collection of instruments for a laboratory.[21] After his death a number of astrolabes, globes, and compasses, as well as other instruments, were found among his possessions.[22] On October 12, 1603, in the "Gesta Lynceorum," a record of the activities of the academy kept by Ecchio,[23] mention is made of a "planisferium" or astrolabe, which had been proposed by Ecchio and which was completed by that date.[24]

Having thus had a period of preparation, the Lincei began their formal studies on October 15, 1603. As his lecture, Ecchio sought to

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[19]Ibid., p. 471.

[20]Ibid., p. 472.

[21]T[abarau]d and D[u] P[etit-Thouar]s, "Cesi, Federico," Biographie universelle, VII, 583.

[22]Gabrieli, "Alla ricerca," pp. 226-27.

[23]Giuseppe Gabrieli, "Gli scritti inediti di G. Ecchio Linceo (1577-1620?)," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, VI (1930), 366.

[24]Gabrieli, "Verbali," p. 474.

show the connection that could be made between the real world and the intellect through abstraction. He also proposed a medicine to quicken the senses and the vital spirits. Stelluti taught the principles of geometry and demonstrated a ladder that could be lengthened and shortened. Cesi proposed to show that plants were animals that had vegetated. De Filiis gave the history of the world before the Flood and proposed the construction of certain lamps and a study of their effects.[25]

Ecchio began a correspondence with several scientists in Europe. These letters constituted the initial attempt of the Lincei to make contact with other men whose interests might be similar to their own. To Kaspar Bauhin (1560-1624), the Swiss botanist, he wrote:

> Jam dudum est, quod nullas E. T. vidi litteras, quas in dies sperabam, saltem responsorias in meas; easque iterum sollicitant hae Illmae Lynceae Academiae epistolae, quas ipsi ut ad te mitterem imperarunt co-academici, in liberalibus omnem navantes operam scientiis, quorum singuli inter nos sunt studiosissimi professores, qui alternis animum excolunt lectionibus.[26]

To Matthias de l'Obel (1538-1616), an Anglicized Flemish botanist, he wrote:

> Inclusam ad te mittit Lyncea Illma Academia epistolam, optatque

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[25]Ibid., pp. 474-75; Odescalchi, Memorie istorico, pp. 17-19.

[26]Giuseppe Gabrieli, "Il carteggio Linceo della vecchia accademici di Federico Cesi (1603-1630). Parte prima (anni 1603-1609). Parte seconda (anni 1610-1624). Parte III ed ultima (anni 1625-1630). Indici," Atti della Reale Accademia Nazionale dei Lincei, Memorie della classe di scienze morali, storiche e filologiche, series 6, VII, fasc. I, II, III (1938-1942), p. 27. Letter from Ecchio in Rome to Bauhin in Basel (?), February 17, 1604. "It is now some time, and I have seen none of your letters which I had hoped for at least in response to mine; and again the letters of the most illustrious Accademia dei Lincei, which my co-academicians, who accomplish all their work with ingenious skill, have ordered me to send to you, solicit [your reply]. Among the academicians there are certain most learned professors who cultivate the mind by reading one after the other."

> responsorias, et tuae etiam famae exactissimam agnitionem per proprias litteras; . . .[27]

To Charles de Lècluse (1526-1609), a French botanist, he wrote:

> Imperantibus studiosissimis Academicis has ad te mitto litteras, vir excellme, optans ut per eum qui fert tabellarium satisfacias petitionibus horum doctissimorum virorum; ipsasque si mihi remiseris epistolas, quam diligentissime et quam citissime exhibebo.[28]

Of the men to whom Ecchio wrote, there is record of only one reply, that from Adone Campello (c. 1537- 14), an Italian scientist to whom Ecchio had written in March of 1604 and from whom the Lincei received a letter describing the properties and reactions of metals and metal calxes.[29] However, the Accademia dei Lincei was beginning to function in the manner that Cesi had intended, and its members were firmly committed to the precepts of learning and experimentation.

The idyllic life that Cesi had envisioned for his academicians was never fully realized. The close friendship of the four young men, their almost constant companionship, and the seclusion in which they carried out their studies aroused the suspicion of Cesi's family, particularly that of his mother, who feared the influence of a foreigner, which Ecchio was, and a heretic, which she suspected Ecchio of being,

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[27] Ibid., p. 29. Letter from Ecchio to l'Obel in London (?), February 17, 1604. "Enclosed the Accademia dei Lincei sends to you a letter and an exact recognition of your reputation through special letters, and it desires replies."

[28] Ibid., p. 29. Letter from Ecchio to Decluse in Leiden (?), February 17, 1604. "By order of the most studious academicians, I send you these letters, most excellent sir, hoping that by what you might write you will satisfy the petitions of these most learned men, and I will show the letters which you send to me very quickly and very diligently."

[29] Ibid., p. 29. Letter from Adone Campello in Spoleto to the Lincei, April 10, 1604.

on her son. Cesi's father, a man with no love of learning and a penchant for dissolute living, whose character seems to have been the polar opposite of his son's, was also highly suspicious of the activities of the Lincei. The hostility of his parents and his father's courtiers took the form of constant surveillance, harassment, and accusations of heresy and witchcraft.[30] Ecchio was formally charged with heresy before the Roman Curia in 1604.[31]

Nevertheless, the Lincei remained steadfast in their studies in the face of their persecuters. At first Ecchio, Stelluti and de Filiis wavered when they saw the harassment to which Cesi was subjected by his family, and according to Odescalchi, they urged him to give up his plans, but he refused and continued in his daily application to his studies.[32] His example was followed by his friends, although they deemed it necessary to evolve a code, based largely on planetary symbols, in which they communicated in writing.[33] Cesi and Ecchio also adopted Arabic forms of their academic names, Cesi calling himself Sammavio and Ecchio, Monuro.[34]

On December 24, 1603, their constancy in the face of persecution seemed to have won for the young men if not a durable peace at least a truce with their enemies, and they erected over the room where they met a flag bearing a painting of a lynx as a symbol of their victory and

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[30]Gabrieli, "Cesi," p. 356.

[31]Gabrieli, "Gli scritti inediti.... Ecchio," p. 396.

[32]Odescalchi, Memorie istorico, p. 21.

[33]Gabrieli, "Il carteggio scientifico," p. 151; Odescalchi, Memorie istorico, p. 17.

[34]Gabrieli, "Carteggio Linceo," p. 39.

their determination to remain united.[35] On Christmas day, his three friends proclaimed Cesi the "principe" of the academy. Cesi, clad in a full length purple robe, showed his friends a pendant that he was wearing on a chain around his neck. The pendant bore the likeness of a lynx, and he gave similar pendants to Ecchio, Stelluti and de Filiis as "nonsolo un segno di virtù e di fratellanza, ma un premio delle future e delle presenti fatiche."[36] With this gesture Cesi solemnly reaffirmed the existence of the Accademia dei Lincei. St. John the Baptist was taken as the patron of the organization.[37]

This burst of religious fervor, which was indeed characteristic of Cesi, gave fresh cause for suspicion to the enemies of the group. Accusations of heresy were leveled against Ecchio, and thus the activities of the group were brought to the attention of the supreme tribunal of the Roman Curia.[38]

Cesi left Rome in January of 1604 apparently because of the difficulties which the academy faced. Ecchio wrote to him from Rome on January 13 expressing dismay at his absence, and on January 14 he wrote again to Cesi, who was by this time in Acquasparta.[39] Cesi's departure from Rome must have been a secret one because Ecchio commented on his leaving "senza pur farne un minimo motto ne ad Sig. Duca ne ad

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[35]Odescalchi, Memorie istorico, p. 24.

[36]Ibid., p. 29. "a sign not only of virtue and brotherhood, but an indication of present and future efforts."

[37]Gabrieli, "Verbali," p. 475.

[38]Odescalchi, Memorie istorico, p. 34.

[39]Gabrieli, "Carteggio Linceo," pp. 25-27.

altre di casa."[40] His letter was a plea to Cesi to return to Rome to still the accusations of the Duke, Cesi's father, that his flight was a result of Ecchio's influence.

The continued harassment forced the Lincei to disband at last. Ecchio was constrained to leave the city under guard, and he was taken as far as Turin on a journey that eventually returned him to his native land.[41] De Filiis, Stelluti, and Cesi all left Rome. Thus the Accademia dei Lincei, which had begun on such an idealistic plane and with such great hopes in the summer of 1603, succumbed to the pressures of a hostile and distrusting environment in the spring of 1604.

The members of the Lincei continued on their separate ways. Stelluti went first to Fabriano after he left Rome and then continued on to Parma.[42] Cesi wrote to him in Parma on July 17, 1604, giving him news of his fellow Lincei and stating his own desire to maintain the ideals of the Lincei.[43] De Filiis returned to Terni for a time and finally went to Naples to study mechanics under Giambattista Della Porta (1535-1615), a leading scientist of the time.[44]

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[40]Ibid., p. 26. "without giving the slightest word either to the Duke [his father] or to others in the house."

[41]Giuseppe Gabrieli, "Qualche altra notizi sugli scritti e sulla vita di Giovanni Ecchio Linceo," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, X (1935), 490.

[42]Enciclopedia Italiana di scienze, lettere ed arti pubblicata sotto l'alto patronato di S. M. il re d'Italia (36 vols.; Rome: Istituto della Enciclopedia Italiana fondata da Giovanni Treccani, 1929-1939), XXXII, 692.

[43]Gabrieli, "Carteggio Linceo," pp. 36-37.

[44]Ibid., p. 38; Gabrieli, "Cesi," p. 358.

Between April and June of 1604 Cesi went to Naples, where he became the fast friend of Della Porta, who dedicated his De distillatione to the young marchese.[45] On his return he spent some time as the guest of Cardinal Robert Bellarmine (1542-1621) at his palace at Capua.[46] He went on to Rome, but his stay there was not a happy one. In his letter of July 17, 1604, to Stelluti, he wrote that he spent all his time in his cell, and his masters were his books and the voices of P. Alessandro, his tutor, and L'Arabico, his Arab tutor.[47]

While Cesi was traveling in Italy--to Naples, Capua and Rome--Ecchio was traveling from Milan to Turin, and then through the mountains of Savoy. His intention was to return to his home in Deventer, and from Savoy he went to Lyons and then to Paris, where he met many learned men whom he informed of the existence and the aims of the Lincei. He journeyed thence to Rotterdam and on to Dieppe, on the coast of France, where he hoped to get a boat to Holland. But while there he fell into a quarrel with a group of Protestants, from whom he escaped on a boat which was ultimately swept by a storm onto the coast of England. He wrote from England to his parents, and he was joined there by his brother, who accompanied him on a journey through England, Scotland, and Ireland, during which time he recorded observations of many plants and animals. The two young men returned to London, from there to Newport, England, and on to Holland, where they traveled through Rez,

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[45]Gabrieli, "Carteggio Linceo," p. 41. Dedicatory letter from Della Porta to Cesi dated July 20, 1604.

[46]Odescalchi, Memorie istorico, p. 78.

[47]Gabrieli, "Carteggio Linceo," p. 40. The Arab is not identified by name. Gabrieli speculates that he may have been a Syrian.

Zeeland, Utrecht, and finally to Deventer.[48]

Ecchio took advantage of the respite from his journey to begin putting in order the observations he had collected in the course of his travels. One volume contained descriptions of all the machines he had seen. One volume contained descriptions of fish, and another, descriptions of other animals. Another was about the geography of the places he had seen, and another contained accounts of memorable events then happening in the world. One volume he made up of descriptions of herbs and plants, to which he added small colored drawings. Some of these observations might have formed the basis for a later collaborative work by Cesi and himself, the Icones fungorum.[49] Cesi asked Ecchio at one point in his travels to send him records of his observations and also seeds of plants. A later reference (1628) to Cesi's work on seeds is made by Johannes Faber (1574-1629) in his supplement to the Rerum medicarum.[51] A work by Ecchio, which was never published,

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[48]Odescalchi, Memorie istorico, pp. 75-76; Gabrieli, "Qualche altra notizia," pp. 499-501; Gabrieli, "Carteggio Linceo," p. 44. Cesi wrote to Ecchio on August 12, 1604, acknowledging receipt of two letters from London and Deventer.

[49]Gabrieli, "Alla ricerca," p. 235. The work is no longer extant.

[50]Gabrieli, "Carteggio Linceo," p. 45. Letter from Cesi in Rome to Ecchio in Deventer (?), August 12, 1604.

[51]Francisco Hernandez, Rerum medicarum novae Hispaniae thesaurus seu plantarum animalium mineralium Mexicanorum historia ex Francisci Hernandi novi orbis medici primarii relationibus in ipsa Mexicana urbe et Neap. regni archiatro generali iussu Philippi II Hisp. Indar. regis collecta ac in ordinem digesta a Ioanne Terrentio Lynceo Constantiense Germ.o Phõ. ac medico notis illustrata nunc primum in naturaliũ rerũ studiosor gratia et utilitate studio et impensis Lynceorum. Publici iuris facta Philippo IV magno dicata (Rome: Ex Typographico Iacobi Mascardi, 1628), p. 757.

was sent to the Lincei with a dedicatory letter on August 1, 1605.[52] The title of the work was De vegetabilis, and this might be the record for which Cesi asked. The word vegetabilis in classical Latin refers merely to animating power, but in medieval Latin and presumably in seventeenth century Latin it means vegetables or plants and yet also retains the implication of a vitalizing power,[53] such as might exist in seeds. This meaning might justify Ecchio's use of that term instead of plantis, which refers to a slip or shoot by which a plant is propagated rather than to a seed.

Among Ecchio's other works were a book on butterflies, a book on the illustrious men he had met, a book on antidotes for poisons, and a short book on the plague.[54] Ecchio left Deventer shortly after he finished the book on the plague. His association with known heretics there had earned him the suspicion of the townspeople. Because of this, and also because of the plague then raging in the country, which was worthy of scientific interest but not conducive to health,

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[52]Gabrieli, "Carteggio Linceo," p. 87. Letter from Ecchio in Prague to the Lincei in Rome, August 1, 1605.

[53]Revised Medieval Latin Word-List from British and Irish Sources, Prepared by R. E. Latham (London: Published for the British Academy by the Oxford University Press, 1965), p. 506.

[54]The book on the plague, which was published, is cited by the Bibliotheque Nationale under the name Johannes Heckius. The title of the book is Disputatio unica Doctoris Joannis Heckii equitis Lyncaei Daventriensis. De peste et quare praecipue grassetur tot abhinc annis in Belgio ad Ill^mum Principem Fredericum Caesium Marchionem Montis Celii, & Baronem & Heroa Romanum mecaeratem incytum cum descriptione electuarii Lyncaei, cujus usu author has regiones accedens per Dei gratiam, salvus evasit, & de huius antidoti praecipuis operationibus (Deventer: Excud. J. Cloppenburch, 1605). This work and the others listed above are mentioned by Odescalchi, Memorie istorico, pp. 73, 78. See also Domenico Carutti, Breve storia della Accademia dei Lincei (Rome: Coi Tipi del Salviucci, 1883), pp. 170-76.

he left Deventer and began his travels again.[55] By his own account, between the spring and winter of 1604 he visited ".... in nome dell' Accademia li [prudentissimi uomini] che habbia Francia, Ingelterra, Scotia, Dania, Fiandra, Holandia, Franconia, Alemagna, Bohemia et Moravia, di quali tutti ho datto particolaro rescritto al Principe et alli altri Accademici."[56] He finally settled for a time in Prague, where he lived under the assumed name of Gisberto Tacconi.[57] He wrote to Cesi from Prague on January 24, 1605, discussing a new star which had appeared in the heavens.[58] He had evidently arrived in that city by December of 1604 because on December 19 he wrote to the members of the Lincei from Prague, sending with the letter a copy of his book on the plague.[59] Cesi acknowledged receipt of the book on April 1, 1605.[60] The new star that Ecchio had observed furnished him with the subject matter of another book which was published in 1605. The work, appropriately entitled De nova stella, is the first to appear with the title Linceo appended to the author's name.[61]

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[55]Odescalchi, Memorie istorico, pp. 78-79.

[56]Gabrieli, "Carteggio Linceo," p. 46. Letter from Ecchio in Prague to the Lincei in Rome, December 19, 1604. ". . . in the name of the academy the wisest men who live in France, England, Scotland, Denmark, Flanders, Holland, Franconia, Germany, Bohemia and Moravia, concerning whom I have given written particulars to the Prince and to the other academicians."

[57]Gabrieli, "Carteggio Scientifico," p. 164.

[58]Gabrieli, "Carteggio Linceo," pp. 54-55.

[59]Ibid., p. 46. [60]Ibid., p. 59.

[61]Gabrieli, "Qualche altra notizia," p. 483; Io. Heckii, De nova stella disputatio Io. Heckii I. Lyncaei Daventriensis philosophiae, et medicinae doctoris ad Illustriss. Dominum D. Federicum Caesium Marchionem Monticellorum (Rome: Apud Aloisium Zannettum, 1605).

The letters exchanged by Ecchio and the Lincei indicate that he dedicated several other works (which were never published) to his colleagues. These include volumes two and four, De annulosis or De papillionibus, and the already mentioned volume three, De vegetabilis, of a larger work that he had entitled Fructus itineris ad Septentrionales.[62]

During his stay in Prague Ecchio met Johann Kepler (1571-1630) and the younger Tycho Brahe (1581-1627), the son of the great Danish astronomer, although he did not share his father's interest in astronomy. In addition to his visits to scientists, Ecchio was also fulfilling another service for the Accademia. Cesi was evidently furnishing him with money so that he could buy books for the library of the Lincei.[63]

The correspondence between Cesi and Ecchio while the latter was in Prague throws an interesting sidelight on the nature of Lyncealita, a term that Cesi used to describe the zeal and devotion to learning that should characterize a true Linceo. It seems that the circle of Ecchio's acquaintances was not limited solely to men of scientific inclination. He evidently fell in love with a woman who remains unidentified, and he expressed to Cesi a desire to marry. Cesi greeted the suggestion with a certain amount of dismay, which he conveyed to Stelluti and de Filiis,[64] and to Ecchio he wrote a letter

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[62]Gabrieli, "Carteggio Linceo," p. 88. Letter from Ecchio in Prague to the Lincei in Rome, August 1, 1605, and p. 90, letter from Ecchio in Parma to the Lincei. Cf. supra concerning De vegetabilis.

[63]Ibid., p. 86. Letter from Cesi in Rome to Ecchio in Prague, July 2, 1605.

[64]Ibid., p. 64.

firmly reminding him of the principles of Lyncealita.[65]

The hardships that Ecchio endured appear to have had an unsettling effect on an already unstable personality. Although Ecchio's letters are not available for the time that he spent on the first part of his journey, they seem to have been bitter and accusing. Cesi's letters to him are written in a placating manner, assuring him that the other Lincei have not forgotten him and are writing to him. In his letter of August 12, 1604, to Ecchio in Deventer, Cesi says, "Binas a te, easque mihi supra modum charissimas, recepi epististolas Londinensem et Daventriensem . . . utrisque responsum dedi litteris, unde miror quod me damnas negligentiam. . . ."[66]

While Ecchio was writing about the plague and traveling throughout Europe, Cesi was pursuing his own interests. During a short stay in Monticello in the early part of 1605, he excavated the tomb of Zenobia, the queen of ancient Palmyra, who had been captured by the emperor Aurelian (270-275) and brought to Rome, where she died. Her tomb was near Monticello, which was part of the Cesi family's holdings, and Cesi wrote to Ecchio describing the marble pillars and the gold and silver ornaments he had found in the grave.[67]

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[65] Ibid., p. 85. Letter from Cesi in Rome to Ecchio in Prague, July 2, 1605.

[66] Ibid., p. 44. "I have received two letters from you, and those most pleasing to me in every way, from London and Deventer, and I have replied to both letters, whence I wonder that you condemn me for negligence. . . ." Cf. also letters from Cesi to Ecchio in Prague, December 19, 1604 (pp. 46-47), March 19, 1605 (pp. 55-57), April 30, 1605 (p. 75), and May 15, 1605 (p. 77).

[67] Ibid., p. 58. Letter from Cesi in Rome to Ecchio in Prague, April 1, 1605.

While Ecchio was in Europe and Cesi was spending his time at Monticello and Rome, Stelluti removed himself secretly from Fabriano to Parma where he hoped to live in peace. He sought the protection of the Duke of Parma and was taken in charge by the Farnese family. In Parma he continued his studies of mathematics and philosophy.[68] De Filiis remained in Terni for a time before going on to Naples to study under Della Porta.[69]

During the period from 1604 to 1609, the activities of the Accademia dei Lincei were mainly those of Cesi and Ecchio, and the means of communication among the members were the letters that were exchanged among them.[70] Note has already been made of most of the letters exchanged by Cesi and Ecchio. From this correspondence, and from the fact that Cesi sent Ecchio money for living expenses and for buying books for the Lincei library, it would seem that Ecchio was traveling as a kind of official envoy of the Lincei. He speaks in his letter of December 19, 1604, of visiting learned men ".... in nome dell'Accademia...."[71] The influence of Cesi was strong in his long distance relationship with Ecchio, and it was also strong in his correspondence with Stelluti and de Filiis. The most important activity conducted by Cesi, Stelluti and de Filiis after 1604 was a council called by Cesi and held in Rome on April 10, 1605. Cesi's opening

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[68]Odescalchi, Memorie istorico, p. 80.

[69]Gabrieli, "Carteggio Linceo," p. 351.

[70]For the period from July 17, 1604, to March 10, 1607, Gabrieli prints fifteen letters from Cesi to Stelluti and Ecchio, and seven letters received by Cesi. Ibid., pp. 36-107.

statement at the meeting was as follows:

> Considerando il nostro incominciato ordine, per esser ancori nella prima infantia, haver bisogno di fermezza stabilità et apoggio, et per la copia delli persecutori inimici della virtu esserli necessario la concordia costanza, difesa et cautela, et per sequir li proprij essercitij la comodità unanimità unione et provedimento di tutte le cose necessarie si al animo come al corpo et a tutte queste cose l'inviolable osservatione dette costitutioni;...[72]

It was in this meeting that Cesi first mentioned the new constitution, the Lynceographia, to Stelluti and de Filiis.

> .... al stabilimento perpetuo del nostro ordine, parmi niuna cosa sia più necessaria et efficace che la pubblicazione del Linceografo et puntuale osservatione di quello, poichè in esso si contengono tutte le leggi costitutioni et statuti da noi già fatti, et altre nuove utilissime senza peso, in esso è il modo di vivere de'Lyncaei et tutte le loro attioni governo e cautele, et quanto sia necessario per augmento et mantenimento della Lyncaelita....[73]

At the council note was also made of the activities of the members. De Filiis, in Terni, seemed to be having some trouble with his Lyncealita because he had trouble with his Latin, being unable to read it well. Stelluti was in Parma, carrying on the practices "de buon Lyncaeo," Ecchio was in Prague, "seque ferventissimamente le esercitii Lyncaei," the practices mentioned including those of buying books for the academy,

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[72] Ibid., p. 60. Letter (or report) from Cesi to Stelluti and de Filiis, Rome, April 10, 1605. "Considering our newly begun order, which is still in its infancy, there is need of stability and support, and owing to the number of enemies of virtue, there must be constant concord, defence, and caution, and in order to follow the proper exercises, comfort, unanimity, union, and provision for all things necessary for the spirit as well as for the body, and for all these things, inviolable observation of the constitution. . . ."

[73] Ibid., p. 65. ". . . for the perpetual stability of our order, nothing is more necessary and efficacious than the issuing of the Linceografo and its punctual observance, since in it are contained all the laws and regulations already made by us and other new, most useful things without burden, and in it is the way that the Lincei should live and the guidance and precautions of all their actions and more that is necessary for the augmentation and maintenance of Lyncealita."

and Cesi was in Rome, where he "seque i suoi studi Lyncealmente al solito."[74]

Various business pertaining to the Accademia was transacted at this meeting. Cesi proposed a list of intentions of both a general and a particular nature concerning the actions of the Lincei. Among the general intentions was that concerning how the members should be reunited and the nature of their future meetings. Among the particular intentions was the question of whether Ecchio should be sent on another journey, this time to Lithuania to visit learned men in that country.[75] It was also at this meeting that the problem of Ecchio's desire to marry was discussed. Stelluti and de Filiis recorded their reactions to Cesi's list of intentions, agreeing, for instance, to the proposed trip to Lithuania but expressing disapproval of Ecchio's proposed marriage.[76]

About a month after this meeting, and perhaps because of the decisions reached there, the Lincei issued a decree to Ecchio that he should go to Naples so that "potremo per benefitio della vicinanza sequir li nostri esercitii in parte...."[77] The intent, it seems, was for the members to adjourn to Naples where they might have greater security from their enemies in Rome.[78] There is no evidence, however, that the intention ever became fact. On August 13, 1605, Cesi wrote to

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[74] Ibid., p. 61.

[75] Ibid., pp. 63, 66-67.

[76] Ibid., pp. 68-70.

[77] Ibid., p. 78. ". . . we will be able by the advantage of proximity to follow our practices in that region. . . ."

[78] Ibid.

Ecchio to make arrangements for his journey to Italy and to ask about books for the purchase of which he had sent money and which he wanted Ecchio to send to him. He also asked him to write as soon as he had begun his journey to Italy.[79]

Ecchio evidently left Prague sometime after August of 1605. His last letter from Prague, dedicating to the Lincei his De annulosis, is dated August 1, 1605. October of the same year found him in Parma, from which he wrote to the Lincei on October 1 dedicating to them his observations of butterflies.[80] On November 1 he was in Spoleto,[81] and by March of 1606 he had returned to Rome.[82]

Upon his return to Rome, Ecchio continued his role as a kind of official representative of the Lincei. He began writing to some of the men he had met during his travels. These included Giovanni Robin (1579-1662), a French botanist,[83] Girolamo Mercuriale (1530-1606), an Italian physician and humanist,[84] and Johannes Kepler, the famous astronomer whom he had met in Prague.[85] In his letter to Kepler, Ecchio closed with the phrase "salve et vale, valere te iubent Lyncei," but despite this salutation which has led some to believe that Kepler became a Linceo, Gabrieli asserts that he never did so.[86]

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[79] Ibid., p. 89.

[80] Ibid., pp. 87, 90.

[81] Ibid., p. 92.

[82] Ibid., p. 97.

[83] Ibid., p. 100. Letter to Robin in Paris, April 1, 1606.

[84] Ibid. Letter to Mercuriale in Pisa, April 1, 1606.

[85] Ibid., p. 99. Letter to Kepler in Prague, April 1, 1606.

[86] Giuseppe Gabrieli, "Per la storia della prima Romana Accademia dei Lincei," Isis, XXIV (1935), 87.

Two particularly interesting letters were written by Ecchio, and although the recipient is not indicated, Gabrieli assumes that they were probably sent to Lècluse, with whom Ecchio had corresponded in 1604. The letters contain descriptions of fungi. In the first, for example, Ecchio mentions "Alter fungus rubens omnino sanguinis instar sed horridus copiose visitur in Herecynia silva, ubi ego eum reperi magnitudine varia. . . ."[87] Ecchio's letter of April 8, 1606, again assumed to be to Lècluse, contains more descriptions of fungi, and it might be possible that these observations formed a part of the previously mentioned Icones fungorum.[88]

Ecchio remained in Rome for less than a year after his return. His last letter from Rome is dated April 8, 1606.[89] When he left the city is not certain, but he was in Narni and Acquasparta with Cesi in 1606, probably in November and December of that year.[90] There is a long silence, or perhaps simply no extant letters, from Ecchio until June 2, 1608, when he wrote to Stelluti from Madrid, where he was practicing medicine and pursuing his studies of natural science. He informed Stelluti that "colligo rerum naturalium musaeum,"[91] and he mentioned also going to see the "Bibliothecam Regiam in Escuriali, ubi

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[87]Gabrieli, "Carteggio Linceo," pp. 97-98. Letter from Ecchio to Lècluse (?) in Leiden (?), March 19, 1606. "Other fungus, red like blood but very hairy, is seen in the Hercynian forest [Germany], where I have found it in great variety."

[88]Ibid., p. 102. Cf. p. 19.

[89]Ibid., p. 101.

[90]Ibid., p. 107.

[91]Ibid., p. 110. "I collect a museum of natural things."

siunt Regem omnes Indicas plantas glutine affixas servare."[92]

The Accademia dei Lincei, although its members were dispersed, was certainly not defunct after 1604. The initial opposition, with its accompanying flurry of activity, died down, and as early as 1605 Cesi could write to Ecchio, "Meco è l'Ecclissato, et insieme andiamo quasi di continuo a spasso in carozza per Rome, et facciamo i nostri consegli dove ci pare, senz'alcuna obietione...."[93] And in 1606 he could spend two months (November and December) with Ecchio in Narni, pursuing "lincei esercitij"[94] and then on to Acquasparta where he, Ecchio and de Filiis continued their activities "con ogni quiete et, quello che è più, sodisfatione del sig. Padre."[95]

It was to Cesi and Ecchio that the Accademia dei Lincei owed its existence during the years 1604 to 1609. Cesi, by means of his many letters to Stelluti, de Filiis, and Ecchio, was the link which held the members together. It was he who supported Ecchio's travels to a great extent, he who sent money to Ecchio so that he could buy books, and he who arranged for meetings of the members such as the council in Rome on April 10, 1605, and the return of Ecchio to Rome

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[92] Ibid., p. 111. "The royal library in the Escurial, where they say the king preserved all Indian plants fixed with glue." Gabrieli attributes to this phrase a description of the work by Francesco Hernandez (1514-1577) which was to become the Rerum medicarum published by the Lincei.

[93] Ibid., p. 50. Letter of August 15, 1605. "L'Ecclissato (de Filiis) is with me, and together we go without stopping in a carriage through Rome, and we hold our councils where we think of it, without any objection. . . ."

[94] Ibid., p. 107. Letter from Cesi to Stelluti in Fabriano, March 10, 1607.

[95] Ibid. "with all quiet and, what is more, with satisfaction to my father.

in 1606. He himself entertained de Filiis in Rome in 1605 and spent time with Ecchio in Narni in 1606. His letters are full of references to the practices of a Linceo and encouragement to his fellows in their exercise of those practices.

Ecchio's contribution to the Lincei during this period of their history was in his role as roving ambassador. During the course of his travels throughout Europe, he met many learned men, to whom he evidently mentioned the Lincei. His correspondence with some of these men, notably l'Obel and Kepler, served as a link between them and the Accademia and served to expand the activities of the group beyond the confines of Rome.

In his activities Ecchio, more than Cesi, Stelluti and de Filiis, gives visible evidence of fulfilling the ideals of Lyncealita. His published works and his manuscripts reveal the wide scope of his observations--plants, fungi, butterflies, the plague, and the new star of 1605. To his name as the author of a book on this last subject he appended the title Linceo, thus identifying himself with the group to all who came into contact with the book.

In the activities of Cesi and Ecchio, then, one finds an example on a limited scale of the characteristics of a scientific society: the encouragement of Ecchio's individual efforts through Cesi's financial support, the attempt to gather scientific information both through Ecchio's observations and his correspondence with other scientists, and the publication of Ecchio's works on the plague and the new star. An example of the coordination of scientific effort is the exchange between Cesi and Ecchio concerning seeds of plants, a subject of research

which occupied them both, Cesi in his later microscopical studies, Ecchio perhaps in the De vegetabilis, and ultimately in their joint Icones fungorum.

Cesi dreamed of an organization that would promote experimental and observational science, and the lessons and experiments of the Lincei in the period 1603-1604, before their disbanding, served this purpose, which Ornstein cites as the keynote of the motives of any scientific society. Thus, from its founding the Accademia dei Lincei showed many of the characteristics of a scientific society. By 1610 it was possible to resume the activities of the organization. But of the original members, Ecchio had left Rome for the second time in 1606, and de Filiis had died in Naples in 1608.[96] To Stelluti, who returned to Rome in 1608,[97] or perhaps in 1609[98] and to Cesi fell the task of building the Accademia into the kind of organization that Cesi had envisioned and one which would perform on a larger scale those activities which had characterized it during the period from 1603 to 1609.

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[96]Gabrieli, "Cesi," p. 358.

[97]Gabrieli, "Carteggio Linceo," p. 109.

[98]Enciclopedia Italiana, XXXII, 692.

CHAPTER III

ORGANIZATION, MEMBERSHIP AND ACTIVITIES OF THE ACCADEMIA DEI LINCEI: 1610-1630

During the trying period of 1604 and 1605, when persecution still plagued the members of the Lincei and Cesi spent as much of his time as possible away from Rome, he formulated the outlines of the organization more clearly in his mind, and the enforced separation from his friends gave him leisure time to devote to the business of the academy, despite his father's wishes. From this period emerged the constitution of the Accademia dei Lincei, the work which Cesi titled Linceografo and which he mentioned in his letter of April 10, 1605, to Stelluti and de Filiis.[1] It was published in shortened form in 1624 as Praescriptiones under the name of Johannes Faber (1574-1629), who was then secretary of the group and who had edited the work.[2]

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[1]Giuseppe Gabrieli, "Il carteggio Linceo della vecchia Accademici di Federico Cesi (1603-1630). Parte prima (anni 1603-1609). Parte seconda (anni 1610-1624). Parte III ed ultima (anni 1625-1630). Indici," Atti della Reale Accademia Nazionale dei Lincei, Memorie della classe di scienze morali, storiche e filologiche, series 6, VII, fasc. I, II, III (1938-1942), 62, 65.

[2]Johannes Faber, Praescriptiones Lynceae Academiae curante Ioan. Fabro Lynceo Bamberg. Simpliciario Pontificio Academiae cancellario, praelo subiectae (Interamnae: In Typographio Thomae Guerrerii, 1624). The text of the Praescriptiones is reprinted in part in Domenico Carutti, Breve storia della Accademia dei Lincei (Rome: Coi Tipi del Salviucci, 1883), pp. 219-95. See also Giuseppe Gabrieli,

The principles laid down in the Linceografo were meant to guide the activities of the organization as a whole, but they also reached the personal lives of the members. Lyncaealita was the term Cesi used to describe the total devotion to learning and to the principles of the Accademia dei Lincei which he expected from those who joined it.[3] Members were sworn to chastity, and they were not to be members of religious orders, as Cesi felt that clerics would not be able to devote themselves with single-minded devotion to the cause of secular knowledge.[4]

Concerning the organization of the group, it was decided at the meeting of April 24, 1613, that there were to be three classes of members. These were the Emeriti, who because of long service and study were worthy of special honor; the Benefattori, who were learned in some exceptional way and who had published works showing a knowledge of science; and the Studiosi, who studied practical science and applied it and who, if they had not produced anything from their studies to benefit the academy, at least gave promise of doing so.[5]

"Bibliografia Lincea IV. Scritti di Giovanni Faber Linceo," Rendiconti della R. Accademia dei Lincei, classe di scienze morali, storiche e filologiche, series 6, IX (1933), 276-334.

[3]Gabrieli, "Carteggio Linceo," p. 60.

[4]D. Baldassare Odescalchi, Memorie istorico critiche dell'Accademia de'Lincei e del Principe Federico Cesi Secondo Duca d'Acquasparta fondatore e principe della medesima raccolte e scritta da D. Baldassare Odescalchi Duca di Ceri (Rome: Nella Stamperia di Luigi Perego Salvioni, 1806), p. 118; Carutti, Breve storia, p. 223.

[5]Odescalchi, Memorie istorico, p. 206; Giuseppe Gabrieli, "Verbali delle adunanze e cronaca della prima Accademia Lincea (1603-1630)," Atti della Reale Accademia Nazionale dei Lincei anno CCXXIII, 1926. Serie sesta, memorie della classe di scienze morali, storiche e filologiche, series 6, II (1926), 489.

Within the framework of the Linceografo the work of the Accademia dei Lincei was to be carried out. But there was a difference between the ideal academy of the Linceografo and that which existed in reality. While humanistic studies were expressly included in the course of study--"non neglectis interim amoeniarum musarum et philologiae ornamentia"[6]--and while many of the members were men of literary talent or inclination, the humanities were the subject of relatively few of the works published by the members of the Lincei. Although the primary emphasis of the academy came to be scientific, several of its members were not scientists.

After the year 1610 the organization began to shape itself along the lines that Cesi had laid out for it. In 1610 Cesi made a trip to Naples to recruit Giambattista Della Porta, whose friendship he had gained in 1604, as a member of the group.[7] Della Porta became a member on July 6, 1610,[8] and he used his new title, Lyncei, in the De aeris which he published in that year and which he dedicated to Cesi.[9]

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[6]Carutti, Breve storia, p. 220.

[7]Giuseppe Gabrieli, "Federico Cesi Lincei," Nuova antologia, series 7, CCLXXII (luglio-agosto, 1930), 358-59.

[8]Gabrieli, "Carteggio Linceo," p. 125.

[9]Ibid., p. 148. The title page of the 1614 edition of the work reads: Io. Baptistae Portae Lyncei Neapolitani de aeris transmutationibus libri IIII. In quo opere diligenter pertractatur de ijs, quae, vel ex aere, vel in aere oriuntur, multiplices opiniones, qua illustrantur, qua refelluntur. Demum variarum causae mutationum aperiuntur (Rome: Apud Iacobum Mascardum, 1614). There is a short poem by Joannis Demisiani, a member of the Lincei, included in the front of the work, and the dedication is to Cesi. For a bibliography of Della Porta's work and a complete account of his connections with the Lincei, see Giuseppe Gabrieli, "Bibliografia Lincea. I. Giambattista Della Porta. Notizia Bibliografica e libri, edizioni ecc. con documenti inediti," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, VIII (1932), 206-77.

A branch of the Lincei was established in Naples later in that same year, and Della Porta became its head, a post which he held until his death in 1615.[10]

In 1611 Galileo Galilei arrived in Rome (March 29) to demonstrate his telescopic discoveries.[11] A report from Rome dated April 16, 1611, noted that

> Thursday [April 14] evening, at Monsignor Malvasia's estate outside the St. Pancratius gate, a high and open place, a banquet was given for him [Galileo] by the Marquis of Monticelli and nephew of Cardinal Cesi, who was accompanied by his kinsman, Paul Monaldesco. In the gathering there were Galileo; a Fleming named Terrentius; Persio, of Cardinal Cesi's retinue; [La]galla, professor at the University here; the Greek, who is Cardinal Gonzaga's mathematician; Piffari, professor at Siena; and as many as eight others. Some of them went out expressly to perform this observation [with a telescope], and even though they stayed until one o'clock in the morning, they still did not reach an agreement in their views.[12]

It was at this banquet that the name telescope was proposed for the instrument which Galileo had built and which to this time he had called an ochiale.[13] Shortly afterward, Johannes Faber sent a report of this banquet, at which he had evidently been a guest, to Marcus Welser (1558-1614) in Augsburg. He said that Gelileo had demonstrated his telescope to the guests by showing them the satellites of Jupiter and the benediction on the gallery of the church of St. John Lateran on which the letters of the inscription of Sixtus V appeared very distinctly although

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[10]Fabio Colonna, Fabi Columnae Lyncei ΦΥΤΟΒΑΣΑΝΟΣ cui accessit vita Fabi et Lynceorum notitia adnotationesque in ΦΥΤΟΒΑΣΑΝΟΝ Iano Planco Ariminensi auctore et in Senensi Academia Anatomes publico professore (Florence: I. P. Aere, & Typis Petri Caietani Viviani, 1744), p. xv.

[11]Gabrieli, "Cesi," p. 359.

[12]Edward Rosen, The Naming of the Telescope (New York: Henry Schuman, 1947), pp. 30-31.

[13]Ibid.

the distance was three miles.[14]

Following this impressive demonstration, Galileo was quickly invited by Cesi to become a member of the Lincei, which he did on April 25, 1611.[15] Because, as Santillana says, the universities of the time were not receptive to new ideas, the Accademia dei Lincei offered a new channel for Galileo's scientific efforts, a mode of communication, and the support of men who, like himself, were men of learning with varied interests in science. Galileo had encountered resistance to new ideas during his time as a professor at Padua. He wrote to his fellow scientist Johann Kepler:

> . . . in Copernici sententiam multis abhinc annis venerim, ac ex tali positione multorum etiam naturalium effectuum causae sint a me adinventae, quae dubio procul per communem hypothesim inexplicabiles sunt. Multas conscripsi et rationes et argumentorum in contrarium eversiones, quas tamen in lucem hucusque proferre non sum ausus, fortuna ipsius Copernici, praeceptoris nostri, perterritus, qui, licet sibi apud aliquos immortalem famam paraverit, apud infinitos tamen (tantus enim est stultorum numerus) ridendus et explodendus prodiit. Auderem profecto meas cogitationes promere, si plures, qualis tu es, exstarent: at cum non sint, huiusmodi negotio supersedebo.[16]

Of the Lincei and Galileo's association with them, Broderick says:

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[14] *Ibid.*

[15] Gabrieli, "Cesi," p. 359.

[16] Galileo Galilei, *Le opere di Galileo Galilei: ristampa della edizione nazionale sotto gli auspicii di Sua Maesta il re d'Italia* (20 vols.; Florence: Tipografia di G. Barbera, 1890-1909), X, 70. Letter from Galileo in Padua to Kepler in Graz, August 4, 1597. ". . . I had come to the conclusions of Copernicus many years ago, and from such a position I had discovered the causes of many natural phenomena which without a doubt cannot be explained by the common hypothesis. I have written many reasons against and refutations of [this hypothesis], but I have not to this time dared to bring them to light since I am frightened by the fate of Copernicus, our teacher, who valued a lasting reputation among men but who appeared ridiculous to countless men (for such is the number of stupid men) and was disapproved of. I will dare, certainly, to bring forth by thoughts if many men such as you appear, but if they should not, I will refrain from this action."

> The importance of the Academy, membership of which Galileo greatly prized, lay in the fact that in those days, as contrasted with our times, universities had become hidebound in conservatism with a vested interest in maintaining the accepted views. The academies, of which several sprang up in imitation of the Lincean or for other purposes, offered an alternative to enterprising men and so promoted the advancement of knowledge.[17]

Of the guests at the banquet in Rome in 1611, at least three followed Galileo's example and became members of the Lincei. The "Fleming Terrentius" was Giovanni Schreck (1576-1630), who became a member on May 3, 1611.[18] He made a major contribution to the Rerum medicarum, which has been mentioned earlier, but in November of the same year he entered the Jesuit order,[19] and, adhering to Cesi's rule concerning members of religious orders, he quit the group to become a missionary. He went to China in 1618, but he did not lose contact with the organization. He wrote several time to Faber asking that Galileo furnish calculations of eclipses,[20] and Faber kept Schreck informed of the work of the Lincei.[21]

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[17]James Brodrick, Robert Bellarmine: Saint and Scholar (London: Burns and Oates, 1961), p. 342.

[18]Giuseppe Gabrieli, "Il carteggio scientifico ed accademico tra i primi Lincei. Per la restituzione e la publicazione del carteggio fra i primi Lincei," Atti della Reale Accademia Nazionale dei Lincei anno CCCXXII, 1925. Serie sesta, memorie della classe di scienze morali, storiche e filologiche, series 6, I (1925), 178.

[19]Galileo, Opere, XI, 236. Letter from Cesi to Galileo, December 3, 1611.

[20]Giuseppe Gabrieli, "Giovanni Schreck Linceo Gesuita e missionario in Cina e le sue lettere dall'Asia," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, XII (1937), 464, 490-513.

[21]Giuseppe Gabrieli, "I Lincei e la Cina. A propositio di oriente ed occidente nella storia della scienze," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, XII (1936), 242-56.

Faber, a native of Bamburg, who also contributed to the Rerum medicarum, became a member on October 29, 1611.[22] He was a physician and the director of the papal botanical gardens.[23] He served the Lincei also as chancellor, a post to which he acceded on April 17, 1612.[24] Giovanni Demisiani (1576-1619), a Greek from Cefalonia who served as mathematician to Cardinal Ferdinand Gonzaga, was elected in 1612 and served as "Censore" or editor of the group.[25] Antonio Persio (1542-1612), who was a member of Cardinal Bartolomeo Cesi's household and who had taken part in many discussions with Cesi and others who had been at the banquet at Malvasia's estate, had expressed an eager desire to become a member of the Lincei, a desire that was cut short by his death on January 22, 1612. Cesi granted his wish by numbering him posthumously among the Lincei,[26] and in 1613 the Lincei published two of Persio's works and an index of these works.[27] Giulio Cesare Lagalla

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[22]Gabrieli, "Carteggio scientifico," p. 179.

[23]Giuseppe Gabrieli, "Vita Romana del 600 nel carteggio inedito di un medico Tedesco in Roma," Atti del I° Congresso Nazionale di Studi Romani, I (Rome: Istituto di Studi Romani, 1929), p. 815.

[24]Gabrieli, "Carteggio scientifico," p. 179.

[25]Giuseppe Gabrieli, "Un Greco di Cefalonia accademico dei primi Lincei: Giovanni Demisiani," Studi Bizantini, I (1924), 125-34; Giuseppe Gabrieli, "Ancora del Linceo Demisianos," Studi Bizantini, II (1927), 313-14.

[26]Giuseppe Gabrieli, "Notizia della vita e degli scritti di Antonio Persio Linceo," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, IX (1933), 486, 477.

[27]Giuseppe Gabrieli, "Partecipazione della Reale Accademia Nazionale dei Lincei alla I[a] Esposizione Nazionale di Storia della Scienze in Firenze," Rendiconti della R. Accademia Nazionale di Lincei, classe di scienze morali, storiche e filologiche, series 6, V (1929),

(1583-1624?), a Neapolitan physician and philosopher, was eager to become a member, but he was known as the leader of the Peripatetic philosophers at Rome, and Cesi wrote to Galileo on January 30, 1614 that a book that Lagalla had written, De phenomenis in orbe lunae (1612), was unsatisfactory in its treatment of celestial movements.[28] Another man who joined the Lincei in 1611, although he had not been a guest at Cesi's banquet for Galileo, was Theofilo Müller (Molitore, 1576-1618), a German who was interested in the study of plants.[29]

The year 1612 marked an influx of new members and a more formal organization than had heretofore existed among the Lincei. Fabio Colonna (1567-1650) of Naples, a distinguished botanist, became a member in January of 1612, and on May 21 of the same year he was made procurator for the Lincei at Naples.[30] Also made a member on January 20, 1612, was Filesio di Costanca Della Porta, grandson of Giambattista Della Porta.[31] On March 3 Stelluti was elected procurator general of the group and was invested with the legal power to make contracts and to act on behalf of the Lincei.[32]

198; Index capitum librorum . . . A. Persio . . . . de ratione recte philosophandi et de natura ignis et caloris (Rome, 1613).

[28]Gabrieli, "Carteggio scientifico," p. 188.

[29]Gabrieli, "Carteggio scientifico," p. 180; Colonna, ΦΥΤΟΒΑΣΑΝΟΣ, p. xxxviii.

[30]Gabrieli, "Carteggio scientifico," p. 181; Gabrieli, "Verbali," p. 482.

[31]Gabrieli, "Carteggio scientifico," p. 180; Gabrieli, "Carteggio Linceo," p. 325.

[32]Gabrieli, "Verbali," p. 481.

A series of monthly meetings of the Lincei also began on April 23, 1612, to carry out the business of the academy, particularly the election of new members. A record of the meetings was kept by Faber.[33] At this first meeting Angelo de Filiis (1583-1624), the brother of Anastasio, became a member and at the meeting of June 7 was made librarian of the group.[34] Luca Valerio (1552-1618) of Naples, a mathematician, was also made a member on June 7.[35] On July 18, 1612, Marcus Welser of Augsburg, Galileo's friend and recipient of the famous sun spot letters, was proposed for membership,[36] as were Giovanni Demisiani, who has been mentioned earlier, and Filippo Salviati (1582-1614), a young Roman nobleman who was also a close friend of Galileo and who later served as the model for Galileo's Copernican in the Dialogue on the Two Chief World Systems.[37] They were formally elected as members on August 3, 1612.[38]

Also elected in 1612 were Niccolo Antonio Stelliola (1564-1623) from Nola, an architect, physicist, and mathematician, and Diego de Urrea Conca (1562-1623), a Neapolitan who had served as an interpreter of Arabic, Turkish, and Persian at the court at Fez, Morocco.[39] He

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[33]Ibid., pp. 493-512.

[34]Ibid., pp. 481-82.

[35]Ibid., p. 482.

[36]Giuseppe Gabrieli, "Marco Welser Linceo Augustano," Rendiconti della R. Accademia dei Lincei, classe di scienze morali, storiche e filologiche, series 6, XIII (1937), 79.

[37]Giuseppe Gabrieli, "Degl'interlocutori nei dialoghi Galileiani, e in particolare di Filippo Salviati Linceo," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, VIII (1932), 108-20.

[38]Gabrieli, "Verbali," p. 483.

[39]Gabrieli, "Carteggio scientifico," pp. 181-82.

demonstrated his command of Arabic by signing his name in the Lincei register in that language, and Cesi evidently hoped to promote the study of oriental knowledge using Urrea Conca's facility in oriental languages. He collected several manuscripts in Arabic, Turkish and Persion,[40] and he proposed a translation of several Arabic works, notably the Conics of Apollonius, into Latin.[41]

At the meeting on July 16, 1613, another member was added. This was Cosimo Ridolfi (1570-1619), a Florentine poet who was coopted at the instance of Galileo and Salviati.[42] In the following year (1614) Vincenzo Mirabella (1570-1641) from Syracuse, an archaeologist, historian, mathematician, musicologist and numismatist, was elected on the recommendation of Della Porta, and Filippo Pandolfini (1575-1655), another Florentine poet, was also elected.[43]

Ecchio also returned to Rome in 1614, and he gave an account of his various voyages and advantures at a meeting of the Lincei on July 26.[44] But by the end of the year the academy had lost two members--Welser had died, and Salviati had died in Barcelona, the victim of a

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[40]Giuseppe Gabrieli, "I primi accademici Lincei e gli studi orientali," Bibliofilia, XXVIII (1926), 99-115.

[41]Gabrieli, "Verbali," p. 491; Gabrieli, "Studi orientali," p. 102.

[42]Gabrieli, "Carteggio scientifico," p. 185; Gabrieli, "Verbali," p. 490; Odescalchi, Memorie istorico, p. 118.

[43]Gabrieli, "Carteggio scientifico," pp. 186-87; Gabrieli, "Verbali," pp. 494-94.

[44]Gabrieli, "Verbali," p. 493; Odescalchi, Memorie istorico, p. 122.

severe case of asthma[46] and thus the membership at the end of 1614 stood at sixteen.

In 1615 the academy lost yet another member when Giambattista della Porta died in Naples on February 4.[47] At a dinner meeting on April 25, Colonna was chosen to succeed as head of the Lincei in Naples.[48]

On January 26, 1616, a number of men were proposed for membership, and on March 24 three of them, Virginio Cesarini (1595-1624), a Roman philosopher and poet, Giovani Ciampoli (1590-1645), a Florentine poet and disciple of Galileo, and Carlo Muti (1591-1622), a Roman physicist, mathematician, and poet and a friend and kinsman of Cesi, were accepted as members of the group.[49] The fact that both Cesarini and Ciampoli were clerics indicates a laxness in the application of the rule of the organization regarding members of religious orders.[50]

The year 1616 also marked the first stirring in that tranquility which had prevailed among the Lincei in their work. It was in that year that Galileo first encountered the open opposition of the Catholic Church to the teaching of the Copernican system of astronomy and was forced to declare that he would not teach the Copernican doctrine as fact. This

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[46]Gabrieli, "Carteggio scientifico, p. 184.

[47]Gabrieli, "Carteggio Linceo," p. 486.

[48]Gabrieli, "Verbali," pp. 494-95.

[49]Gabrieli, "Carteggio scientifico," pp. 191-92; Gabrieli, "Verbali," p. 498; Odescalchi, p. 125.

[50]Giuseppe Gabrieli, "Bibliografia Lincea II: Virginio Cesarini e Giovanni Ciampoli con documenti inediti," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, VIII (1932), 422.

event caused a great deal of concern among the Lincei, and it also sowed the seeds of dissent. At the meeting on March 24, 1616, it was noted that Luca Valerio had condemned the doctrine of the motion of the earth and had agreed with the Church fathers in their actions against Galileo. Valerio submitted his resignation from the group; however, it was decided by the members not to accept the resignation but rather to censure him and to suspend him from the activities of the Lincei.[51] No evidence has yet been found concerning the precise nature of Valerio's statements against Galileo that prompted this action.

At the same meeting the following note was made concerning Ecchio. "Fuit in hoc eodem colloquio D. Joannes Eckius propter defectum naturalem quod mente sit inquietum, donec ad suam sanitatem redeat, consiliis Lynceorum ad tempus scilicet, exclusus."[52] There is no further mention of Ecchio's attending the meetings of the Lincei, and he evidently remained mad until his death.[53]

At the meeting held in May of 1621, the first meeting in over three years, there were seven members in attendance, more than had attended any other meeting.[54] Several men were proposed for membership, and in 1622 three new members were added: Cassiano dal Pozzo (1583-1657),

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[51]Giuseppe Gabrieli, "Luca Valerio Linceo B Un episodo memorabile della vecchia accademia," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, IX (1933), 708-709; Carutti, pp. 29-30.

[52]Carutti, p. 28. "Because of the natural defect that he is of unsound mind, D. Joannes Eckius has at this meeting been excluded from the councils of the Lincei until such time as he returns to health."

[53]Ibid.

[54]Gabrieli, "Verbali," p. 501.

maestro di camera of Francesco Barberini and a student of antiquity and natural science, Giuseppe Neri (1586-1623), from Perugia, a lawyer and mathematician, and in December, Claudio Achillini (1574-1650) of Bologna, whose interests were philosophy, medicine, astronomy, theology, and law.[55]

In 1623 Maffeo Barberini became pope as Urban VIII, and the Lincei wasted little time in strengthening their associations with the new pope by electing his nephew Francesco Barberini (1597-1679) a member on October 1, 1623.[56] Soon after his uncle's election Francesco was himself elevated to the cardinalate. He evidently hoped to demonstrate his interest in the Lincei to Cesi by sending him a pair of lynxes, a male and a female, that had been trapped somewhere near Rome.[57]

Two new members were added at the meeting of March 6, 1625. One was Cesare Marsili (1592-1633), a Bolognese laywer, literary patron and scientific dilettante who had been proposed by Galileo in 1624.[58] The other was Giusto Ricchio (Rycke, Ryoquio, 1587-1627) from Ghent, who in 1614 had been invited by Cesi to come to Italy to accept his hospitality and a stipend in return for his services as eulogist and necrologist to the Lincei. He had been unable to accept the offer at that time because of ill health. In 1616 Faber had proposed his name for membership, but it was not until 1624 that he finally arrived in Rome and was made a

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[55]Odescalchi, p. 141; Gabrieli, "Carteggio scientifico," pp. 197-98.

[56]Gabrieli, "Carteggio scientifico," pp. 198-99.

[57][Persius], p. 37.

[58]Gabrieli, "Carteggio scientifico," p. 200.

member shortly thereafter. He was made the official panegyrist of deceased members and was also appointed librarian since Angelo de Filiis had died in 1624.[59] At the meeting of July 3, 1626, he was formally requested to write the lives of the Lincei.[60]

On January 6, 1629, three new members were proposed for the group. They were Luco Olstenio (Niccola Holstein, 1596-1661), from Hamburg, Pietro Sforza Pallavicini (1607-1667), a Roman marchese who was head of the Roman academy of the Umoristi, and Pietro della Valle (1586-1652), a Neapolitan traveler and orientalist,[61] and at the meeting on January 27, 1629, they were officially accepted.[62] In 1630, the last year of the academy's existence, Mario Schipani, a Neapolitan doctor and philosopher who was fluent in Arabic and who had been proposed by Cesi in 1616 and 1625, was made a member.[63]

Cesi's personal life was greatly complicated by his connection with the Lincei and in turn complicated the affairs of that organization. The initial conflict between father and son caused by Cesi's founding of the academy was never fully resolved. On November 27, 1609, the elder duke willed to his son Giovanni all his estate, thus depriving Cesi of

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[59]Giuseppe Gabrieli, "Bibliografia Lincea III. Giusto Ricchio Belga: I suoi scritti editi ed inediti," Rendiconti della R. Accademia Nazionale dei Lincei, classe di scienze morali, storiche e filologiche, series 6, IX (1933), 142-145.

[60]Gabrieli, "Indice analitico e topografico," p. 229.

[61]Gabrieli, "Carteggio scientifico," pp. 204-205.

[62]Gabrieli, "Verbali," p. 507; Odescalchi, p. 192.

[63]Gabrieli, "Carteggio scientifico," p. 205.

his rights of primogeniture.[64] In 1613 Cesi came into a new title through a grant from Pope Paul V to the Cesi family of the territories of Sant'Angelo and San Polo.[65] This grant, given to aid the rapidly depleting family fortune, made the young man prince of Sant'Angelo and San Polo in addition to his inherited title of marchese of Monticello.

Cesi married in 1614, but his wife Artemisia Colonna died less than two years later. His mother died in 1616, leaving him an inheritance of 14,000 crowns, a small sum in view of the fact that on August 18, 1618, Cesi's father ceded to him the administration of the family affairs, which included debts of 43,000 crowns.[66] Cesi's family responsibilities kept him occupied and also kept him more and more in Acquasparta, whence he removed his family on July 4, 1618.[67] The affairs of the Lincei suffered with Cesi's departure from Rome. There was a lapse of some three years between the last meeting in 1618 and the meeting of May, 1621. During this period Cesi could do nothing for the academy except contract with an engraver to cut plates for the illustrations of the Rerum medicarum,[68] and to entertain members of the Lincei at his home in Acquasparta, among whom were Stelluti, Cesarini, and Ciampoli in 1620.[69]

Not only the problems of debt but personal grief again plagued him. In 1617 Cesi had married Isabella Salviati. The deaths of the two

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[64]Odescalchi, p. 98.

[65]Gabrieli, "Cesi," pp. 352-353.

[66]Odescalchi, pp. 130, 139.

[67]Gabrieli, "Verbali," p. 500. [68]Odescalchi, p. 140.

[69]Gabrieli, "Cesi," p. 360; Colonna, p. xx.

much wanted sons from this marriage shortly after their births on June 1, 1623, and January 7, 1626, affected Cesi deeply.[70] In 1626 he began to suffer from kidney stones, which affected his health and were to lead to his death.[71] The decline in his health and his sorrow over the deaths of his two sons no doubt hampered him in the execution of his duties as the head of the Lincei. The declining family fortunes made it impossible for him to bestow the emerald ring, a sign of membership in the Lincei, on the four men who became members in 1629 and 1630.[72]

Cesi wrote several times to Galileo complaining of "domestiche turbulenze,"[73] "un cumulo di brigosissimi e molestissimi negotii, che me tengono continuamente avviluppato et inquieto,"[74] and "molestissimi travagli urbani domestici."[75] He was released from his troubles only by his death on August 1, 1630, in Rome,[76] two days short of the twenty-seventh anniversary of the founding of the Accademia dei Lincei. He was buried in the Church of Santa Cecelia in Acquasparta.[77]

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[70] Odescalchi, pp. 147, 183.

[71] Ibid., p. 186.

[72] Gabrieli, "Carteggio scientifico," pp. 204-205.

[73] Galileo, Opere, XIII, 375. Letter of September 4, 1627.

[74] Ibid., p. 449. Letter of September 9, 1628. "A lot of the most vexing and annoying duties, which keep me continually tied up and disquieted."

[75] Ibid., p. 103. Letter of December 27, 1622. "Annoying urban domestic toil."

[76] Gabrieli, "La data precisa," p. 5.

[77] Odescalchi, p. 199.

With his death, the effective existence of the academy came to an end. A meeting was held to elect a new prince, but no decision was reached on a successor. Cesi's manuscripts and letters passed into the hands of Cassiano del Pozzo.[78] Stelluti wrote to del Pozzo on August 17, 1630.

> Le quali vedo andare in rovina, se non sono a bracciate da signore potente; che percio lei insieme col detto Monsignore potra racommandarle all'Eminentissimo Sig.r Card.le Barberino, giache il povero Signore ha disposto di quelle come sempre ha detto, et era di lasciar il suo museo, libraria, et il ritratto del libro messicano all detta Accademia, accio il Principe futuro potesse supplire alle spese per le stampe de libri, e per gli anelli da darsi agli Accademici.[79]

This attempt to enlist Barberini's support as patron of the Lincei failed, however, and having lost the force of Cesi's enthusiasm and personality, the members drifted apart, and the Lincei ceased to exist as an organized group. It remained to Stelluti to carry out the last remaining work of the academy, the printing of the Rerum medicarum in 1651 with the support of Don Alfonso Turiano, the Spanish ambassador to Rome.[80]

The diversity of interest among the members of the Lincei fitted quite well with the statement of Cesi in the Praescriptiones:

> Philosophos suos Academicos desiderat, qui ad rerum ipsissimarum cognitionem tendentes, disciplinis naturalibus praesertim mathematicis se dedant, iisque sedulam commodent operam, non neglectis

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[78] Ibid.

[79] Gabrieli, "Carteggio Linceo," p. 1220. "I see that things will go to ruin if they are not taken over by a powerful person; therefore when you are with him you will be able to recommend to him Eminence Cardinal [Francesco] Barberini that the poor Signore [Cesi] has not disposed of those things as he had always indicated, and it was his wish that he leave his museum, library, and the extract of the Mexican book to the Academy, that the future prince might be able to supply the expense of the printing of the book and of the rings to give to members of the academy."

[80] Biographie Universelle, XLIII, 517.

> interim amoeniorum musarum, et philologiae ornamentis, ut quae ad instar elegantissimae vestis, reliquum totum scientiarum corpus condecorent . . . .[81]

That the academy was primarily scientific in its orientation was due largely to the fact that Cesi's interests were mainly scientific.

The strength of the academy lay not in the number of its members. The greatest number of Lincei at any time was during 1613 and 1614 when fifteen men were members of the organization. It was not in the frequency of their meetings. It was stated in the Praescriptiones:

> . . . neque enim recitationibus, declamationibus, aut cathedralibus disceptationibus vacare Lyncei erit instituti; non etiam frequenter, et numerose convenire; praeterquam ut opportunum fuerit, pro negotiis Academiae obeundis. . . .[82]

Meetings, although held fairly regularly during 1612 and 1613, were in later years held at irregular intervals and did not play a major part in transmission of knowledge. Faber's record of the meetings of the Lincei probably did not include those meetings at which he was not present, but of those he did record (listed by Gabrieli), he and Cesi were the only members who participated in all. The others who participated on a fairly regular basis were Stelluti (who was not present at nine meetings between August 3, 1612, and February 20, 1613), de Filiis (who missed eleven meetings between January 13, 1613, and January 26, 1616), and Valerio,

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[81]Carutti, p. 220. "[The Academy] desires as its academicians philosophers who, holding to real knowledge, devote themselves to the study of nature, particularly mathematics, and take upon themselves the most diligent work, not neglecting meanwhile the ornaments of elegant literature and philology which, like graceful garments, adorn the whole body of science. . . ."

[82]Carutti, p. 221. "The academy was not founded to give leisure for recitations and debates, nor for frequent and numerous meetings, except those that are necessary for attending to the affairs of the academy. . . ."

who was a regular participant from July 10, 1612, until his censure by the group on March 24, 1616. Demisiani attended three meetings in October and November of 1612,[83] but he left Rome for Venice in 1613.[84] Ecchio attended four meetings between July 26, 1614, and March 24, 1616. On the last date he was removed because of his unfortunate fit of madness. The meeting recorded by Faber at which the greatest number of members was present was that of May, 1621, when Stelluti, Faber, Cesi, de Filiis, Cesarini, Muti, and Ciampoli were present. In all, Faber recorded thirty-four meetings between April 23, 1612, and July 3, 1626.[85]

The activities of the Accademia dei Lincei during the period from 1619 to 1630 were much the same as those which marked the earlier period (1603-1609), except that they took place on an expanded scale. Of all those who were members throughout the history of the group twenty-three are classed by Gabrieli as having some interest, either professionally or as amateurs, in fields of science and mathematics. Twelve were either members of clerical orders or were active in fields of the humanities such as philosophy or poetry. Yet men like Cesarini and Ricchio were to use their literary talents or their positions on behalf of publications of the Lincei such as Il saggiatore and the Apiarium.

As has been pointed out, the meetings of the group played a relatively minor role in its activities. The members were dispersed over a wide area, and, moreover, the greatest number in any one year was

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[83]Gabrieli, "Verbali," pp. 493-512.

[84]Gabrieli, "Carteggio scientifico," p. 183.

[85]Gabrieli, "Verbali," pp. 493-512.

fifteen. Only a small group participated with any regularity in the meetings that were held. It was rather Cesi's correspondence which served as a connecting link among the members.[86] His correspondence with Galileo, for example, shows his support of and interest in Galileo's scientific efforts, and it led, directly or indirectly, as the case may be, to the publication of the Apiarium. This, however, is a matter to be discussed in a later chapter.

In addition to Cesi's letters, there was an exchange of correspondence among the other members that served to make the Accademia a kind of clearing house for scientific information. Galileo wrote his sun spot letters to Welser, Ecchio wrote to Stelluti telling him of the herbals in the Escurial, and Faber wrote to Shreck in China concerning the work of the academy. It was this correspondence which, in Ornstein's words "co-ordinated the scientific efforts of the various progressive European countries" in a limited way.[87]

But the most important activities of the Lincei were those connected with the various publications issued by the Lincei as a group--activities fully in keeping with one characteristic of a scientific society, that of publishing scientific books. All of the major works, Galileo's book on sunspots, Il saggiatore, Colonna's Ecphrasis, Il telescopio, Rerum medicarum, and the Apiarium, published by the Lincei or financed by Cesi, were concerned with subjects of a scientific nature,

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[86]Gabrieli, "Carteggio Linceo," pp. 119-20, 979-87, 1321-25. Over 1000 letters are reprinted by Gabrieli in the "Carteggio," and of these, he gives 395 as being written either to Cesi by various members of the Lincei or written by Cesi to members.

[87]Ornstein, p. 260.

and they merit discussion in their own right as examples not only of publication but as examples of the cooperative efforts of the members of that group and support of individual scientific endeavor.

The two books which were to have the most immediate impact were the book on sunspots and Il saggiatore, written by Galileo and published with the financial support of Cesi. In 1612 Christopher Scheiner (1575-1650), a Jesuit astronomer, had announced the discovery of sunspots in three letters to Marcus Welser which he had signed "Apelles latens post tabulam" and which were published in Augsburg in 1612.[88] Scheiner had explained the spots as small planets revolving about the sun. Welser sent a copy of the letters to Galileo asking his opinion of them, and Galileo answered him in three letters (May 4, August 14, and December 1, 1612) describing the observations he had made and his conclusions and noting that his research had begun about eighteen months earlier. This date would place his discovery in the middle or latter part of 1610, a time which according to Fahie was before Scheiner's observations, which supposedly took place early in 1611.[89] Galileo wrote to Cesi on May 12 outlining his theories as he had done to Welser in his letter of May 4, 1612, and enclosing a copy of his letter to Welser.[90] The letters from Galileo to Welser were evidently circulated among the Lincei to some extent because on November 9, 1612, at a meeting of the group, de Filiis,

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[88]Apelles [Christopher Scheiner], Tres Epistolae de Maculis Solaribus Scriptae ad Marcum Velserum Augustae Vind. II. Virum Praefect. cum Observationum Iconismis (Augustae Vindelicorum, 1612); Galileo, Opere, V, 23-27.

[89]Fahie, pp. 128-30.

[90]Gabrieli, "Carteggio Linceo," p. 220.

the librarian, asked permission to print the sunspot letters that Welser had received.[91] The publication was undertaken by the Lincei and financed by Cesi,[92] and on February 20, 1613, the Istoria e dimostrasioni intorno alle macchie solari was shown at a meeting of the Lincei and ordered distributed.[93]

Il saggiatore was a reply to an attack on Galileo, the Libra astronomica of Horatio Grassi (1583-1654). It was written in the form of a letter to his friend and fellow Lynx Virginio Cesarini.[94] In October of 1622 Galileo had sent the completed manuscript to Rome where it was read by Cesi, Cesarini, Angelo de Filiis and Giovanni Ciampoli, who discovered a number of minor errors that they felt should be corrected.[95] The work was finally published in 1623 under the auspices of the Lincei.[96]

Other publications by other members of the Lincei were also supported either by the funds of the organization or by Cesi personally.[97] Among these works was the Ecphrasis of Fabio Colonna. Colonna had published his ΦΥΤΟΒΑΣΑΝΟΣ in 1592, and in 1606 the Ecphrasis, which was simply the ΦΥΤΟΒΑΣΑΝΟΣ under a different title, was printed in Rome. At

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[91] Favaro, p. 222; Gabrieli, "Verbali," p. 486.

[92] Morghen, p. 373.

[93] Odescalchi, p. 112; Gabrieli, "Verbali," p. 488.

[94] Il saggiatore. The title of the work is self-explanatory.

[95] Gabrieli, "Carteggio Linceo," pp. 780-81. Letter from Cesarini to Cesi, December 22, 1622.

[96] The Controversy on the Comets of 1618. Galileo Galilei, Horatio Grassi, Mario Guidicci, Johann Kepler. Trans. Stillman Drake and C. D. O'Malley (Philadelphia: University of Pennsylvania Press, 1960), p. xix.

[97] Morghen, p. 368.

that time the copper plates of the figures, which Colonna had drawn himself, were left out because of the expense of printing them. By 1610 Colonna had finally found the money for printing the plates.[98] In 1616 Cesi encouraged him to write a second part to the work and paid for its printing, which was carried out under the auspices of the Lincei[99] with an encomium which had been written by Welser.[100] The 1616 text contained two appendices--one on Purpura, or mollusks,[101] and the other on Glosopetris, or dogfish, in which he tried to prove that the fossils of Glosopetris were not the tongues of serpents, as was commonly thought, but the bones and teeth of dogfish.[102]

In 1627 there appeared the Il telescopio of Stelliola, another work printed at the expense of Cesi.[103] Stelliola had died in 1623, and his papers had passed into the hands of his son Dominique, who published the Telescopio with Cesi's aid.[104]

The Rerum medicarum of Francisco Hernandez is the work which best exemplifies the spirit in which the Lincei undertook their search for

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[98]Colonna, pp. ii-v.

[99]D[u] P[etit-Thouar]s, "Colonna, Fabio," Biographie Universelle, IX, 324.

[100]Colonna, pp. vi-vii.

[101]Fabio Colonna, Fabii Columnae, Lyncei, Nobilis Neapolitani, Genere Romani, Opusculum de Purpura Romae Primum, an. 1616. Editum, & Nunc Iterum Luci Datum Operâ ac Studio Johann-Danielis Majoris, Medicinae d. cujus Novissimè Accesserunt Annotationes Quaedam (Kiliae: Imprimebat Joachim Reumannus, 1675).

[102]Colonna, ΦYTOΒAΣANOΣ, pp. vi-vii.

[103]Il telescopio ovvero ispecillo Celeste di Niccolo Antonio Stelliola Linceo (Naples: Domenico Maccarana, 1627); Carutti, p. 188.

[104]Odescalchi, p. 131; Gabrieli, "Verbali," p. 499.

knowledge. Francisco Hernandez (1514-1577?) had been physician to Philip II of Spain and had been sent by Philip to study the plants and animals of the New World. The manuscript that Hernandez compiled, some sixteen volumes, was presented to Philip; instead of publishing it, he deposited it in the Escurial.[105]

Hernandez's manuscript had been edited by Nardo Antonio Recchio, and in this greatly shortened form it had been brought to Cesi's attention by della Porta. It is also possible that Cesi had seen the manuscript and examined it in Naples in 1604.[106] In 1611, Della Porta urged Cesi to undertake the publication of the work.[107] In the same year Cesi had evidently bought the manuscript from Marco Antonio Petilio, Recchio's nephew, who had inherited it from his uncle after the latter's death in 1595.[108] Galileo mentions seeing the manuscript at Cesi's home in 1611,[109] and Cesi wrote to Galileo on September 17, 1611, that he had commenced to edit the manuscript and that Terrentius (Schreck) was adding his comments.[110] On June 20, 1612, Cesi wrote to Faber suggesting that he ask "Monseigneur Corbilluzzi" for the privilege of printing the work.[111] The

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[105]Martin de la Cruz, The Badianus Manuscript (Codex Barberini, Latin 241), Vatican Library, An Aztec Herbal of 1552, Introduction, Translation and Annotations by Emily Walcott Emmart (Baltimore: The Johns Hopkins Press, 1940), p. xiv.

[106]Gabrieli, "Alla ricerca," p. 229.

[107]Gabrieli, "Carteggio Linceo," p. 1271.

[108]Gabrieli, "Alla Ricerca," p. 229.

[109]Galileo, Opere, XI, 107.

[110]Ibid., p. 211.

[111]Gabrieli, "Alla Ricerca," p. 229; Gabrieli, "Carteggio Linceo," pp. 240-41.

privilege was granted by Pope Paul V on July 21, 1612,[112] and Cesi, Terrentius and Faber contributed their editorial talents to the work,[113] Cesi also providing the financial support for the printing.[114] It was not until 1628, however, that the first publication of the Rerum medicarum finally took place. The long delay between the beginning of the work and its final publication was due probably to the financial difficulties which plagued Cesi.[115] The 1628 edition was a very limited one, if one is to judge by the rarity of its appearance today. Only one known copy presently exists in the United States.[116] It was not until 1651 that the work was printed in a more extensive edition.

The additions made by members of the Lincei served to expand the scope of the manuscript that had come into their possession. Cesi contributed his Phytosophicarum tabularum, a system of classification of knowledge that is, in the arrangement of the text, similar to the Apiarium.[117] Terrentius added his observations on plants, animals, and

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[112]Gabrieli, "Carteggio Linceo," pp. 1273-74.

[113]Odescalchi, p. 201.

[114]Gabrieli, "Cesi," p. 365.

[115]Odescalchi, p. 108.

[116]Catalogue of Botanical Books in the Collection of Rachel McMasters Miller Hunt. Vol. I, Printed Books 1477-1700 With Several Manuscripts of the 12th, 15th, 16th & 17th Centuries, compiled by Jane Quinby (Pittsburgh: The Hunt Botanical Library, 1958), p. 266. The only copy of the 1628 edition of the Rerum medicarum in the United States is in the National Library of Medicine in Washington, D.C.

[117]Hernandez, pp. 901-51. Phytosophicarum tabularum ex frontispiciis naturalis theatri principis Federici Caesii Lyncei S. Angeli et S. Poli princ. I. March. M. Caelii. II. & Baron. Roman. desumpta prima pars. in stirpium scientiae, ac studiorum institutionem, totiusque herbariae syntaxis prospectum: post Mexicanas Recchi, quae caeteris cum omnibus plantis in ea copulam inire debeant nunc primum a Linceis edita.

minerals.[118] Faber provided his section on animals, which was also printed as a separate work in that year.[119] Colonna, who also contributed to the work,[120] proposed the name petal for the parts of a flower.[121] He added fifteen drawings of plants, and he named on plant caesia, in honor of Cesi,[122] and one cardinalis, in honor of Barberini.[123]

The various sections of the 1628 edition of the Rerum medicarum are dedicated to Francesco Barberini, who, as a man of wealth, learning, and influence, would seemingly be a logical choice as the patron of the Lincei.[124] The fortunes of that organization were closely tied to Cesi's personal life since he was the motivating force and in large measure the financial support which maintained the group. As his financial problems became more pressing and the weight of the management of his family affairs came to rest fully upon him, it is reasonable that he would seek outside support for the Lincei. The Rerum medicarum was probably an attempt to persuade Barberini to take on the position of patron for the

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[118]Hernandez, pp. 27, 44, 101, 131, 181, 259, 313, 335, 347-456. Ioannes Terrentius Lynceus leori, aliarum novae Hispaniae plantarum nardi Antonii Recchi imagines, et nomina.

[119]Hernandez, pp. 460-840. Aliorum novae Hispaniae animalium nardi Antonii Recchi imagines et nomina Ioannis Fabri Lyncei Bambergensis philosophi, medici, publici professoris Romani, summo Pontifici ab herbariis studiis expositione.

[120]Hernandez, pp. 841-899. Fabii columnae Lyncei in Nardi Antonii Recchi montecorvinatis medici, regii rerum medicarum novae Hispaniae volumen. Annotationes, et additiones.

[121]Oxford English Dictionary, 1961, VII, 745.

[122]Hernandez, p. 873.

[123]Biographie Universelle, XIX, 325.

[124]Hernandez, pp. 458, 845, 903.

group, and when Barberini failed to accept this responsibility, the Rerum medicarum languished. It was not until 1651 that the Spanish ambassador to Rome, Don Alfonso Turiano, was prevailed upon by Stelluti to give his financial support to the printing of the work, which appeared in a larger edition in that year.[125]

Stelluti also undertook the publication of a work begun by Cesi on the fossilized wood that he had discovered near his palace in Acquasparta. The work had been unpublished upon Cesi's death, but Stelluti completed it, and it appeared under his name in 1637.[126]

Cesi's family affairs had evidently kept him from publishing most of the works that he had undertaken. The Tabularum which appeared in the Rerum medicarum and the Apiarium, his work on bees, were the only writings published during his lifetime. Among those that he intended as part of his Theatrum naturalis, a compendium of natural history, were the Metallophytis (the work on fossils that Stelluti had completed), Thaumatombria (a work on miraculous rains),[127] the Tabularum, and the Apiarium. A number of others are listed by Carutti, most of them known only through their mention by Stelluti.[128]

The various publications of the Accademia dei Lincei were perhaps the most important products of that organization. In the case of Galileo's

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[125]D[u] P[etit-Thouar]s, "Stelluti, Francois," Biographie Universelle, XLIII, 517.

[126]Francesco Stelluti, Trattato del Legno Fossile Minerale Novamente Scoperto nel Quale Brevemente si Accenna la Varia & Mutabil Natura di detto Legno, Rappresentatovi con Alcune Figure, che Mostrano il Luogo Dove Nasce, la Diversita dell'onde, che in esso si Vedono, e le sue Cosi Varie e Maravigliose Forme di Francesco Stelluti Acad. Linceo da Fabriano all'Emin.mo & Rever.mo Sig. Card. Francesco Barberino (Rome: Appresso Vitali Mascardi, 1637).

[127][Persius], pp. 21-22

[128]Carutti, pp. 167-70.

two books, they introduced the new theory of sunspots to the scientific world and supported the Copernican doctrine. The Hernandez work entailed the contributions of four members of the group and again was a source of new knowledge concerning the New World. Some of this knowledge was later put to use by Cesi in the Apiarium. In its publications, then, the Lincei showed some important characteristics of a scientific society.

The history of the publication of the Apiarium serves as a case study of the activities of a small group of the Lincei. The Apiarium, published in 1625, was the result of a collaboration between Cesi and Stelluti, with the assistance of Ricchio and Galileo and Colonna. Galileo's contribution to the work was the microscope with which bees were observed and their appearance noted. Ricchio wrote the dedication, Stelluti did the drawings, and Colonna contributed his observations, while Cesi wrote the text. The activities associated with the work thus include cooperative effort, encouragement of experimental science, promulgation of scientific discoveries, and publication.

CHAPTER IV

FEDERICO CESI AND GALILEO GALILEI

When Galileo Galilei became a member of the Accademia dei Lincei in 1611, he found a loyal friend and ally in his fellow Linceo, Federico Cesi. Galileo also brought several of his friends into the academy (Salviati, Welser, Ridolfi, Ciampoli) and was thus supported by a group of men who were sympathetic to his ideas. It was Cesi's friendship with and his support of Galileo that was to be an important factor in the production of three of the publications of the Lincei: Galileo's book on sunspots, Il saggiatore, and the Apiarium.

In 1612 Galileo published his Discorso intorno alle cose che stanno in su l'acque, or che in quella si muovono (Discourse on floating bodies). The book grew out of a discussion in which Galileo opposed the ideas of Aristotle concerning floating bodies, that their floating or sinking depended upon shape, and offered experiments to disprove this theory. Present at that discussion and siding with Galileo against the Peripatetics who defended Aristotle were Cardinals Gonzaga and Maffeo Barberini,[1] who was later to play an important part in the activities of Galileo and of other members of the Lincei.

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[1] J. J. Fahie, Galileo, His Life and Work (London: John Murray, 1903), p. 137; Galileo, Opere, XI 304-305.

Galileo's refutation of the ideas of Aristotle brought forth a flurry of replies from the Peripatetic element in Italy, but one person who liked the Discorso was Barberini. He wrote to Galileo on June 5, 1612:

> Mè perenuto il trattato composto da V.S. sopra le differenze che nacquero mentre ero costi nella questione filosofica, et con molto piacere l'andrò vendendo, si per confermarmi nell'opinione che havevo simile alla sua, come per amirare questo con l'altre opere del suo rarissimo ingegno.[2]

To those who attacked the Discorso Galileo considered making a direct reply, but he was disuaded by Cesi, Giovanfrancesco Sagredo, and Lodovico Cigoli.[3] Cogoli wrote to Galileo on August 31, 1612, saying that he had talked to Cesi, who had expressed a wish to reply to the Peripatetics,[4] but Cesi never mentioned the proposed reply in any of his letters to Galileo. It is likely that what he may have intended to write was a work that he had been considering on the subject of sunspots.[5] It was left to Benedetto Castelli, a pupil of Galileo, to conduct the defense

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[2]Galileo, Opere (XI, 317-18. "I have received your treatise on various scientific questions which have been raised during my stay here, and shall read them with great pleasure both to confirm myself in my opinions which agree with yours and to enjoy with the rest of the world the fruits of your rare intellect."

[3]Antonio Favaro, "Di alcune relazioni tra Galileo Galilei e Federico Cesi illustrate con documenti inediti per cura di Antonio Favaro," Bullettino di bibliografia e di storia delle scienze matematiche e fisiche pubblicato da B. Boncompagni, XVII: (New York: Johnson Reprint Corporation, 1964, originally published in Rome: Tipografia delle scienze matematiche e fisiche, 1884), p. 220.

[4]Ibid.; Gabrieli, "Carteggio Linceo, " p. 264.

[5]Favaro, p. 221.

in a work published under his name but written largely by Galileo.[6]

Although Cesi played no active part in the controversy over the Discorso, his interest in sunspots was to lead him to Galileo's defense in another matter. Cesi's interest in astronomy was encouraged by his friendship with Galileo, and on June 20, 1612, he write to Galileo asking for information on the Copernican system of astronomy and expressing his belief in that system.[7] His letter of September 29, 1612, to Galileo contained mention of a nearly completed work that he had written.

> L'opera, che io ho fatta e chiamo Celispicio, contiene molte materie celesti, come V.S. vedrà, quali vado scorrendo anco teologicamente, e sbatto particolarmente la sodezza e durezza e moltiplicità degl'Orbi e la copia dei moti Il tutto sarà a giudizio di V.S.[8]

It was as a result of his interest in sunspots that the Istoria of Galileo was published by the Lincei in 1613. He had received a letter from Galileo on May 12, 1612, in which Galileo explained his theory of sunspots and had enclosed a copy of the letter that he had written on the subject to Welser.[9]

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[6]Benedetto Castelli, Risposta alle opposizioni del S. Lodovico delle Colombe e del S. Vincenzio di Grazia contro al trattato del Sig. Galileo Galilei circa le cose che stanno sù l'acqua, ò che in quella si muovono. All'Illustriss. Sig. Enea Piccolomini aragona, Signore di Sticciano, etc. nella quale si contengono molte considerazioni filosofiche remote dalle vulgate opinioni (Florence: C. Giunti, 1615).

[7]Gabrieli, "Carteggio Linceo," p. 238.

[8]Favaro, p. 223; Gabrieli, "Carteggio Linceo," p. 274. "The work that I have written and call Celispicio contains many celestial matters, as you will see, which I consider theologically and refute, particularly the solidness and hardness and multiplicity of the orbs and the great number of their movements."

[9]Gabrieli, "Carteggio Linceo," p. 220.

There were those who in 1611 had refused to look through the telescope at all and who in 1613 denounced sunspots as mere imperfections in the lenses of the instrument. According to Santillana, they rejected the Istoria because it was an openly Copernican work which seemed to prove that only the Copernican theory of the universe would explain the phenomenon of sunspots.[10] Galileo himself had recognized what effects his theory might have when he wrote to Cesi before the publication of the Istoria.

> La quale novità dubito che voglia essere il funerale, o piú tosto l'estremo et ultimo giudicio, della pseudosilosofia, essendosi già veduti segni nelle stelle, nella luna e nel sole; e sto aspettando di sentir scaturire gran cose dal Peripato per mantenimento della immutabilità de i cieli....[11]

But again, Maffeo Barberini expressed his approval of Galileo's work. He wrote to Galileo on April 20, 1613:

> Mi son pervenute le lettere de V.S. scritte al Velseri, date in luce, et mi sono state molto accette, nè mancherò di vederle e rivederle con gusto grande, conforme a che merita l'opera.... Intanto ringratio infinitamente V.S. della memoria che ha tenuta di me mandandomi dette lettere, et ricordole la stima che faccio del suo valore....[12]

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[10]Santillana, p. 26.

[11]Gabrieli, "Carteggio Linceo," p. 220. Galileo to Cesi, May 12, 1612. "This new thing [sunspots] I suspect can be the funeral or rather the final judgment of the pseudo-philosophy, signs being already seen in the stars, in the moon, and in the sun; and I am expecting now to see the Peripatetics put forth some grand effort to maintain the immutability of the heavens. . . ."

[12]Galileo, Opere, XI, 495-96. "There have come to me the letters written by you to Welser and published, and I have accepted them with great joy. I will not fail to look at them again and again with the great pleasure that conforms to what the work merits. . . . Meanwhile I am infinitely pleased with you for the mindfulness that you have had for me in sending me the letters, and I remind you of the value that I have for your health. . . ."

But Galileo, though he had many friends, also had many enemies in Rome. In a letter to his friend Castelli, written in a theological vein, he defended the appeal to experience as a means of obtaining truth, rather than strict dependence upon Scripture even when it contradicted experience. He ended with a long discussion of Joshua's miracle, during which the sun stood still in the heavens, and he brought it to a reductio ad absurdum. Castelli gave the letter wide circulation; however, among those who read it were enemies of Galileo who used its assertions to launch an attack against him on the grounds that he had contradicted several passages in the Bible and had given his own interpretation, grounds that left him open to charges of heresy.[13]

The controversy aroused by the opinions of Galileo and the attacks that were made on his friend led Cesi to come to Galileo's defense in an indirect way. On January 4, 1613, Cesi wrote to Galileo informing him that he had prepared two letters which he had made to appear as though they had been written by two Peripatetics.[14] The letters were so constructed as to make the Peripatetics appear ridiculous and their opinions absurd. On the following day, Galileo replied to Cesi:

> Io rendo gratie a V.S., e all'amico mio carissimo delle provvisioni su che stanno continuamente per mia sicurezza contro alla malignità, la quale qua ancora non resta di macchinare, e tanto più quanto il nemico e piu vicino; ma perche sono pochi in numero, e della lega (che cosí la chiamano lor medesimi tra di loro), che V.E. può scorgere nelle loro scritture, io me ne burlo.[15]

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[13]Fahie, pp. 149-52.

[14]Gabrieli, "Carteggio Linceo," pp. 310-11.

[15]Ibid., p. 312. "I give thanks to Your Excellency and to my very dear friend [Lodovico Cigoli] for the provisions that you continually make for my security against evil intent, which still does not cease to plot,

But on receiving the two letters that Cesi had written, Galileo replied frankly:

> Sono in necessità di fare sapere a V. Eccellenza come, havendo mostrato le due lettere mandatemi da lei a diversi amici letterati, sono state giudicate per finte, per del medesimo autore, e per di V.E.; cosa che mi ha fatto maravigliare. L'istesso m'è accaduto poi qui col sig. Salviati, al quale havendo io poi confessato il tutto in confidenza, e piu detto che il medesimo guiditio havean fatto altri amici in Firenze, gli è caduto in consideratione, che venendo, stampate, in mano de'miei detrattori, se gli potrebbe dare un attacco di mordere terribilmente, opponendo che per palliare le mie menzogne mi fosse necessario l'andar con fintioni e fraudi ingannando il mondo; del quale artificio non sendo io punto bisognoso, bastandomi che solo si sappia la pura verita, pareva a detto signore che ogni detto di V.E., mio e di altri,deve essere schiettissimo e nulla palliato; onde il contenuto di esse lettere, che per altro è piaciuto infinitamente, pareva che per avventura fosse stato meglio progerlo sotto forma più libera, e sicura di non dar attacco alcuno alla malignità.
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> Io però mi rimetto a quanto determinera la sua prudenza, et in tanto si fanno maggiori i miei oblighi nel veder con quanto affatto alla invigili nel mio patrocinio.[16]

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and so much more as the enemy is close by; but because they are few in number, and in a league (as they call this thing among themselves) as Your Excellency is able to perceive in their writings, I laugh to myself about them.

[16] Ibid., p. 320. Letter from Galileo to Cesi, January 25, 1613. "I must tell Your Excellency that, having shown the two letters that you sent to me to diverse educated men, I find that they have judged them to be counterfeits, to be by the same author, and to be written by Your Excellency, a thing that has made me marvel. The same has happened to me also here with Signore Salviati, to whom I have confessed all in confidence, and he has said also that other friends in Florence had made the same judgment. It was his consideration that if [the letters] were published and fell into the hands of my detractors, they might be able to make a terribly biting attack, and in opposing it, it would be necessary to disguise my falsehood by deceiving the world with counterfeit and fraud. Of that artifice I have no need because the fact that I know the plain truth suffices me. It appeared to the previously mentioned Signore that everything said by you, by me, and by others, ought to be most open and not disguised; therefore the content of those letters which moreover is infinitely pleasing, would appear perhaps to be better offered under a form more open and certain not to give any pretext for evil intent. I, however, put myself under whatever your prudence will determine, and my obligations are so much greater on seeing with what affection you watch over my defense."

In February of 1615 Galileo's activities on behalf of the Copernican system were brought to the attention of the Inquisition in Rome by a Dominican priest named Lorini who with another priest named Caccini had attacked the system.[17] Called upon in Rome for a more complete account of Galileo's actions, Caccini repeated rumors that he had heard, adding that Galileo was suspect in religious matters because "he belongs to a certain Accademia dei Lincei, and corresponds with the Godless Fra Paolo Sarpi at Venice and with many Germans."[18]

In 1616 Galileo himself went to Rome with the intent of clearing his name before the Inquisition and asserting the validity of the Copernican doctrine. Santillana has documented and discussed Galileo's efforts and the resulting injunction of February 25, 1616, to Galileo by Bellarmine that he should relinquish his opinions that the sun was the center of the world and that the earth moved around it and never teach or defend those opinions verbally or in writing.[19] On March 3 a decree of the Congregation of the Index declared Copernicus's work De Revolutionibus (1543) suspended until it had been corrected of its errors.[20]

The condemnation of the Copernican system and the injunction to Galileo to give up his opinions raised an immediate stir and led to the suspension of Luca Velerio from the membership and activities of the Lincei on March 24, 1616.[21] It did not prevent Cesi from coming to

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[17]Fahie, pp. 152-54.

[18]Ibid., p. 155.

[19]Santillana, pp. 120-23.

[20]Ibid., p. 123.

[21]Carutti, pp. 30-31.

Galileo's defense, however. Two years later he defended Galileo's views, which were also his own, on the nature of the heavens. On August 14, 1618, he wrote to Cardinal Robert Bellarmine, the man who had issued the injunction to Galileo in 1616. Bellarmine had evidently solicited a letter from Cesi, who had spent some time at the Cardinal's residence in 1604, and Cesi welcomed the opportunity to attack the Peripatetic doctrine that the planets were carried around the earth on crystalline spheres. Cesi sought to prove "Unicum, Tenue, peruiumque Caelum."[22] In his reply to Bellarmine, a prince of the Church, Cesi argued appropriately from scripture.

> Meam cum audire sententiam voluisti, neque dumtaxat, Unicum, Tenue, peruiumque Caelum, à me propositum te probare Orbium & orbiculorum tam multas, tam perplexas moles è naturae puritate eliminatas, sed etiam proprio ex voto ed esse affirmasti, & sacrae paginae oraculis maximè consonum. . . .[23]

From a study of the Hebrew text of the Bible Cesi concluded that the word Y meant expansion and extension, and that the heavens were not confined by boundaries into a definite form such as spheres but were

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[22]"A unified, tenuous, and pervious sky." It is rather ironic that the correspondence between Cesi and Bellarmine was published in a work by Galileo's protagonist in the matter of sunspots, Christopher Scheiner. The title of the work is Rosa ursina sive sol ex admirando facularum & macularum suarum phoenomeno varius, necnon circa centrum suum & axem fixum ab occasu in ortum annua, circaq. alium axem mobilem ab ortu in occasum conversione quasi menstrua, super polos proprios, libris quatuor mobilis ostensus, a Christophoro Scheiner Germano suevo, e societate Iesu ad Paulum Iordanum II. Ursinum Bracciani Ducem (Bracciani: Apud Andream Phaeum typographum ducalem 1626-30). Cesi's correspondence begins on page 775 with the title De caeli unitate, tenuitate, fusaque & pervia stellarum motibus natura, ex sacris litteris. ad Illustriss. &c Reverendiss D. D. Robertum Bellarminum S. R. E. Card. Amplissimum Epistola.

[23]Scheiner, p. 777. "Since you wish to hear my opinion, you must assert that not only do you approve that single, tenuous, and pervious sky that I have proposed and eliminate many and complex masses of large and small orbs from the purity of nature, but also you must affirm that it is proper according to the vow and wholly in harmony with the oracles of the sacred pages [The Bible]."

tenuous and diffuse. The stars were not carried on rigid spheres but moved by themselves through this tenuous matter.[24] He cited the writings of Church Fathers to support his assertions that the stars moved through the sky.

> Ita caelum immobile sydera verò minimè affixa ad peruium illud percurretia non solum agnoscunt, sed summa nobis asseueratione determinant D. Chrysostomus, Justinus Martyr, Diodorus Tarsensis, Eusebius Emissenus, Origenes, Procopius Gazeus, Theodoretus Tyrensis, Theophylactus, Lactantius, Philastris aliique.[25]

He deplored the attitude that many people had taken toward the new discoveries that Galileo had made with the telescope.

> Sed certè non possum non deplorare, eam nostro saeculo compliurium philosophantium aegritudinem, qua ab experimentis, & observationibus non solum abstinere, sed plurimum abhorrere solent, non enim pauci sunt qui non modo Telescopium quo visus hominum altius protollitur, Galileumque ipsum, qui tam multa in Caelo priscis abscondita, nouos nobis Planetas, noua fixa, nouas Astrorum facies detexit, execrantur; sed simplici etiam oculorum inermium observatione destituti, potius velint sponte caecutire, & in antiquam syluam ire, quorumdam Veterum scriptorum opinionibus fascinati, quam ab illis tantillum discedere, sensu, & ratione duoti, praesumptis decretis, aut regulis aliquid adiungere vel immutare.[26]

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[24] Ibid., p. 779.

[25] Ibid., p. 778. "Chrysostomus, Justin Martyr, Diodorus Tarensis, Eusebius Emissenus, Origenes, Procopius Gazeus, Theodoretus Tyrensis, Theophylactus, Lactantius, Philastrius and others not only recognize the immobile sky with the unfixed stars moving in a passage through it, but they determine it with the greatest vehemence."

[26] Ibid., p. 779. "Certainly I cannot helpt but deplore that sickness of many philosophers in our age who are accustomed not only to refrain from but even more to abhor experiments and observations, for there are not a few who not only execrate the Telescope, by which the sight of men is extended upward, and Galileo himself who, in the sky that hid so much from the ancients, has discovered new Planets for us, new fixed stars, new kinds of stars, but who also, destitute in the observations of their unaided eyes, wish rather of their own accord to be blind and to travel in the ancient ways, fascinated by the opinions of certain ancient writers than, led by sense and reason, to depart even a little from them or to add to or change presupposed theories or rules."

However, Cesi based his arguments for the tenuousness of the sky not on scientific observation but on linguistic analysis of Hewbrew texts and upon the authority of the Church Fathers, and he did not stray far from what he felt to be orthodox opinion. He acknowledged Bellarmine's opinions thus:

> Quia vero aliqua sunt quae varii variè interpretantur, nec parum in scholis agitantur ea hic exponere & fusè quidem consilium est tuo digniora conspectu, tuo dignissima iudicio, nec enim mihi ratae omni ex parte explicationes videri pterint nisis divini alicuius Interpretis & examen, & authoritas intercesserit. Cuius vero id potius quam Illustris Bellarmini?[27]

The letter seems to have had little effect in changing the official opinions of the Church, or at least of Bellarmine, on any substantial matter that might have related to the Copernican system. Bellarmine, in his reply, which was written from Rome on August 25, 1618, cited Ecclesiastes to prove that the sky moved about the sun. He went on to say:

> Sed illud quod ego desideravi à V.E. non est, intelligere, à S. Scriptura, & S.S. Patribus asseri, caelum esse firmum & stellas moveri, & coelum non esse durum, & impenetrabile instar ferre, sed molle & facillime penetrabile instar aëris; haec enim omnia sciebam: verum volebam discere à V.E. quomodo saluentur motus Solis, & Stellarum praesertim fixarum, quae semper erunt simul, & conficiunt suos circulos maiores vel minores prout sunt remotiores vel viciniores polo.[28]

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[27] Ibid., pp. 777-78. "Truly there are those who interpret various things in various ways, and they are not a little vexed in debates to explain this [the nature of the heavens] at length, and indeed the conclusion is in your worthy sight and your worthy judgment, for these explanations seem to me reckoned from no other source than from the great number of divine Interpreters, and authority intercedes. Whose authority is greater than that of the illustrious Bellarmine?"

[28] Ibid., p. 784. "But that which I have asked from you is not to know that the fact that the sky is immovable and that the stars are moved, and that the sky is not hard and impenetrable like iron but soft and easily penetrated like air is asserted by Sacred Scripture and the

Ten years later, on June 1, 1628, Cesi wrote to Faber explaining the circumstances surrounding this letter and its consequences. When Bellarmine contended that it was impossible to save the phenomena without the solid spheres, Cesi replied that it was impossible to save the phenomena with them.[29] Bellarmine encouraged him to complete his work and the two exchanged letters, but the pressure of his family duties slowed his studies considerably, to the great disappointment of Bellarmine.

In the autumn of 1618 the appearance of three comets in the skies of Italy occasioned a controversy that was to embroil Galileo with the agents of the Church once more. His opponent was Horatio Grassi (1583-1654), a Jesuit who held the chair of mathematics at the Collegio Romano and who wrote a work on the three comets which was published anonymously at Rome in 1619. According to Drake and O'Malley, Grassi's book was hailed by the Jesuits as a refutation of the Copernican system.[30] Hoping to avoid a direct clash with the Jesuit order, Galileo presented his reply in the form of two lectures delivered by his young friend and disciple, Mario Guiducci (1585-1646), and subsequently published in the latter's name. Grassi took offense at this reply, although it contained no severe or personal criticism of his views, and he prepared his rebuttal, the Libra Astronomica, which was published in Perugia in 1619.[31]

Holy Fathers; I knew all these things: I truly wish to learn from you in what way the motions of the sun and particularly of the fixed stars, which are always together and make their circles larger or smaller as they are nearer or further from the pole, are preserved."

[29] Ibid., p. 780.

[30] The Controversy on the Comets of 1618, pp. xv-xix.

[31] Ibid.

The book was a virulent attack on Galileo, and his friends agreed that it could not go unanswered. Stelluti expressed this opinion in a letter to Galileo on January 27, 1620.[32] Cesi advised Galileo in a letter of May 18, 1620, that his reply to the Libra astronomica should be addressed to Guiducci since it would be easy to avoid sharp and bitter satire in a letter to a friend.[33]

In 1623 the long-awaited reply appeared--Galileo's Il saggiatore. Shortly before the work of printing Il saggiatore was completed, Maffeo Barberini was elected Pope as Urban VIII (August 6, 1623).[34] Galileo greeted the news of the election with joy, for here was an ally in the highest position in the Church. Barberini was an admirer of Galileo, and it was he, as a cardinal, who had interposed his voice against the proposal of Pope Paul V, when Galileo was first warned away from Copernicanism in 1616, that the Copernican doctrines be declared heretical.[35] It was Barberini as well who had greeted the publication of the Istoria with an expression of pleasure, and it was he who sent Galileo an ode that he had written in his honor on August 28, 1620. The ode praised the new discoveries that Galileo had made, the moons of Jupiter and the sunspots.[36] And it was to Barberini that the new work, Il saggiatore was dedicated.[37]

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[32]Gabrieli, "Carteggio Linceo," p. 707.

[33]Ibid., p. 715.

[34]Odescalchi, p. 147.

[35]Santillana, p. 123.

[36]The poem is reprinted in Santillana, p. 156. See also Galileo, Opere III, 48-49, letter from Barberini to Galileo, August 28, 1620.

[37]Gabrieli, "Carteggio Lincei," p. 822. The dedicatory letter is from the Lincea to Barberini and is dated October 22, 1623.

Barberini was close to other members of the Lincei as well. He took Cesarini into his household as Mastro di Camera and made Ciampoli his secretary.[38] The Lincei sought to capitalize on their associations with the new pope by presenting him with ten books written by members of the Academy, among which were two by Galileo, the Istoria and the discourse on floating bodies.[39] They also strengthened their ties by making Francesco Barberini, the Pope's nephew, a member of the group. On September 30, 1623, Stelluti wrote to Galileo

> Questa sera poi si è dato finalmente l'annello a Mons.r Ill.mo Barberino, quale è stato assai da S. S. Ill.ma gradito; et ha mostrato haver caro d'essere connumerato fra questi altri Signori, e tutti insieme l'habbiamo ringratiato di tanto favore che ci ha fatto:...
> Hieri fu fatta la coronatione di N. S.re, et lunedi si farà Concistoro, et sarà promosso al Cardinalato detto Mons.r Barberini, onde haveremo un protettore porporato e principale, che possiamo credere debbia anco esser mostro benefattore.[40]

Cassiano dal Pozzo, another member of the Lincei, was Maestro di Camera to Francesco Barberini.[41] The ties between the Lincei and the new Pope and

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[38] Ibid., p. 808. Letter from Stelluti to Galileo, August 12, 1623.

[39] Ibid., p. 814. Letter from Stelluti to Galileo, September 30, 1623.

[40] Galileo, Opere, XIII, p. 133. "This evening the ring was finally given to Monsignor Barberini, who has always been very esteemed by our Holy Father, and has shown that he wished to be numbered among those other Signores, and all together we have thanked him for all the favors that he has done:...
"Yesterday Our Holiness [the Pope] was crowned, and Monday there will be a Consistory and that same Monsignor Barberini will be promoted to the Cardinalate, whence we will have a protector in the purple and the principate who, we are able to believe, should also be our benefactor."

[41] Morghen, p. 376; Gabrieli, "Carteggio Linceo," p. 808. Letter from Stelluti to Galileo, August 12, 1623.

his nephew were strong, and Galileo looked on this connection with hope for the future of the Copernican system.

Galileo wrote a letter to Cesi on October 9, 1623, proposing a visit to Acquasparta and then to Rome to make a personal appeal to Urban.

> Io ho bisogno del consiglio ci V.E. (nella quale piu che in ogno'altro mio Signore confido) circa l'effettuare il mio desiderio, et anco per avventura obbligo, di venire a baciare il piede a S.S.ta; me lo vorrei fare con oportunita, la quale staro aspettando che da lei mi venga accennata. Io raggiro nella mente cose di qualche momento per la republica litteraria, le quali se non si effettuano in questa mirabil congiuntura, non occorre, almeno per quello che si aspetta per la parte mia,...[42]

Tommaso Rinuccini sent encouraging news, saying that he had told the Pope of Galileo's desire to pay homage to him and that the Pope had expressed his pleasure at the prospect of seeing Galileo.[43]

On October 20, a copy of Il saggiatore was presented to the Pope.[44] He was delighted with the book and had portions of it read to him at meals.[45] The opportunity which Galileo had felt demanded expediency was indeed present, but ill health and bad weather prevented his proposed trip to Rome during the fall or winter of 1623. It was not until April of 1624

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[42]Gabrieli, "Carteggio Linceo," p. 817. "I have a great need for counsel from Your Excellency (in whom more than in any other man I confide) concerning the effecting of my desire and also the risk I must take, to go to kiss the foot of Our Holiness; but I wish to do it with expediency, since the opportunity appears to beckon me to him. I have in mind things of no small importance for the learned world, and perhaps can never hope for so wonderful a combination of circumstances as the present to ensure their success, at least so far as I am able to conduce to it. . . ."

[43]Galileo, Opere, XIII, 139. Letter from Rinuccini to Galileo, October 20, 1623.

[44]Ibid., VI, 201.

[45]The Controversy on the Comets of 1618, p. xix.

that circumstances permitted him to take the road to Acquasparta, where Cesi was impatiently awaiting his arrival. He reached the town on April 8, and he remained there until April 22 in the company of Cesi and Francesco Stelluti.[46] Their meeting was saddened by news of the death of Virginio Cesarini in Rome on April 11.[47]

On April 22, Galileo left Acquasparta for Rome, arriving there the next day. During the course of his stay he met with many members of the clergy, including the Cardinal of Santa Susanna, to whom he demonstrated the working of a microscope, and Cardinal Zollern, to whom he later sent a microscope.[48]

With Pope Urban VIII, his friend and admirer, the man who had Il saggiatore read to him at meals, who was benefactor of two members of the Lincei, he had six long interviews in an attempt to get the decree of March 3, 1616, lifted.[49] But his hopes were bitterly disappointed. Urban listened, but nothing in Galileo's arguments could move him from upholding the official position of the Church that Copernicus's theory was an interesting hypothesis but not necessarily the only physical explanation of the universe. Galileo reported his efforts to Cesi in a letter of June 8, 1624.

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[46]Giuseppe Gabriele, "Galileo in Acquasparta," Atti della Reale Accademia d'Italia memorie della classe di scienze morali, e storiche, series VII, III, fasc. 1 (1942), 8.

[47]Ibid.

[48]Gilberto Govi, Il microscopie composto inventato da Galileo (Naples: Tip. della R. Accademia della Scienze Fisiche e Matematiche, 1888), pp. 1, 9.

[49]Gabrieli, "Carteggio Linceo," p. 889.

> Tra gli altri Signori Cardinali, sono stato più volte con molto gusto in particolare con Santa Susanna, Buoncompagno e Zoller.... et mi disse haver parlato con N.S. in materia del Copernico, e come gli heretici sono tutti della sua opinione e l'hanno per certissima, e cho pero è da andar molto circospetto nel venire a determinatione alcuna; al che fu da S. Santità risposto, come Santa Chiesa non l'havea dannata nè era da temer che alcuno fosse mai per dimostrarla necessariamente vera.[50]

Galileo left Rome on June 11, 1624, laden with honors from the Pope but still lacking the one thing that, according to Fahie, was most important to him, the revocation of the decree of March 3, 1616, that would have signified the victory of Copernicanism.[51] All of Cesi's advice and encouragement could not aid him in achieving this goal.

The relationship between Galileo and Cesi seems to have been one of mutual regard. In 1611 when they first met, Cesi was twenty-six and Galileo was forty-seven. In matters of science, Galileo was the master and Cesi the disciple, but in other matters, Galileo willingly accepted Cesi's advice and encouragement. When Cesi desired to know about the Copernican system or about „sunspots„ he learned from Galileo, and when Galileo was doubtful about the reception of his book on sunspots, or when he wished advice concerning the possibility of his obtaining an interview with the Pope, he wrote to Cesi. And Cesi was willing to give him support in any way possible. It was Cesi's money which financed the

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[50] Ibid. "Among other Cardinals, I have been with much joy particularly with Santa Susanna, Buoncompagni, and Zoller . . . and he [Zoller] told me that he had talked with Our Holiness on the matter of Copernicus, and how the heretics are all of this opinion and hold it as truth, and that he however should proceed with much caution in coming to some determination concerning it; to that His Holiness replied that the Church has not condemned nor will condemn it for heresy, but only for temerity, but that it was not from fear that anyone would ever show that it was necessarily true."

[51] Fahie, p. 205.

publication of the Istoria and Cesi's two letters which attempted to make Galileo's Peripatetic attackers look ridiculous, and it was Cesi's home in Acquasparta at which Galileo stopped on his way to Rome in 1624. And when Galileo's mission in Rome failed, it was to Cesi that he wrote expressing his disappointment.

Galileo's knowledge of Cesi's interest in scientific matters prompted him to send Cesi a microscope in 1624 and thus was an influential factor in the production of the Apiarium. The bond between Galileo and Cesi was not only their membership in the Lincei but a close personal friendship which lasted until Cesi's death.

CHAPTER V

THE APIARIUM

In 1625, proclaimed by the Pope as a jubilee year, Galileo was in Florence, and Cesi returned from Acquasparta to his palace in Rome. His chief intellectual occupation during that year was the preparation of the chapter of his proposed encyclopedia of natural history, the Theatrum naturalis, which was to be the Apiarium,[1] the first published work recording observations made with a microscope.

Although Galileo has been credited with the invention of the compound microscope,[2] that invention is more often attributed to a Dutch lens maker named Johannes Janssen, and the date is generally accepted as around 1590.[3] Cornelis Drebbel (1572-1633), mathematical adviser to King James I of England, began making microscopes in London after seeing a Janssen microscope which had been presented to Albert, Archduke of Austria, and one was seen at his house in London in 1619 by William

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[1]Gabrieli, "Cesi," p. 361.

[2]Gilberto Govi, Il microscopie composto inventato da Galileo (Naples: Tip. della R. Accademia della Scienze Fisiche e Matematiche, 1888), pp. 1, 9.

[3]Royal Microscopical Society, Origin and Development of the Microscope, as Illustrated by Catalogues of the Instruments and Accessories, in the Collections of the Royal Microscopical Society, Together with Bilbiographies of Original Authorities, Ed. Alfred N. Disney (London: The Royal Microscopical Society, 1928), p. 91.

Borelius (1591-?), Dutch ambassador to the court of Louis XIV.[4] Christiaan Huygens (1629-1695), the famous Dutch mathematician and astronomer, reported in 1621 that he had heard of the microscopes of Drebbel from people who had seen them in London.[5]

Microscopes found their way to France and Italy in the hands of Giovani Kuffler, brother of the son-in-law of Drebbel, who was sent by Drebbel to demonstrate and sell microscopes on the Continent.[6] Kuffler went first to France, where he showed his wares to the Queen Mother, Marie de Medici, and Nicolas Peiresc (1580-1637), who in a long letter to his son dated May 22, 1622, described the microscope he had seen and the observations he had made with it, noting that movement under the microscope appeared reversed in direction.[7] Peiresc was fascinated by the instrument, and he sent Kuffler and his microscopes on to Rome with a letter of introduction to Geralamo Aleandro (1574-1629), Secretary to Cardinal Bandini, the Cardinal of Santa Suzanna, Cardinal Maffeo Barberini, and anyone else who might be interested in the instrument.[8] Unfortunately, Kuffler died in Italy before he could explain the operation of the instruments he had brought with him. A letter from Periresc to

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[4]Disney, pp. 91, 93.

[5]Christiaan Huygens, Oeuvres complètes de Christiaan Huygens publiées par la Société Hollandaise des Sciences, Vol. XIII, fasc. II, Dioptrique 1685-1692 (La Haye: Martinus Nijhoff, 1916), p. 513.

[6]Gerrit Tierie, Cornelis Drebbel (1572-1633) (Amsterdam: H. J. Paris, 1932), p. 56.

[7]Pierre Humbert, "Peiresc et le microscope," Revue d'Histoire des Sciences et de leur Applications, IV, no. 2 (avril-juin, 1951), 154-58.

[8]Govi, p. 21.

Aleandro dated December 8, 1622, expressed regret at the death of poor Kuffler and also regret that he had not been able to demonstrate the ochiale.[9] Peiresc himself sent two of the microscopes that he had gotten from Kuffler to Aleandro and to the Cardinal of Santa Suzanna, but on February 2, 1624, Aleandro wrote to Peiresc that he and the Cardinal were unable to work the larger instrument even though they had a letter from Peiresc giving instructions for its use.[10] Peiresc wrote a letter again explaining the positioning of the plate on which the object rested so that the object remained directly under the eye, and he noted that movement appeared reversed under the microscope.[11] On May 24, 1624, however, he received a letter from Aleandro, who told him that Galileo had been in Rome and had discovered how the Ochiali worked. He reported also that Galileo had said that he had invented such an instrument, which magnified things 50,000 times so that a fly appeared as big as a hen.[12]

Galileo's microscope seems to have been a product of his work with the telescope, and the telescope and its marvelous discoveries were announced in 1610 when Galileo described in his Sidereus nuncius how he had heard of a "Belga Perspicillum" which magnified objects many times. He decided to make such an instrument for himself, and taking a lead tube he fitted it with a plano-convex lens and a plano-concave lens.[13]

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[9] Ibid.

[10] Ibid., pp. 22-23.

[11] Ibid., pp. 23-24.

[12] Ibid., p. 24.

[13] Galileo Galilei, Sidereus nuncius magne, longeque admirabilis spectacula pandens, suspiciendaque proponens unicuique, praesertim vere

In 1610 John Wodderborn, a student at Padua, wrote of certain observations he had heard of from Galileo, who had described

> . . . the organs of motion and of the senses in the smaller animals; and especially in a certain insect which has its eye covered by a rather thick membrane, which, however, perforated with seven holes, like the visor of a mailed warrior, allows it sight. Here hast thou a new proof that the glass [perspicillum] concentrating its rays enlarges the object. . . .[14]

According to Govi, Galileo's microscope was merely an inversion of his telescope,[15] and thus had a convex objective lens and a concave ocular lens. Although the optical principles of the microscope and telescope differ, it seems from other evidence that Galileo did indeed in some way adapt his telescope to act as a microscope. In 1614 a French priest, Giovanni du Pont, Seigneur de Tarde, reported a conversation with Galileo during which Galileo described a microscope.

> ... le canon du télescope pour voir les estoiles n'est pas long plus de deux piedz, mais pour voir les objetz qui nous sont fort proches et que nous ne pouvons voir à cause de leur petitesse, il faut que le canon aye deux ou trois brasses de longuer.. Avec ce long canon il me dict avoir veu des mouches, qui paroissoient grandes comme un aigneau; et avoit apprins qu'elles sont toutes couvertes de poil, et ont des ongles fort pointues, par le moyen desquelles elles se

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philosophis, atq. astronomis, quae à Galileo patritio Florentino, Patavini gymnasii publico mathematico perspicilli nuper à se reperti benefico sunt observata in lunae facie, fixis innumeris, lacteo circulo, stellis nebulosis, apprime verò in quatuor planetis circa Iovis stellam disparibus intervallis, atque periodis, celeritate mirabili circumvolutis; quos, nemini in hanc usque diem cognitos, novissimè author deprahendit primus; atque medicea sidera nuncupandos decrevit. (Venetiis: Apud Thomam Baglionum, 1610), pp. 6, 6 verso.

[14]John Wodderborn, Quatuor problematum quae Martinus Horky contra nuntium sidereum de quatuor planetis novis disputanda proposuit; confutatio per Joannem Wodderbornium Scotobritannum (Patavii, 1610), quoted in Disney, p. 98.

[15]Govi, p. 4.

> soustienent et cheminent sur le verre, quoique pandu à plomb, mettant la pointe de leur ongle dans les pores du verre.[16]

According to a modern dictionary, a brasse is 1.62 meters. The Galilean telescope when sufficiently extended to act as a microscope would apparently be between ten and sixteen feet long. Galileo himself speaks of the telescope being adapted to see very near objects in Il saggiatore.

> Direi al Sarsi cosa forse nuoua, se cose nuoua se gli potesse dire. Prenda egli qualsiuoglia materia, o sia pietra, o sia legno, o sia metallo, e tendendola al Sole, attentissimamente la rimire, ch'egli si seruira per riguardargli d'un telescopia accomodato per veder gli oggetti vicinizzimi, assai piu distintamente vedera quant'io dico senze verun bisogno, che quei corpi si rivolvano in rugiada, o in vapori umidi.[17]

Govi claims for Galileo the invention of the compound microscope by defining the instrument simply as one having more than one lens, the lenses being separated by a large interval.[18] According to Disney,

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[16]Galileo Galilei, Le opere di Galileo Galilei. Edizione Nazionale Sotto gli Auspicii di sua Maesta il Re d'Italia. 20 vols. (Firenze: Tipografia Barbèra, 1890-1909), XIX, 590. ". . . the tube of a telescope for seeing the stars is no longer than two feet, but for seeing objects that are very near and that we cannot see because of their smallness, it is necessary that the tube be two or three brasses in length. With this long tube he told me that he has seen flies which appear as large as a lamb and has learned that they are all covered with hairs and have very pointed feet, by means of which they keep themselves up and walk on glass, although hanging feet upward, by putting the points of their feet into the pores of the glass."

[17]Galileo Galilei, Il saggiatore nel quale conbilancia esquisita e guista si ponderano le cose contenute nella Libra Astronomicae Filosofica di Lotario Sarsi Sigensano scritto in forma di lettera all'Ill.mo et Rever.mo Mons.re D. Virginio Cesarini Acc.o Linceo M.o di Camera di N. S. dal. Sig. Galileo Galilei Acc.o Linceo nobile fiorentino filosofe e matematico primario del Ser.mo Gran Duca di Toscana (Roma: Appresso Giacomo Mascardi, 1623), p. 105. "I might tell Sarsi something new, if anything new could be told to him. Let him take any substance whatever, be it stone, or wood, or metal, and holding it to the sun, look at it attentively, and he will see all the colors distributed in the most minute particles, and if he will make use of a telescope accommodated for seeing very near objects to examine it, he will see more distinctly what I way without any need for those bodies to dissolve into dew or vapor."

[18]Govi, pp. 1, 9.

however, Galileo's microscope was not a true compound one because the function of the ocular lens was merely to parallelize the rays of light before they reached the eye rather than to invert or reverse the image.[19]

In 1624 Galileo saw the microscope of the Cardinal of Santa Suzanna in Rome and was able to explain its operation to the Cardinal and to Aleandro, even though the instrument was of a different type than the one that he himself had invented. Drebbel's microscope used two convex lenses where Galileo's microscope used a convex objective lens and concave ocular lens. This encounter with a microscope in Rome apparently encouraged Galileo's interest in the instrument. On May 11, 1624, Faber wrote Cesi in Acquasparta:

> Sono stato hier sera col Sig.^{r} Galilei nostro, che habita vicino alla Madalena. Ha dato un bellissimo ochialino al Sig. Card. di Zoller per il Duca di Baviera. Io ho visto una mosca che il Sig.^{r} Galileo stesso mi ha fatto vedere: sono restato attonito, et ho detto al Sig.^{r} Galileo che esso e un altro Creatore, atteso che fossero state create.[20]

In addition to the microscope for the Duke of Bavaria, Galileo also sent microscopes to Bartolemeo Imperali, in Geneva, who acknowledged receipt in a letter dated September 6, 1624, one to Caesar Marsili with an accompanying letter dated December 17, 1624, and one to Cesi with a letter dated September 23, 1624.[21] In his letter to Cesi Galileo wrote:

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[19]Disney, p. 101.

[20]Gabrieli, "Carteggio Linceo," p. 874. "I was yesterday evening with our Signore Galilei, who is living near the [Church of the] Madalene. He has given a very beautiful ochialino [microscope] to Cardinal Zoller for the Duke of Bavaria. I have seen a fly that Signore Galileo himself showed me: they were amazed, and I said to Signore Galileo that he is another Creator because he makes things appear that to this time no one knew had been created." The Cardinal of Zoller was a patron of Faber, as was the Cardinal of Santa Suzanna. See Gabrieli, "Vita.... un medico tedesco in Roma," p. 816.

[21]Reginald S. Clay and Thomas H. Court, The History of the

> Invio a V. E. un occhialino per veder da vicino le cose minime, del quale spero che ella sia per prendersi gusto e trattenimento non piccilo, che cosi accade a me. Ho tardato a mandarlo, perche non l'ho prima ridotto a perfezzione, havendo hauto difficolta in trovare il mod di lavorare i cristalli perfettamenta.[22]

He went on to say that the object to be viewed was to be placed on a mobile platform at the base of the instrument and that the object would have to be moved to get a complete view since the instrument showed only a small part of the object. The distance from the lens to the object would have to be most exact, and the glass would have to be moved nearer and farther away from the object, for which reason the little tube was movable on its stand or guide. Illumination of the object was by sunlight.[23]

In none of his letters does Galileo indicate precisely what kinds of lenses he used, but Govi rejects the idea that Galileo might have adapted Drebbel's microscope which he had seen in Rome.[24] He does say the fact that Galileo apparently did not use his ochialino after 1624 might indicate that he found it inferior to the more powerful and useful instrument that Drebbel had invented.[25]

Microscope Compiled from Original Instruments and Documents, Up to the Introduction of the Achromatic Microscope (London: Charles Griffin and Company, 1932), p. 12; Gabrieli, "Carteggio Linceo," pp. 942-43.

[22]Gabrieli, "Carteggio Linceo," p. 942. "I send you Excellency an occhialino for seeing closely the smallest things, which I hope may give you no small pleasure and entertainment, as it does me. I have been late in sending it because I have not perfected it before, having had difficulty in finding a way to cut the crystals perfectly."

[23]Ibid.

[24]Govi, p. 5.

[25]Ibid.

Allodi describes as a Galilean microscope one having a system of three biconvex lenses, two ocular and one objective.[26] However, there is no firm evidence from which it may be concluded what kind of lens system Galileo used in the microscopes that he gave to Cesi, Marsili, and the Duke of Bavaria, but it seems likely that they were those of his own invention and not Drebbel's.

The Lincei were greatly interested in the new instrument. Faber was responsible for giving it its modern name. In a letter to Cesi written on April 13, 1625, Faber said, "Et perche io fo anche mentione di questo novo ochiale di vedere le cose minute et lo chiamo Microscopio...."[27] Cesi used the instrument for numerous observations. Plano, in his introduction to Colonna's work, mentions the observations that Cesi made of "Semina minutissima,"[28] and in 1628 Faber wrote:

> Hoc oculorũ praesidio Princeps Caesius noster plurimas plantas hactenus à Botanicis sinẽ semine creditas, distinctissimis seminibus luculenter turgentes per Pictorem suum ad hoc operis designatum in cartis delineari curavit. Mirareris in Polypodio minutissimos eos puluisculos foliorum dorso adhaerentes piperis grani magnitudine spectabiles, existimatos hactenus à Natura tantũm cõcessos esse in herbulae ornatum, quos Princeps quidem ante Microscopii usum iamdiu in ibris suis seminis nomine donari debere cẽsuit, & ita huius generis plantas Tergifoetas merito nuncupavit. Sed huic similes innumeras alias Observationes, ac novas penè dixerim, naturas à Principe detectas habebimus, cum olim imperfectarum Stirpium libri sui & lucubrationes lucem aspicient.[29]

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[26]Federico Allodi, Studi e ricerche sui microscopi Galileiani del Museo di Storia della Scienza, Fascicolo I (Firenze: Leo S. Olschki, 1957), pp. 13-14.

[27]Gabrieli, "Carteggio Linceo," p. 1038. "And I also mention his [Galileo's] new ochiale to look at small things and call it microscope. . . ."

[28]Colonna, p. xxi.

[29]Hernandez, p. 757. "With this assistance to the eyes [the

Gabrieli makes reference to an unpublished work by Cesi and Ecchio entitled Icones fungorum.[30] Although Ecchio died around 1620, his contribution to the work seems to have been the collection of observations that he compiled during his travels. In 1785 a three-volume manuscript of text written by Cesi together with drawings of fungi and ferns was discovered in the Albani library at Rome, where Cesi's library and works were deposited some time after his death.[31] Because the Albini library was dispersed during the Napoleonic era, the manuscript is seemingly no longer extent, but in all probability it is the work to which Faber referred in his statement, ". . . cum olim imperfectarum Stirpium libri sui & lucubrationes lucem aspicient," and it is probably also the Icones fungorum to which Gabrieli refers. If it were extant, this work would perhaps be fully as noteworthy a part of the history of seventeenth century microscopy as is the Apiarium.

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microscope], Prince Cesi as author has taken the care to delineate his sketches of plants hitherto considered by Botanists to be seedless, but which are swollen with very distinct seeds. Such is the wonderful and minutely fine dust adhering to the backs of the leaves of the Polypodium fern which appears as big as peppercorns. The prince certainly thought for a long time before the use of the microscope that [this dust] ought to be given the name of seed in his books, and thus be called the plant part of the genus Tergifoetas. We will have countless other observations similar to these made by the Prince when his books and studies of imperfect plants see the light."

[30] Gabrieli, "Alla ricerca," p. 235.

[31] Biographie universelle, VII, 583. Gabrieli mentions the existence of this work and his attempts to locate it in several libraries in Italy and England. He could find no trace of it. See Gabrieli, "Alla ricerca," pp. 240-42 and Giuseppe Gabrieli, "A proposito di cimeli Lincei: due codici iconografici di piante miniate (Mss. Albani-Puteani) nella Bilbioteca Reale di Windsor," Atti della Reale Accademia dei Lincei, Rendiconti, classe di scienze fisiche, matematiche e naturali, series 6, X (1929), 531-38.

The Apiarium was completed by September 26, 1625, when Cesi wrote to Galileo in Florence, enclosing the text of the work and asking him to examine and if necessary to correct it. He indicated at that time that the second part of the work (the drawings) was not yet completed.[32] As he explained to Galileo, "Questo e fatto per significar tanto piu la nostra divotione a'Patroni, et esercitar il nostro particolar studio delle naturali osservationai."[33]

The drawings were completed in December. Faber wrote to Cesi on December 7, 1625:

> .... et rimando li Emblemi per l'Apiario, quale veramente vorrei in orni modo che si stampasse avanti il Natale, accio che con dare le buone feste a quelli Principi e [a] letterati romani, in particolare a questo serenissimo Arciduca, si potesse dare una copia per uno; che so di sicuro che anche Sua Santita et il Cardinale Padrone havrebbero grandissimo gusto. Delle Api ho fatto gia parte questa mattina a Monsig.r Remboldi et al Sig.r Scioppio, et all'uno et l'altro hanno piaciuto fuori di modo.[34]

The Apiarium was presented to the Pope in December of 1625, and Colonna wrote to Cesi, "Mi sono rallegrato intendere che Sua Santita habbi gradito il presente delle imagini dell'Api, e spero piu li piacera l'historia et alogi di quelle; il che sto aspettando sentire."[35] According

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[32]Gabrieli, "Carteggio Linceo," p. 1066.

[33]Ibid. "It has been done to show our very great devotion to the Pope and to exercise our particular study of natural observation."

[34]Ibid., p. 1075. ". . . I am sending the Emblems for the Apiarium, which I wish would be printed before Christmas so that it could be given on that holiday to those Princes and Roman literary men, in particular to that serene Archduke, if you are able to give a copy to him; and so that His Holiness also and the chief Cardinal might certainly have the greatest joy. Of the bees, I have already sent copies this morning to Monsignor Remboldi and to Signor Scioppio, and both have been unusually pleased."

[35]Gabrieli, "Carteggio Linceo," p. 1077. Letter from Colonna to

to Odescalchi, the work as a whole was not published until the first part of 1626.[36] On January 10 Stelluti wrote to Galileo, "Il Sig.r Principe fa stampare alcune cose intorno alla materia d'api, quali manderò insieme con altre copie di quelle figure."[37] On March 14, 1626, Stelluti wrote again to Galileo telling him that Cesi was sending him:

> . . . un suo foglio grande, che e l'Apiario, fatto da S.E. per far cosa grata a N.S.re, trattando diffusamente degli Api, ma pero in ristretto, non comportando il foglio maggior lunghezza; tre operette dei Sig. Ricquio nostro, dove in versi spiega il significato di alcuna medaglie antiche ritrovate con la figura dell'ape, e sei fogli di quelle api intagliati in rame: che dal detto Sig.r Guiducci si fara consegnare il tutto. Il S.gr Principe non ha voluto publicare detto suo foglio se non a N.S.re, ad alcuni di Palazzo et ad amici, essendo questo una parte della sua opera grande. He pero voluto mandarlo anche a V.S. et al Sig. Guiducci.[38]

The poems by Ricchio were not published as part of the Apiarium but separately as the Apes Dianiae.[39] A photocopy of a manuscript titled Apes Dianiae from the library of the Reale Accademia dei Lincei shows one

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Cesi, December 19, 1625. "I have been gladdened to hear that His Holiness has welcomed the present of the likenesses of bees, and I hope that the history and panegryic to them will please him more; I am expecting to hear it."

[36]Odescalchi, p. 181.

[37]Galileo, Opere, XIII, 300. "The Prince has had printed some other things concerning the material on bees, which I will send together with other copies of the figure."

[38]Gabrieli, "Carteggio Linceo," p. 1110. ". . . a large page, which is the Apiarium, done by him (Cesi) as a thing pleasing to our Holiness (Urban VIII), treating diffusely of the bee, but in summary, not affording a page of greater length; three small works of Signore Ricchio, where in verse he explains the significance of certain ancient medallions found with the figure of the bee, and six pages of that bee engraved on copper: which will all be delivered by Signore Guiducci. The Prince has not wished to publish his page except for our Holiness, certain others at the Palace, and his friends, since it is a part of his great work. However, he has wished to send it to Your Excellency and to Signore Guiducci."

[39]Ibid.; Gabrieli, "Ricchio," p. 152.

draft and one revision of a ninety-three line Elegia to Urban VIII, a ten line Epigramma and a ten line dedicatory poem. The subjects of the Elegia are mythological, and in the entire manuscript only one reference describes one of the medallions of the Apiarium. Line nineteen of the elegy speaks of the Palestinian stag under the shelter of a palm.[40]

The idea that the Apiarium was intended for limited distribution is corroborated by a letter from Colonna to Cesi.

> Con grandissimo gusto ho data una occhiata per adesso all' Apiario che molto mi ha dato gusto non solo la divisione delle differenze et proprieta dell'Api, ma li circonscritti elogii et attributi, quali poicha l'havera veduti il Sig. Mario Schipani, le godero piu minutamente osservandoli, et in vero la lettura e scommoda assai. Ma se V. Ecc.za gia l'ha presentati a sua beatitudine et al Sig. Cardinal Nipote, non ci farei altro, poiche questa edizione non e stata fatta per altro fine se non per dar gusto a patroni, et non per dar in luce una particella della sui fatighe. ...[41]

The fact that only three known copies of the text and two of the plate of drawings exist today would seem to be evidence of the rarity of the Apiarium, a condition stemming perhaps from a limited printing.[42]

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[40]The title on the first page of the manuscript is, "Apes Dianiae in Monimentis Veterum nouiter observata: elegiacum poema sanctiss. principis Urbana VIII. pont. opt. max. sacrum. Auctore Iusto Riquio Belga."

[41]Gabrieli, "Carteggio Linceo," p. 1100. Letter from Colonno to Cesi, February 13, 1626. "With the greatest joy I have glanced just now at the Apiarium, which has given me much pleasure not only in the sections on the differences and peculiarities of bees but also in the circumscribed panegyrics and the emblems, which, since Sig. Mario Schipani has seen them, I will enjoy observing most minutely; in truth the reading is rather troublesom. But if your excellency has already presented it to his Holiness and to the Cardinal Nephew, let it not be otherwise, since this edition has not been done for any other end than to give joy to the Pope, and not to make public a small part of your labors. . . ."

[42]A copy of both text and plate is in the Lancasi Library in Rome. A copy of the plate (cropped on the lower edge and the left-hand side) is in the possession of the Scottish Beekeepers Association and is housed in the Edinburgh Public Library. A copy of the text is in the possession of

The peculiar nature of the Apiarium as a work of scientific and literary import cannot be adequately conveyed simply by a discussion of the text. A reproduction of the full Latin text with a translation is the only way to do justice to the work, and to the knowledge of the writer, no translation of the Apiarium has even been made before. The torturous quality of parts of the Latin makes translation difficult at times, if not impossible, and the Latin is reproduced so that the reader may form his own opinion of Cesi's style of writing and meaning in those parts of the text where the translation seems obscure. Since there are, to the writer's knowledge again, only three extant copies of the text of the Apiarium, it is hoped that this reproduction and translation will be of value in making the work available to scholars who might be interested in its role in the history of microscopy and the history of the Accademia dei Lincei.

The Apiarium is composed of two large sheets, one the text, written by Cesi, and the other the figures, drawn by Stelluti and engraved on copper plates by Mathias Greuter (1564?-1638). The page of text is actually four sheets glued together, and the text within its margins measures thirty-nine and one-half by twenty-five inches. The plate of drawings in the possession of the Scottish Beekeepers Association, which has been slightly cropped around the lower and left hand edges, measures twelve and one-half by ten inches. At the top of the page of text are the medallions mentioned by Stelluti.[43] They are arranged in pairs which

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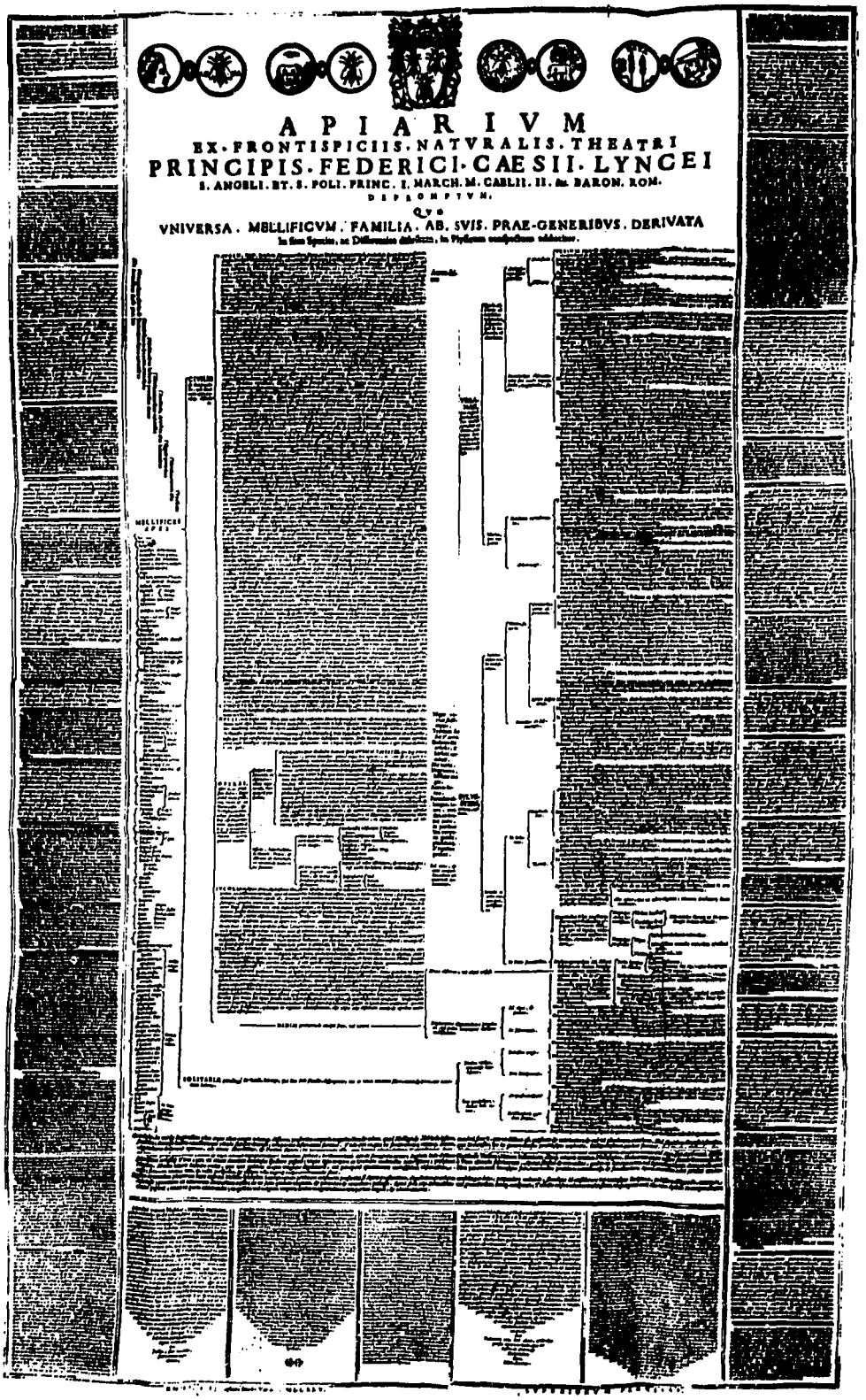
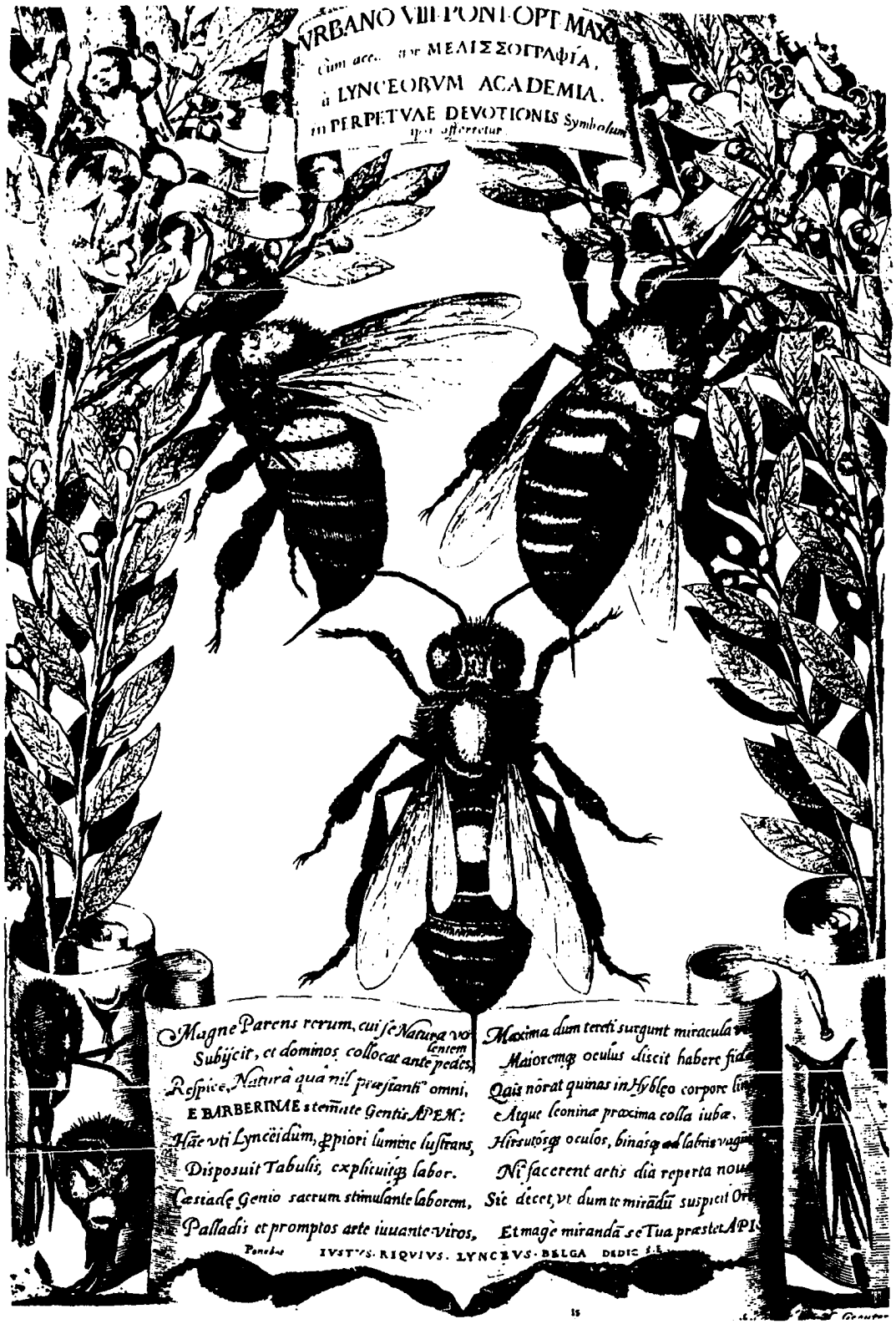
the Marucelliani Library in Florence (No. 4.A.II.90), and a copy of the text is part of the History of Science Collections of the University of Oklahoma, Norman, Oklahoma.

[43]Cf. Illustration on p. 90.


APIARIVM
EX. FRONTISPICIIS. NATVRALIS. THEATRI
PRINCIPIS. FEDERICI. CAESII. LYNCEI
S. ANGELI. ET. S. POLI. PRINC. I. MARCH. M. CABLII. II. &c. BARON. ROM.
DEPROMPTVM.
Quo
VNIVERSA. MELLIFICVM. FAMILIA. AB. SVIS. PRAE-GENERIBVS. DERIVATA


VRBANO VIII PONT OPT MAX
cùm acc... ...ae MELISSOGRAPHIA,
à LYNCEORVM ACADEMIA,
in PERPETVAE DEVOTIONIS Symbolum
...ere...
Magne Parens rerum, cui se Natura vo- lentem
Subijcit, et dominos collocat ante pedes,
Respice, Naturâ quâ nil præstantiꝰ omni,
E BARBERINAE stemmate Gentis APEM:
Hãc vti Lynceïdum, ꝓpriori lumine lustrans,
Disposuit Tabulis, explicuitq; labor.
Cæsiadę Genio sacrum stimulante laborem,
Palladis et promptos arte iuuante viros,
Maxima dum tereti surgunt miracula v...
Maioremq; oculus discit habere fid...
Quis norat quinas in Hybleo corpore li...
Atque leoninæ proxima colla iubæ,
Hirsutosq; oculos, binasq; ad labris vagi...
Ni facerent artis dia reperta nou...
Sic decet, vt dum te mirãdũ suspicit Or...
Et magè mirandã se Tua præstet API...
Ponebat IVSTVS RIQVIVS LYNCEVS BELGA DEDIC ...

perhaps represent the reverse and obverse of coins. The third set of medallions, with the bee on one side and the deer on the other, represents the coin of Ephesus,[44] and the last set represents the coin of the Metapontians, which as pictured by Sutherland has the wheat heads and the head of Heracles but not the bee.[45] Aldrovandi, in his book on insects, uses drawings which correspond exactly to the third set and the last set.[46] Cesi's familiarity with ancient coins was perhaps a result of his interest in archeology, and on page of the translation, he speaks of the coins of the Brutti and the coins of the Metapontians.

In the center of the page, between these sets of medallions, is the Barberini crest, three bees surmounted by the papal crown and keys to indicate that the work is dedicated to Maffeo Barberini. Immediately below is the title of the work which reads:

> The Bee-Hive from the Frontispiece of the Natural Theatre of Prince Federico Cesi Lincei Prince of San Angeli and San Polo. I. March[ese] of M[onti] celli. II. A Roman Noble, Descendent [Grandson] of G.[iacomo] C.[esi], who is dedicated to the Universal Honey-Making Family Derived from its First Generation, Distributed in its Species and Differences in the Visible Natural World.[47]

The dedication of the work, which appears on the plate of drawings, was

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[44]A. R. Burns, Money and Monetary Policy in Early Times (New York: Alfred A. Knopf, 1927), facing p. 116.

[45]C. H. V. Sutherland, Art in Coinage: The Aesthetics of Money from Greece to the Present Day (New York: Philosophical Library, 1956), p. 21.

[46]Ulysse Aldrovandi, De animalibus insectis libri septem, cum singulorum iconibus ad vivum expressis. Autore Ulysse Aldrovando in almo gymnasio Bonon: rerum naturalium professore ordinario ad Sereniss. Franc. Mariam Secundum, Urbini ducem sextum, cum indice copiosissimo. (Bonon: Apud Clementem Ferronium, 1638), pp. 112-113.

[47]The bracketed material is supplied from Gabrieli, "Cesi," p. 352.

the work of Ricchio, and his name appears at the bottom of that page, "Iustus Riquius Lynceus Belga Dedic. S. E."

The text itself is divided into paragraphs composing sections that correspond to chapters. Two long sections occupy the center of the page. Across the bottom of the sheet beneath these center sections are five small sections that constitute yet another chapter. Along the left hand side of the two center sections is a series of brachets and classifications that organize the material within them. This organization by brackets is very similar to that in the Tabulae phytosophicae, which appears in the Rerum medicarum, and the similarity of form between the two works would seem to indicate that they were to be parts of a larger work, the Theatrum naturalis.

Cesi begins the Apiarium with a pun, using the terms urbanas and barbaras for Pliny's urbanarum (domestic) and rusticae (wild) bees.[48] This is a play upon the name of Maffeo Barberini, Pope Urban VIII. Another pun is a very elaborate one on favo (honeycomb), favoris (favor), and favonius (west wind). At this point the intricacy of the play on words serves to obscure the meaning of the passage.[49] Cesi uses puns or plays on the meanings of words in several other instances to produce effects that are more literary than scientific.

The address to Pliny in the first line sets a tone that continues throughout much of the work--an appeal to classical authority. Much that Cesi says in the section concerning the habits of bees can be found in

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[48]Cf. 1. 2.

[49]Cf. 11. 142-146.

Pliny--the classification of wild and domestic bees.[50] the notion that the king is sometimes carried on the shoulders of his subjects,[51] the regular hours for sleep and meals.[52] Aristotle, also, is a source upon whom Cesi seems to rely heavily. For instance, it is from Aristotle and Pliny that the idea comes that bees use small pebbles, carried in their feet, as ballast when they fly in high winds.[53] Also derived from Aristotle are the ideas that bees drive unproductive drones out of the hive,[54] that bees can tell the approach of rough weather,[55] and that bees feed on only one kind of flower at a time.[56]

Mythological references, again a device more literary than scientific, form an important part of this first section. The kindness of bees is exemplified by their protection of the infant Jupiter in a cave on Mount Ida.[57] The medicinal value of honey is shown by the legend that a swarm of bees flew around and settled on the coffin of Hippocrates at his funeral rites.[58] The theory that honey was a juice falling from the sky (taken from Pliny),[59] leads Cesi to compare it with the golden showers of coins in which form Jupiter visited the maiden Danae,[60] or the golden showers which fell on Rhodes at the birth of Minerva.[61]

The first main section of the text contains little if any information that is original, and that might be of scientific note. There

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[50] Cf. 1. 2.

[51] Cf. 1. 23-24.

[52] Cf. 11. 27-28.

[53] Cf. 1. 71-72.

[54] Cf. 1. 29-31.

[55] Cf. 1. 76-77.

[56] Cf. 1. 87-88.

[57] Cf. 1. 148-151.

[58] Cf. 11. 264-266.

[59] Cf. 11. 274-275.

[60] Cf. 1. 288-289.

[61] Cf. 1. 289-290.

is one reference to Metl, a plant from Mexico which gives off a sweet sap,[62] but apart from this information, which appeared later in the Rerum medicarum, the treatment of bees and honey is carried out almost wholly with reference to classical authorities and with legendary and mythological allusions. The whole tone of this section is one of praise for bees, as, for example, the following passages: "Ab hisce Volucellis, praeter ipsam morum puritatem, pribitatem. . ..."[63] and "Parva ipsa hisce multis magnisque iure merito titulis condecoratur; quos & ipsa magis, magisque parvitas extollit."[64]

The left hand column of the middle section is concerned chiefly with the embryology of the bee, although this term is certainly too modern for Cesi's description of the process that goes on. He begins with a fairly straightforward account of the way in which the king, or father of the hive, can be recognized. Here his sources are again primarily classical authorities, i.e., Aristotle, Pliny, Columella and Aelian, and he brings up the controversy over whether the king has a sting or not.[65] Cesi himself seems to have no definite opinion on the matter.

As to the generation of the bee, Cesi agrees with Pliny, Aristotle,, and Cardano that the bee is created from honey.

> Succo materia praegnans, haud aequè disposita, . . . ut madore ab ipso, dum evaporatio impeditur, primùm calores concipiat, qui in

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[62]Cf. 1. 322.

[63]Cf. 11. 13-14. "Also learn purity of morals and honesty from these Swift-flying creatures. . . ."

[64]Cf. 11. 128-130. "This very small bee is adorned by many great titles, which are certainly merited, and even the small size of bees praises them the more.

[65]Cf. 11. 332-336.

> meditullijs pulsent & cieant. . . . aliae atque aliae contexuntur superinductae figurae, ad organorum usque claustra. . . .[66]

The role of the king bee in this process is one that Cesi describes as ". . . seminalibus etiam ab eo spiritibus immissis, . . ."[67] These seminal spirits begin the heat within the matter from which the bee springs, a notion that Cesi shares with Scaliger, although he is not in full agreement with Scaliger's explanation of the forming of the bee.[68] According to Cesi, the bee attains its final form through a process involving the change from a worm to a nymph to the bee.

> Progressus à vermiculo est, quasi germine, maturante natura in ovi initium praemisso, inde quasi in ovum conglobato, ad complementum conclusa quiescente Nympha, & vires constitutis principijs sumente; tandem promissis cruribus & brachijs protensi, in Apem ventum.[69]

This theory, although not explained in any real detail and therefore available only for conjecture as to its full implications, seems to fall into the category of a preformation theory--that the bee is already formed in its initial stage and grows through accretion rather than by metamorphosis.[70]

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[66]Cf. 11. 355-363. "The material, swollen with juice, is not nicely arranged. . . . Since it is suffused by moisture, at first it contains heats which by evaporation pulse and quicken. . . . Now the one and now the other of the forms caused by the heat are united for the completion of the organs."

[67]Cf. 11. 420-421. ". . . seminal spirits injected by the king "

[68]Cf. 11. 435-436.

[69]Cf. 11. 482-490. "It has progressed, like a bud maturing in nature, from a little worm at the beginning which turns into an egg, where it is gathered up into a round ball, as if in an egg. At its complection it encloses a resting nymph which gathers strength from its chief components. When at last arms and legs have grown out and its other parts have been stretched forth, it is made into the bee."

[70]Jan Swammerdam, The Book of Nature; or, the History of Insects:

According to Nordenskiöld, the preformation theory was very influential in the period immediately succeeding its advancement by Swammerdam.[71] There is a similarity between Cesi's and Swammerdam's descriptions of the nature of the process of completion of the bee. In the passage quoted above, Cesi speaks of the resting nymph gathering strength from its chief components and of the stretching forth of the arms and legs and other parts. There are two chief agencies of the change, according to Cesi. These are the moist material and the heat from the seminal spirits injected into it by the king.[72] Swammerdam also notes the effects of moisture and heat on the emerging bee in the following passages:

> The Worm, whilst at rest in the manner just mentioned swells considerably about the breast, but not so much about the head; and after this it begins likewise by degrees to grow thicker, and to swell out about the second and third annular incision: the reason of this is, because the limbs of it, which have increased inwardly, are insensibly distended with fluids.[73]

and

> . . . besides that, the operculum or cover of wax contributes much to preserve the heat by the assistance of which both the evaporation of the superfluous moisture and the subsequent change of the Nymph into a Bee are promoted.[74]

Reduced to Distinct Classes, Confirmed by Particular Instances, Displayed in the Anatomical Analysis of Many Species, and Illustrated with Copper-plates. Including the Generation of the Frog, the History of the Ephemerus, the Change of Flies; Butterflies, and Beetles; with the Original Discovery of the Milk-vessels of the Cuttle-fish, and Many Other Curious Particulars by John Swammerdam, M.D. with the Life of the Author by Herman Boerhaave, M.D. Translated from the Dutch and Latin original by Thomas Flloyd. Revised and improved by notes from Reaumur and others by John Hill (London: Printed for C. G. Seyffert, 1758), pp. 172-173.

[71] Nordenskiöld, p. 170.

[72] Cf. 11. 408-414 and 11. 420-426.

[73] Swammerdam, p. 179.

[74] Ibid.

and

> The creature is in this state of the Nymph excessively, nay amazingly tender; for almost all its limbs are extended and inflated with abundant humidity; . . .[75]

On the basis of a comparison between the two, Cesi's theory of bee formation can be considered as an early example of the preformation view expressed by Swammerdam in 1673.[76] However, Swammerdam's description of the development from worm to nymph to bee is based upon exhaustive observation and dissection, while Cesi's description is based largely on the concept of seminal spirits--a vitalistic theory of an intangible thing that could not be examined by observation.

In the matter of the reproduction of bees, Cesi expresses the same lack of certainty that characterizes the work of Pliny and Aristotle.[77] He mentions the ideas that the bees might reproduce by means of sexual intercourse. "In quo tertius nascendi modus, qui mirabiliter priores, parentum se commiscentium unione, vel coitus aut concalefactorum mixtione vel coniunctione provenientes; . . ."[78] It will be noted that Cesi still refers to the king bee--a tradition evidently dating from Aristotle. It was not until Butler wrote his Feminin' Monarchi' that the idea of the

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[75] Ibid., p. 180.

[76] Ibid., p. 160. Much of Swammerdam's research was done in 1673 although the original Dutch edition of the Book of Nature appeared in 1737-38.

[77] Cf. 11. 345-47 and 11. 521-524.

[78] Cf. 11. 524-427. "The third manner of bringing forth young, which is as remarkable as the others, is the generation from the union of the parents, either in intercourse or in a mixture of warm substances, or a begetting from this conjuncture."

female sex of the ruler of the hive was put forth.[79] Butler's theory of reproduction was a sexual one, but according to him, the drones, which were male, impregnated the worker bees, which were female.[80] Swammerdam realized that the queen bee, whose sex he ascertained by dissection, was the mother of the whole brood of new bees, and he recognized the role of the drone as the male responsible for fertilizing the queen.[81] However, he believed that no actual copulation took place but that the queen was impregnated merely by the effluvium of the male sperm.[82] Cesi's mention of sexual intercourse among bees is no more than a mention, and again, there is no evidence of an observational basis for the assertion that such intercourse does take place.

Following the discussion of the reproduction of bees there is a fairly long descriptive passage concerning various classes of bees. The material for this passage is drawn largely from the works of Pliny, Aristotle, and Aelian[83] and contains no new information.

From this entire section of the work one can conclude that Cesi draws much of his information from classical authorities. There is no mention of personal observation of bees. In the passages concerning the reproduction of bees, there are glimmerings of theories which were later

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[79]Charles Butler, The Feminin' Monarchi', or the Histori of Bees Shewing their Admirable Natur', and Propertis'; their Generation and Colonis' their Government, Loyalti, Art, Industri; Enemi's, Wars, Magnanimiti, &c. Together with the Right Ordering of Them from Tim' to Tim'; and the Fruit of Profit Arising Ther'of (Oxford: Printed by William Turner for the Author, 1634), p. 4.

[80]Ibid., pp. 55-56, 61.

[81]Swammerdam, pp. 160, 166.

[82]Ibid., p. 187

[83]Cf. 11. 525-647, 537-662.

developed in much greater detail by Jan Swammerdam, but they are only glimmerings in the depths of Cesi's rather murky prose. These passages are descriptive of what goes on in the development of bees, but there are no explanations offered as to why things take place in the way they do. There is no real scientific merit in any of the material of this section.

The section is typical of the work as a whole in its recurrent praise of bees. For example, "non igitur aliud quidquam in paterno prolis edendae munere desideres, sed potius Patrem admireris, qui non molliores ullos lusus, non vesanae irritamente libidinis cognoscat, nec immunidtias aut veneres ullas. . . ."[84] Cesi also mentions the duties of the king.

> Populum qui sibi milites, famulos, administros, & quidem filios omnes ex voto, fabrefacit; quibus pleno iure imperitat; quibus ad opificia, & officia industriè utatur. Nec alijs operarum laboribus ullis, aut curis dignis minus, sed summis tantum negotijs addicitur, scilicet Populis regendis atque condendis.[85]

The right hand column of the middle section continues the description of various kinds of bees--in this instance, however, discussing both their physical characteristics and their role in the hive and also their customs. The section is a compilation of information from many sources, beginning as it does with descriptions from Pliny,

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[84]Cf. 11. 438-441. "You might ask nothing more of the paternal office than the production of offspring, but you must admire more the father who knows no easier sports, no excitement of lustful madness, no impurities or veneries."

[85]Cf. 11. 531-536. "He most skillfully makes the beings who are his soldiers, slaves, administrators, and even sons according to the oath, whom he rules with full rights and whom he industriously employs in works and duties. He does not take on any other labors or any cares of less importance than the greatest occupations, the actual ruling and keeping together of the people."

Aristotle, Columella, and Albertus Magnus.[86] Mention is made of observation such as "Magis autem & opere, & corpore validas, Apulas existememus; quas ad Cerinolani Castri moenia, Doctrina, & Genere conspicuus D. Fabius Columna Lynceus observavit; faracissimas illas Apes, & mellis, & sobolis, nobis retulit, ut decem e quovis Alveario, per brevi tempore examina prolifirent."[87] and "Nam interdum & nostratium in domorum partibus, vel etiam cavaedijs, examina confedisse compertum: quod meis in aedibus non sine gaudio, utpote omni animi studio & propensione ipsis addictus, observavi:. . ."[88]

These two instances of observation could hardly be classified as scientific, especially when Cesi is more interested in the zeal and inclination of the spirits of the bees than in the description of the bees themselves. The most interesting part of this section is that which deals with contemporary accounts of bees of the new world. Recchio is mentioned[87] together with his descriptions of Mexican bees such as the Tlalpipioli, Micatzonte camimiaoatl, Tlalneuhtli, and Acomimiaoatl.[90]

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[86]Cf. 11. 663-678.

[87]Cf. 11. 692-696. "We must judge the Apulian bees as the stronger, however, both in their work and in their bodies. D. Fabio Colonna, who is noted for his teaching and his character, has observed them at the walls of the camp of Cerinolani. He brought back to us those bees which are so fruitful both in honey and in offspring that from any beehive ten swarms will proliferate in a very short time."

[88]Cf. 11. 752-755. "Now I have observed at times and in parts of our native homes, or even in caves, that swarms have been tamed. I have observed this phenomenon even in my own buildings, not without delight, inasmuch as the zeal and inclination of each spirit is added to the very buildings."

[89]Cf. 11. 795.

[90]Cf. 11. 810, 819-822, 823-825, and 872-874.

Also mentioned in Gregoire de Bolivar, a French Franciscan who spent some time as a missionary to the New World. He was evidently a friend of Faber, and Cesi says: "Confirmat & voce P. Gregorius Bolivar . . . ." about descriptions of Mexican bees given by Recchi.[91] Hans Staden's observations of Brazilian bees are also mentioned,[92] as are those of other New World explorers.

This compilation of reports of New World bees contains information that was not available from other published sources. Recchio's epitome of the Hernandez work (Rerum medicarum) was not publishes until 1628, and Bolivar's observations were communicated orally, probably to Faber. Therefore, it may be said that in this respect, the Apiarium aids in the dissemination of new scientific information.

After having spent two sections of the text discussing the reproduction of bees and the various kinds of bees, Cesi at last draws a conclusion:

> Concludas, in varijs Regionibus alias atque alias magis minusq. differe, praesertim corporis magnitudine, & colore. quod Melligo, & Mel inde ipsum, maxime fecerit, quo ut dictum est, constant & nutriuntur; & cui ut plurimum concolores.[93]

In terms of Cesi's lengthy discussion of reproduction of bees and of various species of bees, this conclusion would be consistent because Cesi, after all, did believe that the offspring were generated from the honey

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[91]Cf. 1. 799. "And P. Gregoire de Bolivar . . . confirms it orally."

[92]Cf. 11. 859-866.

[93]Cf. 11. 962-965. "You must conclude that in various regions one [bee] differs more or less from another, particularly in the size of its body and in color, because they are formed from the honey-like juice and the honey by which, it is said, they are nourished and they depend upon and to which they are similar in color."

gathered by bees. However, the conclusion cannot be justified as a scientific one. The evidence that Cesi offers is not enough to support his conclusion. Although he mentions the Albus Ponticus of Aristotle and Pliny, a bee which is white and produces white honey,[94] this is the only specific reference connecting the color of bees with the honey that they produce. There is no specific reference to the color of the honey that produces bees. Thus Cesi's conclusion is unsupported by any of the evidence he offers.

In the extreme right hand section of the Apiarium, one comes at last to the mention of the microscope. Here one might expect from Cesi, with a new instrument at his disposal, a rather thorough examination of the external and perhaps internal anatomy of the bee. And indeed, there is a description of the eyes, the proboscis, and the legs of the bee. A comparison of the descriptions in the Apiarium and in the translation of the Satires of Perseus, published by Stelluti in 1630, will give some indication of the difference between a scientific, i.e., precise, objective, and complete description and the limited description couched in literary terms that Cesi gives.

The drawings of the Apiarium and those of the Persius are closely related in origin as well as in form. A plate of the drawings from the Persius book is reproduced on the following page. According to Allessandrini, the archives of the Lincei contain a small volume which is apparently the manuscript of a new and expanded edition of the Apiarium in the form of a book--a smaller and more manageable form than the broadside. On page 5r of that volume is a drawing of bees observed with

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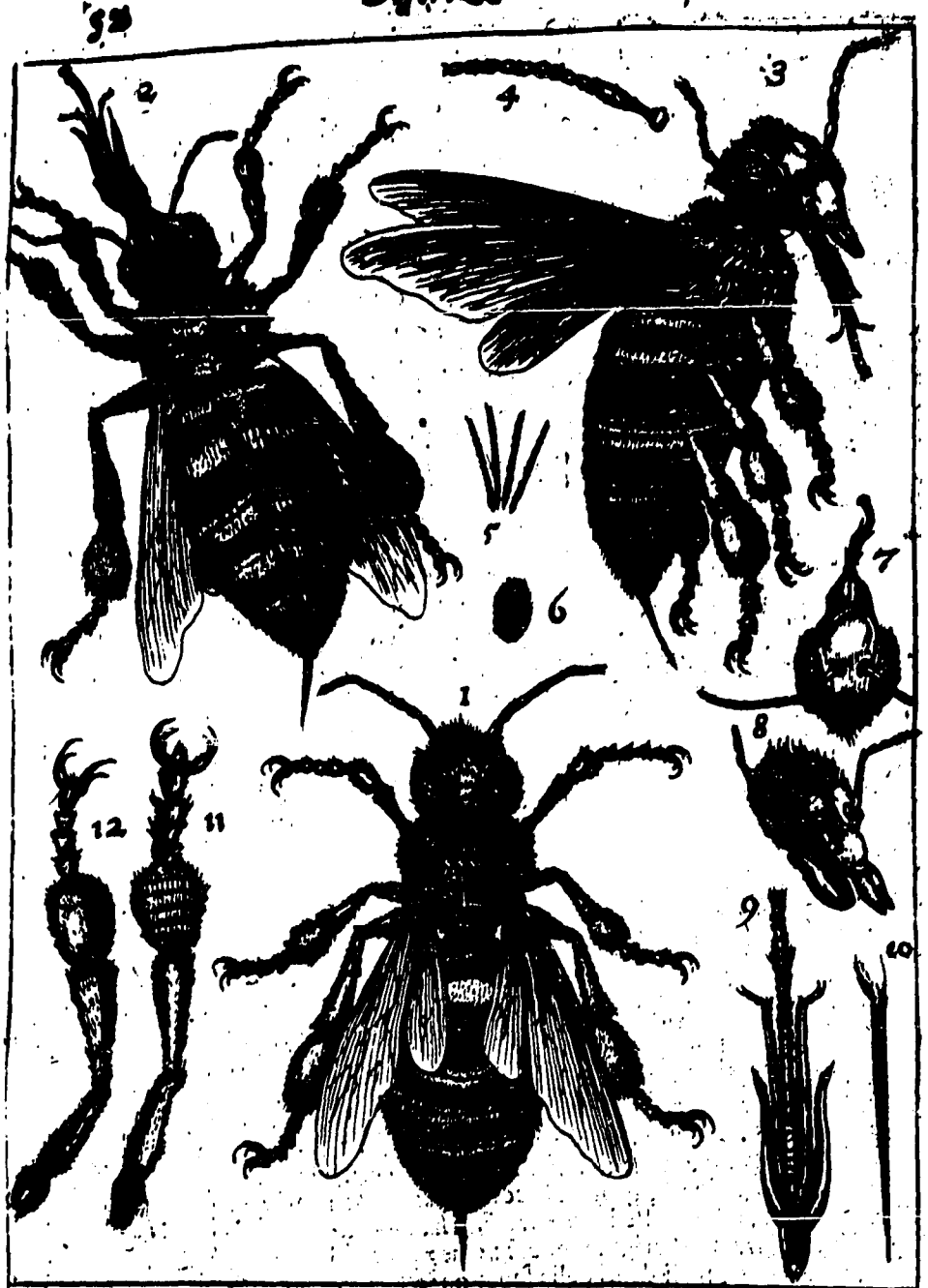
[94]Cf. 11. 706-708.

Descrizzione



1 Ape in atto di camminare.	7. Testa co tutte le sue parti.	10. Aculeo, ouero Spina
2. Ape supino	8. Testa con la lingua ripiegata uerso la gola	11. Gamba che mostra la parte interiore.
3 Ape che mostra il fianco	9. Lingua con le sue 4 linguette, o guaine che l'abbracciano	12. Gamba dalla banda esteriore.
4. Corno.		
5. Penne dell'Ape		
6. Occhio tutto peloso.		

a microscope, the same drawing that subsequently appeared in the Persius book.[95]

Stelluti's description of bees is much more thorough, more detailed, and more straightforward than Cesi's. Since the drawings differ from those of the Apiarium, it appears that they are based on observations made by Colonna, who evidently had a microscope of his own. He wrote to Cesi on January 5, 1626:

> Et però mi sono posto a disegnar il rostro dell'Ape napolitana, qual e diverso forsi dalla romana, che n'accennai al signor Stelluti, che l'avesse meglio osservata, e non me ne ha risposto cosa alcuna; hora havendo veduto le stampe di rame che hanno la diversità dalla mia, ho voluto mandarla a V.E. La quale, come che di quella fa l'historia con le differenze sue, che osservi di nuovo il rostro della romana, se sia cosi articolato nella lingue, et se habbi l'interno rostro cosi rivolto et diviso negli estremi, accio osservato di nuovo et essendo differente, il che non credo, se si facci diligenza con una pujta d' spilla aprir li rostri et dilatarli, alla luce del sole osservar la lingua, la qual credero che il suo Microscopio, per esser miglior assai piu del mio, la chiarische meglio. Questo ho voluto avisar V.E., perche così devo far per il mio obligo.[96]

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[95]Ada Alessandrini, "Cimeli Lincei in mostra nella biblioteca accademica," Atti della Accademia Nazionale dei Lincei, rendiconti classe di scienze morali, storiche e filologiche, Series 8, XI, fasc. 7-10 (luglio-ottobre, 1956), 239-40; [Persius], p. 52.

[96]Gabrieli, "Carteggio Linceo," p. 1085. "However, I have set myself to point out that the beak of the Neapolitan bee is very different from that of the Roman, as I would indicate to Signor Stelluti, so that he might observe it better, and he has not replied anything to me; now having seen the print of the engraving, which is different than mine, I wish to send [my observations] to you. Those, which show the story with its differences and which I have observed anew, show that it is articulated in the tongue, and it has an inner beak sharply bent and divided in its extremity, things which I have observed recently as being different. If you do not believe, open the tongue carefully with the point of a pin and spread it, and observe the tongue by the light of the sun. Your microscope, being very much better than mine, will show these things better. I have wished to inform you of this because I ought to do such because it is my obligation."

Colonna pointed out in another letter the difference in the tongues of Neapolitan and Roman bees. This letter was written to Stelluti on March 20, 1626.

> Se V.S. osservera la punta della lingua dell'Ape fresca, trovera che vi e l'acetabulo, et io h'ho veduto et osservato bene.
> Qui e il signor Castelli con Fra Donata De Eremita, a Dominican priest , et una volta m'ha ragionato, che non ho avuto piu tempo; mostra haver osservato molte cose dell'insetti pennati et senza penne. Voglio vederle un giorno.[97]

The two inner parts of the mouth of the Apiarium bees are flexible but are straight and do not have segments; the Persius bees have two small segments at the ends of each of these mouth parts, and the end segment of each part is divided at the tip. This drawing corresponds, then, to Colonna's description of the mouth in his letter to Cesi of January 5, 1626. At the very end of the tongue of the Persius bee is a small, round, bead-like object that does not appear on the Apiarium drawing. There are two views of the head by itself in the Persius drawing, and only one in the Apiarium, and among the details in the Persius drawings are three small, feathery objects labeled "penne del'Ape" (feathers of the bee) that are not found in the Apiarium. Stelluti describes the bees as having feathers on their backs, sides, and breasts.[98]

There are other differences in the drawings. The Apiarium bees have three long claw-like appendages on the end of each limb; the Persius

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[97] Ibid., p. 1111. "If you will observe the tip of the tongue of the bee anew, you will find that it is somewhat sharp, and I have seen and observed it well.
"Signor Castelli is here with Fra Donato, and he has discussed with me once what I have never had more time [to see]; he showed that he had observed many things about insects with and without feathers. I wish to see them one day."

[98] Persius , p. 54.

bees have two short claws extending from each of two finger-like appendages that grow out of the last segment of the leg.

Stelluti's text is purely descriptive of the bee's external physiology and makes no mention of its habits and its home life. It is an extremely detailed description of the entire body of the bee and its smallest parts, and it could not have been made without a microscope. Stelluti also describes briefly and gives a small drawing of a weevil.[99]

Several members of the Lincei were involved in Stelluti's work. The book was dedicated to Francesco Barberini. Ricchio wrote a short poem praising Stelluti, and the observations were made by Stelluti, Francesco Fontana, and Colonna while the drawings were done by Fontana and printed in Rome from copper plates.[100]

Where Cesi refers to the eyes thus: "Oculi modo in aureos perpulchros fritillos reticuli specie, consignati apparent, hirtis distinguentibus per lineolas pilis,"[101] Stelluti says:

> Delle tre parti della testa, le due quasi son occupatè dagli occhi, quali sono assai grandi, & ovati, havendo la parte più acuta dalla banda inferiore della testa. Son tutti pelosi, a li peli son disposti a scacchiere, cuero a guisa di graticola, o rete, come son' anche tutti gli altri occhi degli'insetti che volano, sembrando graticolati. D'intorno ad èssi vi si vedono le ciglia con peli grossi di color d'oro; mà son senza mouimento, facendo solamente un cerchio intorno all'occhio.[102]

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[99] Ibid., pp. 126-27.

[100] Ibid., pp. xviii, 47.

[101] Cf. 11. 1058-1060. "The eyes, it has been affirmed, appear as beautiful golden dice boxes in a kind of network of hairy lines."

[102] Persius , p. 51. "Of the three parts of the head two are almost completely occupied by the eyes, which are very large and ovate, having the more pointed part on the lower side of the head. They are all hairy, and the hairs are placed like a checkerboard, or a gridiron, or a

Cesi mentions the fingers and nails of the bee thus: "Manus, pedes, bracchia, & crura quaecunque plurimùm articulata, & digitis & unguibus, & nodulis ad opus apprimè accommodatis."[103] Stelluti describes the foot in great detail:

> Segue poi un'altro membro lunghetto che rappresenta il piede, ô la mano, nel fin del quale vi son due dita con alcune giunture molli come di carne: e ciascun di essi ha due unghie, una maggior dell'altra, ripiegato, & acute come quello degli Uccelli, e dure come osso, & ambe due essono dalla sommita del dito, e son contigue nel lor principio: e frà l'uno, e l'altro dito v'e un membretto rileuato carnoso, e pieno di peluzzi bianchi, vedendovisi nella sua estremità una macchietta nera, e tra questo, e le dita vi sono altri peli lunghi di color d'oro.[104]

If one is to cite the first truly scientific, i.e., precise, systematic, and objective description of natural objects viewed through a microscope, it would have to be Stelluti's description of the anatomy of the bee in his translation of Persius. The examples cited from the Apiarium and from the Persius are representative of the two works and show the differences between the two descriptions. But to credit Stelluti with the first scientific description is not to detract from the generally

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net, as they are on the eyes of all other insects that fly, which also resemble gridirons. Around them there are eyelashes of large hairs the color of gold: but they do not move, making only a circle about the eye."

[103]Cf. 11. 1071-1072. "Hands, feet, arms, and legs are very jointed, and both fingers and nails and joints are suited above all to work."

[104] Persius , p. 53. "There follows then another long member that represents the foot, or the hand, on the end of which there are two fingers with some flexible articulation as of flesh: and each of them has two claws, one greater than the other, curved and sharp as those of birds, and hard as bone, and both come from the tip of the finger and are connected at the base: and between the one and the other finger there is a little projecting, fleshy member full of tender white hairs, and there is seen on its extremity a small black spot, and between that and the fingers there are other long hairs the color of gold."

agreed on statement that the Apiarium is the first published work that records observations made with a microscope.

This right hand section of the work is, more than any other, given over to praise of the bee. Cesi says, for instance; "Dotibus profecto, mysterijs sacris, prophanis, heroicis, historijs, exemplis, fructu, ingenio; praesignes, nobiles Apes nullis unquam encomijs satis extuleris."[105] He praises the bee for its sense of smell,[106] its chastity,[107] its majesty,[108] and its cleanliness.[109] At this point Cesi inserts a pun--that the name apis might be derives from a-pes (without feet)--not because bees actually lack feet but because the feet are generally associated with filth. He takes it as a sign of virtue that bees gather honey only from the topmost flowers of plants, never from drooping ones.[110] He also, from this assertion, gets a pun on apibus (bees) and apicibus (summits).[111] It is in this section that Cesi mentions coins which bear likenesses of bees,[112] and associates the bees with the virtues of Roman gods and goddesses--the strength of Jupiter, the cleverness of Pallas, the fecundity of Venus, and the innocence of Diana.[113]

The final sections of the Apiarium are five small ones across the bottom of the page. These deal with honey and wax. The first deals

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[105]Cf. 11. 1107-1109. "You will never extol the outstanding, noble bees with enough praises for their gifts, their sacred mysteries, prophesies, heroics, histories, examples, fruits and nature."

[106]Cf. 11. 1149-1155. [107]Cf. 1160-1164.

[108]Cf. 1. 1165. [109]Cf. 11. 1211-1215.

[110]Cf. 11. 1227-1235. [111]Cf. 11. 1235.

[112]Cf. 11. 1245. [113]Cf. 11. 1263-1265.

generally with flowers and how the honey gets into them. The second concerns certain plants which contain honey and manna. The third and fourth sections are about wax and its uses, and the fifth describes certain differences among wax, honey, and saccharin. There are fewer direct references to classical authors and more descriptive passages in these sections of the Apiarium than in any other except that describing the bees of the New World. Cesi even mentions observing honey with an "Oposcopia," maybe the microscope.[114] He also mentions the Peripatetic doctrine of heat and cole (which he dismisses) and the doctrine of antiperistasis to explain the effects of heat and cold on manna and honey.[115]

The Apiarium is a curious compilation of fact and fancy drawn from ancient and contemporary sources. It cannot be classed as a wholly scientific document because for the greatest part it lacks the objectivity and the observational and theoretical basis which would make it an adequate attempt to explain the natural phenomena which are its subject matter. The treatment of the subject matter, especially in its mythological references and puns, is quite often more literary than scientific, and at times it seems completely uncritical, i.e., in Cesi's acceptance of the statement that bees carry small pebbles in their feet when they fly in high winds.

The form of the work is typical of a genre of natural history works characterized by eclecticism and heavy reliance on classical authors.[116]

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[114]Cf. 11. 1425.

[115]Cf. 11. 1460-1473.

[116]Cf. Ulisse Aldrovandi, De reliquis animalibus exsanguibus libri quatuor post mortem eius editi: Nempe de mollibus crustaceis,

Cesi refers to no less than forty-eight authors from Homer to his contemporaries Stelluti and Colonna, among others.[117] In its form, therefore, Cesi's work had nothing significantly new to offer. This is a curious state of affairs since his avowed purpose in forming the Accademia dei Lincei was to escape the bounds of prejudged theories. He wished to view nature with the clear and penetrating eyes of the lynx. Yet in the Apiarium Cesi binds himself strongly to the tradition of eclecticism that was prevalent in natural history--a tradition that relied heavily on Aristotle.

Those parts of the Apiarium which might be considered of scientific importance are the sections recording observations of New World bees and the section concerning observations made with a microscope. In this former instance the observations are recorded objectively

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testaceis, et zoophytis ad illustrissimum senatum Bononiensem cum privilegiis (Bononia: Typis Io. Baptista Ferronii, 1642); Aldrovandi, De animalibus insectis; Samuel Purchas, A theatre of politicall flying-insects. Wherein especially the nature, the worth, the work, the wonder, and the manner of right-ordering of the bee is discovered and described. Together with discourses, historical, and observations physical concerning them. And in a second part are Annexed meditations, and observations Theological and moral, in three centuries upon that subject (London: Printed by R.I. for Thomas Parkhurst, 1657); Thomas Mouffet, The theater of insects: or lesser living creatures. As, bees, flies, caterpillars, spidrs, worms, &c. a most elaborate work (London: printed by E.C., 1658); Butler, The feminin' monarchi'; Joannes Jonstoni, Theatrum universale omnium animalium insectorum tabulis viginti octo ab illo celeberrimo Mathia Merriano aeri incises ornatum ex scriptoribus tam antiquis, quam recentioribus, Theophrasto, Dioscoride, Aeliano, Oppiano, Plinio, Gesnero, Aldrovando, Wottonio, Turnero, Mouffeto, Agricola Boetio, Baccio, Ruueo Schonfeldio, Freggio, Mathiola, Tabernamontano, Bauhino, Ximene, Bustamantio, Rondeletio, Bellonio Citesio, Theueto, Marggravio, Pisone et aliis maxima cura collectum et ob raritatem denuo inprimendum suscepit Franciscus Iosephus Eckebrecht Bibliopola Heilbrunnensis (Heilbrunne : Typis Ioh. Adami Sigmundi, 1757).

[117]See Appendix III for a list of authors mentioned by Cesi.

and straightforwardly, and in the instance of Recchio and Bolivar they were previously unpublished. In the latter instance, it would perhaps be well to assign the greater scientific merit to the plate of drawings which presents those observations with a greater preciseness, clarity and detachment than does Cesi's textual description.

CHAPTER VII

CONCLUSION: THE APIARIUM AND THE ACCADEMIA DEI LINCEI

Why, one might ask, if the Apiarium is not a scientific document, is it worthy of discussion in connection with the Accademia dei Lincei, a scientific society? Because the work is generally regarded as the first publication of microscopical observations, it has the merit of chronological precedence, and as such it is of interest as the first record of a new phenomenon--the bee as seen under a microscope. This fact alone would probably make it of interest to historians of sicence as the first step in the development of the field of microscopy.

But, one might inquire further, if the Apiarium was intended for a very limited audience, how can its production by a scientific society be justified when the aims of that society should include the dissemination of scientific knowledge. The answer, it can be argued, is that in a very limited way the Apiarium did serve the aims of the Lincei. It is a thread that links together the activities of Cesi and Galileo. Because of their friendship, Cesi came into possession of a microscope, and the microscope served him, Francesco Stelluti, and Fabio Colonna in their observations of bees. Their observations were published in the Apiarium and in the Satires of Persius translated by Stelluti. The Apiarium, although its content is of only limited scientific interest, is nevertheless an example of the transmission of an instrument of scientific

experiment, the microscope, the joint efforts of a group of men--Cesi, Galileo, Stelluti and Colonna--leading to a publication of their efforts, the Apiarium, and a dissemination of information to another group of men, namely Maffeo Barberini and his court.

The strangely unscientific nature of much of the Apiarium raises questions as to the motives which prompted its writing. If the microscope were the sole motivating factor, it would seem that the microscopical observations would form a much larger part of the text. As it is, there are only three references to the microscope--one in the dedication on the plate of drawings (which was written by Ricchio), one in connection with section describing the observations made,[1] and one in the passage asserting that bees have ears.[2]

If one accepted Cesi's explanation to Galileo for the production of the work, "Questo e fatto per significar tanto piu la nostra divotione a'Patroni, et esercitar il nostro particolar studio delle naturali osservationai,"[3] one would expect to find a great deal more observational data, but there is very little. In only four instances (in addition to the description of bees) does Cesi mention personal observation--Colonna's notice of bees at the walls of a camp at Cerolani,[4] his own observation of bees in the walls of his buildings,[5] Colonna's observation of part of

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[1]Cf. 11. 1025-1073.

[2]Cf. 11. 1125-1126.

[3]Gabrieli, "Carteggio Linceo," p. 1066. "It has been done to show our very great devotion to the Pope and to exercise our particular study of natural observation."

[4]Cf. 11. 692-694.

[5]Cf. 11. 752-755.

the mouth of the bee,[6] and of globules of pollen adhering to the bees' legs.[7]

Cesi, in founding the Lincei, had dedicated himself to the cause of science, and in choosing the name of the academy had resolved not to accept theories unless they had been viewed with the keen sightedness of the lynx. And yet, in the Apiarium, he accepts, sometimes uncritically, the word of authority--such writers as Aristotle and Pliny--on bees. The work that he produced is not so much a scientific work but a panegyric on bees.

Cesi was a man who had dedicated his life to fostering the cause of scientific endeavor. He was evidently widely read and was well acquainted with scientists, but of his own scientific endeavors only two published works remain, the Tabulae phytosophicae and the Apiarium. It would be premature to judge Cesi's abilities as a scientist on the basis of the Apiarium alone, and it would require an exhaustive study not only of that work but also of the Tabulae and of his correspondence to form a fair assessment of his personality and his abilities as a scientist.

If one judges Cesi solely on the basis of the Apiarium, he must conclude from the internal evidence that Cesi was either an extremely naïve scientific practitioner or that his reasons for writing the work were not scientific in nature. The first assumption cannot be justified until it takes into account any evidence outside the Apiarium that might shed more light on Cesi's abilities as a scientist. The second conclusion,

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[6]Cf. 11. 1048-1050.

[7]Cf. 11. 1094-1095.

is consistent, within the limited context of the work, with the circumstances of its writing and with the structure of the work.

One motive that might have prompted the writing of the Apiarium was Cesi's friendship with Galileo--not only because he received a microscope from Galileo but because of his continued support of Galileo in the latter's conflict with the Catholic Church. Cesi had come to his friend's defense twice before, once when he had written the two letters attempting to make the Peripatetics look foolish and once when he had upheld Galileo's and his own views to Bellarmine in his letter to the Cardinal. He might hesitate to inform Galileo of his intentions with regard to the Apiarium for fear that Galileo would advise him against writing the work as he had advised him against sending out his two letters making sport of the Peripatetics. Although Galileo is never mentioned by name in the work, it is addressed to Maffeo Barberini, the man who, as head of the Roman Catholic Church, would be most directly involved with any changes in the Church's policy regarding the Copernican doctrines and the injunction against Galileo's teaching or holding them.

Internal evidence can support the argument that Cesi was trying to influence the Pope in Galileo's favor. Consider the following passage:

> Praevertit vel intestinas, vel iniunctas labes APUM BENIGNITAS. URBANAE Idaeis multò potiores, quae praestanti virtute, non ullo in antro, sed orbis in APICE enutrire, liberare, quemvis possint, ad illas qui confugiat. Quae probitate summa, sanctisq. legibus, quaecumque mala, quovis cortice tecta, ipsisque in abditis magis medituliis conclusa; excludere, deicere exterminare possint.[8]

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[8]Cf. 11. 154-159. "More powerful than the bees of Mount Ida are the Urban bees who by outstanding virtue are able to nourish and to liberate, not only in a cave but on the summit of the globe, anyone who flees to

One may read this passage as a gentle reminder to Pope Urban that he had the power to protect Galileo, who had fled to him for protection, and that the Pope also had the power to root out the evil forces which had brought about the ban of Copernicanism by the decree of 1616.

The Apiarium is a panegyric on bees. Cesi praised bees in the same way that ancient authors had praised them, discoursing on their industry, chastity, mode of government, benevolence in ruling, skill in building--all virtues that were indirectly attributed to the Pope by attributing them to the animals that decorated his crest. Cesi said in the Apiarium, "Quod insigne ac praeclarum, in Urbanis vere totius Urbis, totium inquam Orbis laetitijs, summo ipso in Vaticani vertice admiratus, veneratus sum."[9]

The Pope was perhaps familiar with the microscope from the Cardinal of Santa Suzanna and others in Rome to whom Galileo had demonstrated its use. Certainly he was familiar with the telescope and Galileo's discoveries with that instrument. He had praised the Istoria when that work first appeared. Cesi carefully connects the telescope with the microscope in both instances when he mentions the instrument.

> Suspicienda, demiranda CORPUSCULI STRUCTURA. Novisti Plini, nusquam magis rerum naturam, quam in minimis totam esse. O si Telescopio, si Microscopio usus fuisses, quid de Api praesertim de praedicasses Leonina, multi-lingui, hirsut-ocula?[10]

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them. By the greatest probity and by the sacred laws they are able to exclude, drive out, and exterminate any evil whatever, protected as it may be by any cover and even concealed in the hidden center itself."

[9]Cf. 11. 755-757. "I have venerated and admired what is outstanding and truly remarkable in the joyful Urban [bee] of the whole citi, I say, of the whole world, even on the highest vertex of the Vatican."

[10]Cf. 11. 1025-1028. "Wondering at and esteeming the structure of the little body you, Pliny, have agreed that the nature of things is

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> Foramina, aut, quae excipientis vestibuli vicem habere solent, auriculas ipsas minimè apparere dices. Nec quidem Microscopio nobis. At longè minutius, quam nostris innotescere sensibus possit, à natura elaborari corpuscula, & complura quidem, vel ipso adhibito Microscopio existimes. Quo dum multa subtiliùs constructa discernis, alia ulterius illis adhuc exiliora concludas, quae omnem instrumentorum à nobis constructorum aciem fugiant, & eludant. Quod & de Telescopio nostro, dum remotiora ad oculum pertranis, Dijudices congruum erit: alia quippe dissita magis remanere, ad quae hec ipsum ullo modo pertingat. Minusculorum igitur & remotiorum, nec paucorum aspectu aequo animo carere assuescas.[11]

It is worthy noting that Cesi, who was a champion of Galileo's new ideas and who himself went against the accepted doctrines of the heavens in his letter to Robert Bellarmine, in this one work of natural history committed himself to a traditional approach, but perhaps by this display of orthodoxy, he hoped to connect the Lincei and Galileo's microscope with an accepted doctrine as the Istoria had connected Galileo and the telescope with an unorthodox doctrine, Copernicanism. Perhaps he was trying to assure the Pope by this discourse on bees that all the Lincei still held him in the greatest esteem. And he was perhaps also trying

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never greater than when it is complete in its smallest possible form. If only you could have used the microscope, if you could have used the telescope, what could you have said earlier about the lion-maned, multi-tongued, hairy-eyed bee?"

[11]Cf. 11. 1124-1135. "You say that the openings which usually serve the function of the reception of hearing look very little like ears. But this is not so according to our microscope. That which is much smaller than what we can know by our senses can become known, and you can study the many little bodies that nature has brought to completion if you apply the microscope. Any time you see many very tiny structures, you exclude many others still beyond these which flee and elude all the sharpness of the instruments we make. And it will be the same with what you will discern by means of our telescope when you bring things very distant closer to the eye. Other things remain even more distant which it does not reach at all. Therefore you must become accustomed to missing with equanimity not a few of the smaller and more distant things."

to influence the Pope in favor of Galileo. The Apiarium might legitimately be considered a subtle piece of propaganda whose motive was rather more political than scientific.

The political motive would be in keeping with the aims of the Lincei because these certainly included the support and encouragement of individual scientific endeavor. It would also represent an attempt to fight the conservatism of the Catholic Church, a conservatism from which, according to Santillana, the universities offered no escape and to which the scientific academies of the time arose in opposition. If that support came in a very subtle way, it was nevertheless consistent with the other attempts of Cesi to assist and defend Galileo.

The Apiarium, according to historians of science, can be considered a historical "first," but its content is not of an entirely scientific nature. It is a compilation of data rather than an account of personal observation, and there is little attempt at a theoretical explanation of what is recorded. Despite this lack of scientific objectivity, the Apiarium can be considered as representative of the activities of the Accademia dei Lincei in many ways--as an example of transmission of information, joint effort of scientists, and publication. But the rather peculiar nature of the Apiarium can also be justified in terms of another characteristic of scientific societies--support and encouragement of individual scientific endeavor, a support that in the case of Cesi and Galileo appears to have been directed against the conservative forces of the Catholic Church.

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APPENDIX I

NOTES CONCERNING THE PLATE OF DRAWINGS AND THE ORGANIZATION OF THE TEXT OF THE APIARIUM

A reproduction of the plate of drawings that accompanies the text of the Apiarium is included in chapter V. The text that appears on the plate is translated by Singer as follows:

The scroll at the top of the sheet reads:

> To the most holy priest Urban VIII a most accurate ΜΕΛΙΣΣΟΓΡΑΦΙΑ [written account of bees] is offered by the Accademia dei Lincei as a symbol of perpetual devotion.

The scroll at the bottom of the page reads:

> O great parent of the universe, to whom nature willingly submits herself, and before whose lordly feet she kneels, behold the bee from the scutcheon of the Barberini family, than which nothing in all nature is more remarkable. This bee, an achievement worthy of the Companions of the Lynx who have examined it with closer gaze, has been set forth and expounded in pictures (with the spirit of Cesi urging on the sacred toil and the art of Pallas aiding the eager men), while under the polished glass rise the greatest marvels and the eye learns to magnify its faith. Who would have known that there are five tongues in the body of the bee, that the neck is like a lion's mane, that the eyes are hairy, that there are two sheaths to each lip, were it not for the divine discoveries of the new art? Thus it is fitting that, while the world looks up to thee [Urban VIII] in wonder, they bee should show itself to be a yet greater wonder.[1]

At the bottom of the page is the statement: "Francesco Stelluti of Fabriano observed with a microscope."

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[1]Charles Singer, "The Earliest Figures of Microscopic Objects," Endeavor, XII (October, 1953), 199.

The material that comprises the two center sections of the text is organized within a series of brackets. The major heading is Mellifices Apes, and this heading encompasses Civiles, Solitariae, Urbanae, and Sylvestres. Immediately above the heading Mellifices Apes is a series of terms which are printed vertically on the page but which may be reproduced horizontally as follows:

(Favificis
(Membranaceis alis
(Quadripennibus
(Anelitris, detectas alas habentibus
(Alatis, minoribus volucellis
(Mollioribus Insectis praecisius dictis
(Anulosam in speciem articulatis
(Exsanguibus dictis, scilicet rubro succo carentibus
(Ex Animalibus sensu praeditis

The translation is as follows:

(Hive builders
(Having membraneous wings
(Four-winged
(Anelitris, having the wings exposed
(Stinged, the smaller flying ones
(Called the best, outstanding insects
(Jointed with a kind of ring around the joint
(Called bloodless because it has no red liquor
(Outstanding among animals because of its perception

Near the top of the left hand center section, and immediately to the right of it, is the word Aureo-fulvus (golden-yellow), and further down the page is another short list which refers to the text.

Niger varius seditiosus.	Mottled black seditious.
Tertium habet Varro.	Varro makes these a third sort.
Columella infusci, &	Columella recalls dark
hirsuti meminit	and hairy ones
Hae variae	Various ones of these
Nigriores,	Blacker,
hirsutae magis.	hairier
Aureo-luteae.	Golden-yellow
Parvulas oblongas,	Very small, oblong,
laeves, nitidas, ardentes	smooth, dark, glowing
auro, & paribus lita corpora	with gold, and bodies smeared
guttis, placidasq. Virgilius probat.	with equal drops, and Virgil approves their placidness.

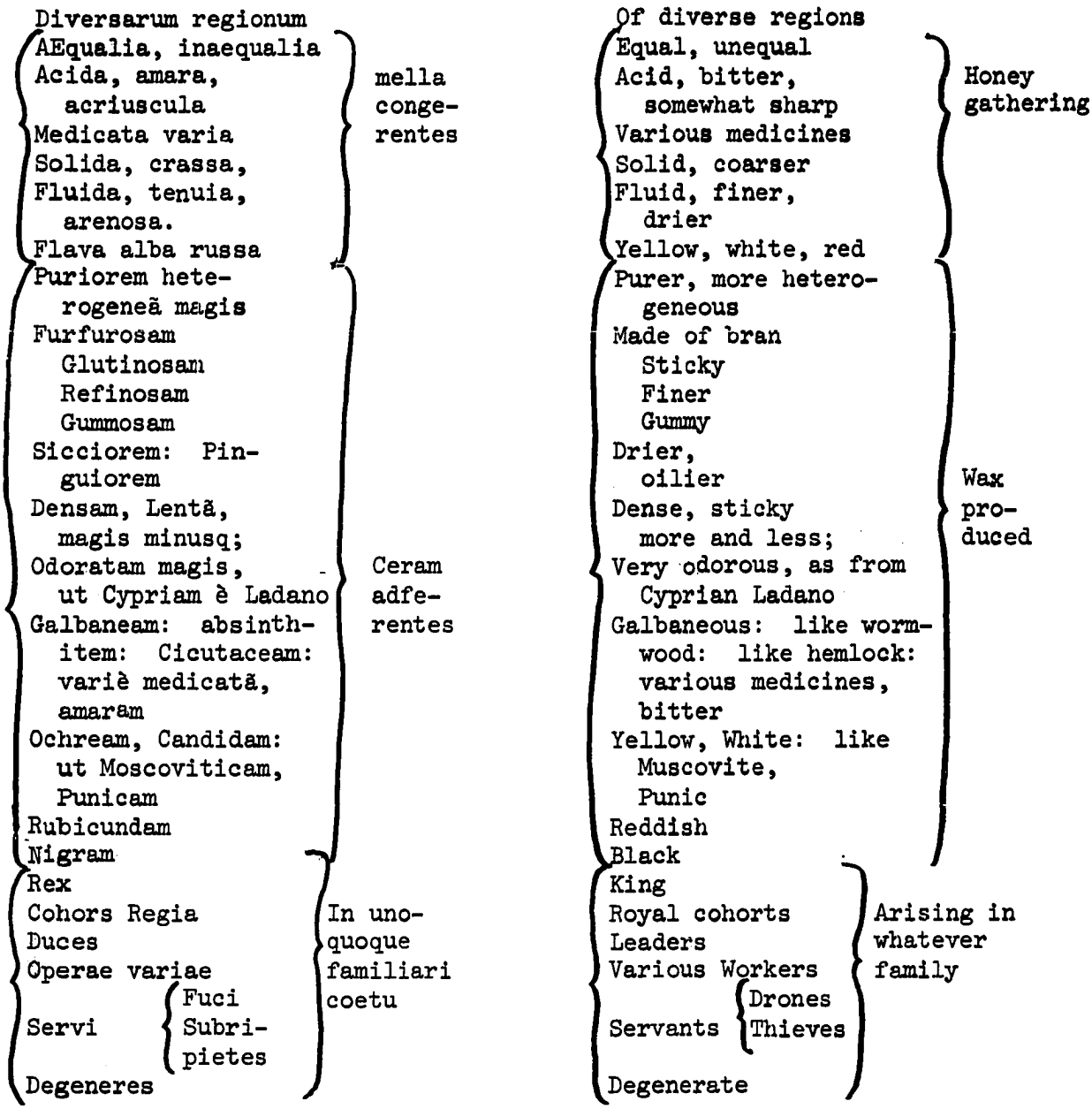
Sed aetate, & anni temporibus, colores aliquantulū immutantur.	But with age, and in the time of years, the colors are changed somewhat.

Following the main heading Mellifices Apes is a list of descriptive words which is reproduced below.

MELLIFICES APES	Honey-making bees
Civiles	Civil
Solitariae	Solitary
Urbanae	Urban
Sylvestres	Forest
Domesticae Admaenianae	Domestic
Campestres Navigantes,	Navigating flat plains
Aquaticae seu Amphibiae	Aquatic or amphibian
Errantes, natātes, volātes.	Wandering, swimming, flying
Domicilio exceptae	Those outside the home
Vagae	Wanderers
Māsuetae, mitiores, Cicures, ut Aethiop. Halizon.	Gentle, very mild, tame, as Ethiopian, Halizonican
Bellicosae Acriores	Warlike, harsh
Ingeniosae dociles magis / minus	Ingenious docile Larger / Smaller
Asperiores Liberiores	Harsh and unrestrained
Hilariores	Joyful
Mellifices utiles magis / minus	Useful honey-makers Larger / Smaller
Inutiles ad mellificia	Not useful for honey-making
Colligentes	Collectors
Subripientes	Thieves
Cerilegae	Wax gatherers
Non cerilegae	Those who do not gather wax
Laboribus addictae diversis	Devoted to various labors
Non addictae	Not devoted
Favifices	Hive builders
Nō favifices, ut Halizonicae Hircaniae & in Cumana fortè & Ponticae & supra Amissum.	Those who do not build hives, as Halizonican, Hircanian and particularly in Cumana and Pontica & above Amissus
Cellas hexagonas, rotundas, varias constituentes.	Hexagonal cells, round, made of various things
Favos planis stratis	Flat, layered hives
Triplicibus	Three-layered
multiplicibus	Multilayered
Laeves	Unsuitable
Cancellatos	Latice like
glomeratione in orbem aut huiusmodi figuras	Gathered together in a globe or other such form

- Favos cereos
- Foliaceos, aut è paleis, tenuioribus tunicis
- E luto rudes, crassos
- Mellificantes in Alveis
  - in Arboribus
  - Petris, Saxis } excavatis
  - Ripis
  - In subterraneis
  - suspendentes ramis
- Liberius passim in arboribus varijsq. locis.
- Diversè: ut in terra, & Alveis
- Aculeo armatas
- Inermes
- Maiori longiori
- Minori breviori
- Pernicioso } praeditae
- Mitiori } aculeo
- Innoxio
- Foecundae { magis
  - simplici { minus
  - multiplici prole
- Steriles
- Imbecilliores
- Robustiores
- Pertundentes
- Excavantes } ligna.
- Findentes
- Regia specie
- Vulgari specie
- Propria specie decora
- Similes Vespis
  - Formicis
  - Culicibus
  - Muscis
- Hirsutae
- Glabrae
- Breviores
  - Rotundiores
  - Latiores
- Longiores
- Albae — Nigrae
- Virides — Fulvae, fuscae
- Luteae — Pallescentes
- Aureae — Citrinae
- Rubentes — Furvae
- Maculosae — Variae
- Miniores
- Maiores
- Minimae

- Wax hives
- Leafy, or from chaff, with a more flimsy covering
- Rude and rough, made from mud
- Making honey in hives
  - in trees
  - Stones, Rocks } excavators
  - Riverbanks
  - In underground places
  - Suspended from branches
- Wandering freely here and there among trees and other places
- Diversely, as on land and in hives
- Armed with a sting
- Unarmed
- Very long
- Very short
- Destructive } Having a sting
- Very gentle
- Harmless
- Fecundity { Greater
  - Simple { Less
  - Multiple offspring
- Sterile
- Weaker ones
- Stronger ones
- Borers
- Excavators } The tongue
- Cleavers
- Royal species
- Common species
- Species with a proper decorum
- Similar to Wasps
  - Ants
  - Gnats
  - Flies
- Hairy
- Hairless
- Shorter
  - Rounder
  - Broader
- Longer
- White — Black
- Green — Tawny, dark
- Yellow — Pale
- Golden — Citrine
- Red — Black
- Spotted — Varied
- Larger
- Smaller
- Smallest



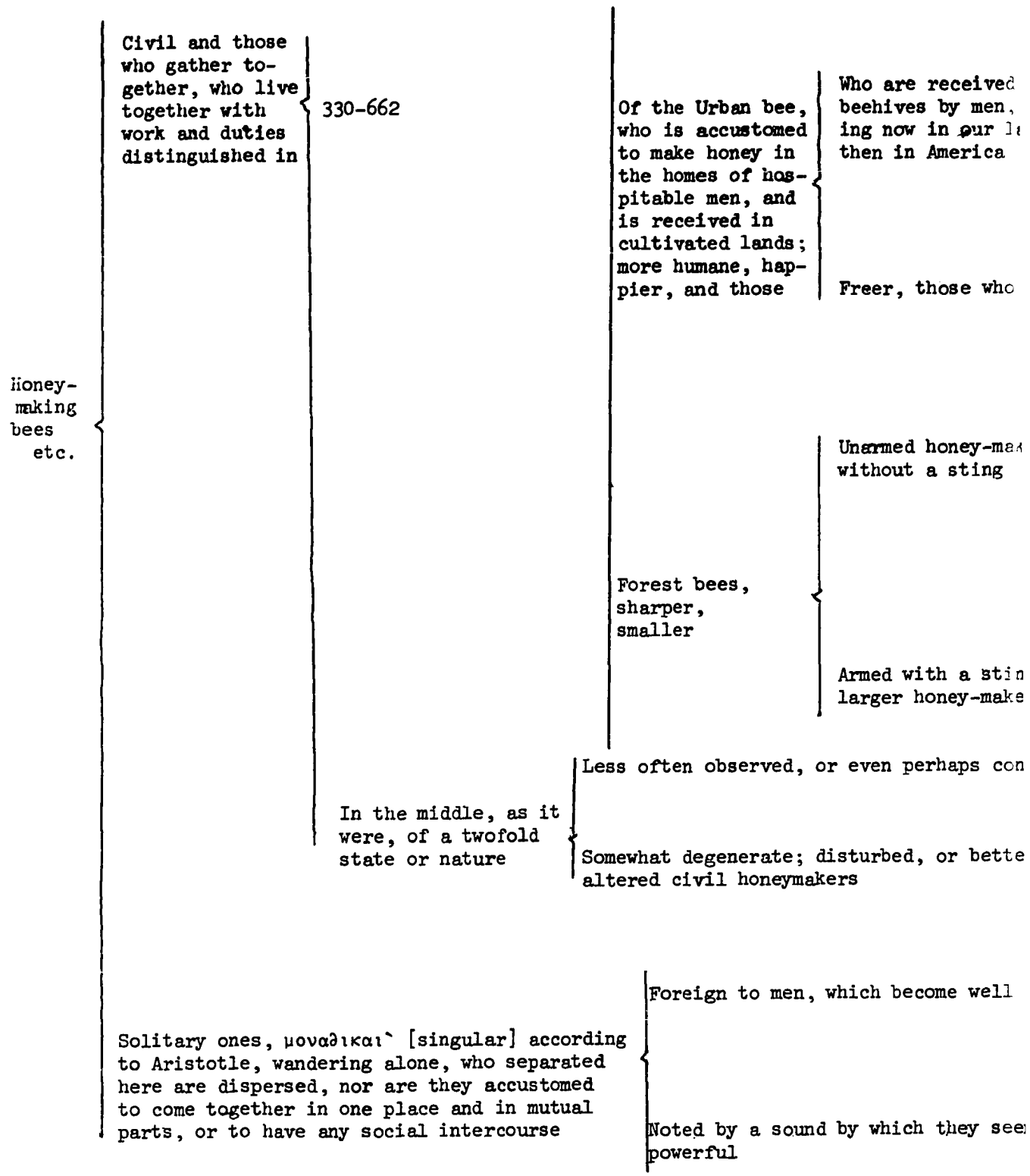
On the following pages is an outline showing the arrangement of the brackets which encompass the main body of the text of the Apiarium. The numbers are the line numbers of the material enclosed by each bracket. For convenience of typing, the bracketed material within the main body is reproduced in a numerical outline form rather than in brackets.

MELLIFICES APES [etc.]

- CIVILES & Congregabiles, quae conviv-unt opere munijsq. distinctae in — 330-662
  - URBANAE, quae hospitibus hominibus mellificare solêt ad domos, cultaque loca receptae; humaniores, hilariores, & ipsae
    - Quae in alvearijs ab hominibus recipiuntu frequentes tum in no orbe, tũ Americano
    - Liberius, quae vagan
  - SYLVESTRES, acriores, minores
    - Inermes absque acule mellificantes.
    - Armatae aculeo, maio ferè, mellificantes
- MEDIAE quodammodo ancipiti statu, vel natura
  - Minus observatae, vel etiam confusae. ———
  - Degenerantes aliquantulum; perturbata, vel potius commutata civilitate mellificantes
- SOLITARIAE μοναδιχαι Aristoteli, Solivagae, quae hinc seiunctae, disperguntur; nec in unum convenire solent, mutuasq. partes, qut convictum habere.
  - Exoticae viribus, quae magis innotescu
  - Sono quae pollere videntur inde notata

- ANAE, quae hos-ibus hominibus lificare solēt domos, cultaque a receptae; hu-lores, hilar-es, & ipsae
  - Quae in alvearijs ab hominibus recipiuntur, frequentes tum in nostro orbe, tũ Americano
    - Antiquiorum descriptionibus
      - Maiusculae 663-671
      - Minores 672-678
    - Recentioribus observationibus fere variae ingenio, fructu, magnitudine facie 679-722
  - Liberius, quae vagantur
    - Hominum contubernales 749-763
    - Arbori-vagae. 764-782
  - Inermes absque aculeo mellificantes.
    - Elatius, favos in
      - Cavitatibus varijs abscondendo 783-794
      - Ramis suspendendo 819-822
    - Humilius in subterraneis
  - Armatae aculeo, maiores ferè, mellificantes
    - In Arborum
      - Cavitatibus 828-844
      - Rami 845-859
    - In Terrae foraminibus 891-921

- /ESTRES, lores, ores
  - observatae, vel etiam confusae.
  - rantes aliquantulum; perturbata, vel commutata civilitate mellificantes
    - Ad ripas, & parietes 919-920
    - In subterraneis 922-929
  - Exoticae viribus, quae magis innotescunt
    - Domestica magis 930-935
    - Ferae Armipotentes. 936-944
  - Sono quae pollere videntur inde notatae.
    - An quasi cantillent? 945-951
    - Bombizationis quodam strepitu.


honey-making bees etc.
Civil and those who gather together, who live together with work and duties distinguished in
330-662
Of the Urban bee, who is accustomed to make honey in the homes of hospitable men, and is received in cultivated lands; more humane, happier, and those
Who are received beehives by men, ing now in our l then in America
Freer, those who
Unarmed honey-ma without a sting
Forest bees, sharper, smaller
Armed with a sti larger honey-make
In the middle, as it were, of a twofold state or nature
Less often observed, or even perhaps con
Somewhat degenerate; disturbed, or bette altered civil honeymakers
Solitary ones, μοναδικαι` [singular] according to Aristotle, wandering alone, who separated here are dispersed, nor are they accustomed to come together in one place and in mutual parts, or to have any social intercourse
Foreign to men, which become well
Noted by a sound by which they see powerful

- Of the Urban bee, who is accustomed to make honey in the homes of hospitable men, and is received in cultivated lands; more humane, happier, and those
  - Who are received into beehives by men, swarming now in our land, then in America
    - By more ancient descriptions
      - Larger 663-671
      - Smaller 672-678
    - By more recent observations, more nearly varied in nature, fruit, size and species 679-722
  - Freer, those who wander
    - Companions of men 749-763
    - Tree-wanderers 764-782
- Forest bees, sharper, smaller
  - Unarmed honey-makers, without a sting
    - Higher, having hives in
      - Various concealing cavities 783-794
      - Suspended from branches 819-822
    - Lower in subterranean places 823-835
  - Armed with a sting, larger honey-makers
    - In trees
      - In cavities 851-868
      - On branches 872-882
    - In aperatures in the earth 891-921

ss often observed, or even perhaps confused

- In riverbanks and walls 919-920
- In subterranean places 922-929

newhat degenerate; disturbed, or better, tered civil honeymakers

ng
- Foreign to men, which become well known
  - More domestic 930-935
  - Fierce and powerful 936-944
- Noted by a sound by which they seem powerful
  - Perhaps as if they are singing? 945-951
  - A certain buzzing din 952-957

APIARIUM EX FRONTISPICIIS NATURALIS THEATRI PRINCIPIS FEDERICI CAESII LYNCEI S. ANGELI ET S. POLI PRINC. I. MARCH. M. CAELII. II. G. C. BARON. ROMAN DEPROMPTUM, QUO UNIVERSA MELIFICIUM FAMILIA AB SUIS PRAE-GENERIBUS DERIVATA IN SUAS SPECIES AC DIFFERENTIAS DISTRIBUTA IN PHYSICUM CONSPECTUM ADDICITUR

Mellea te forsan dulcedo ex Physico Vatem reddidit Plini, qui URBANAS Apes, qui BARBARAS protulisti: hoc siquidem nectare, hoc caelesti lymphatus latice, URBANAS moribus, virtute, dignitate praesensisti: agmine, puritate, concentu, BARBARAS.

URBANAS recole summas Apes. Audi vel priscos Philosophos has celebrantes ad Vatum usque Energiam pervenisse: ipsummet oraculum attigisse. Ecce verè habes Urbanas,

APPENDIX II

THE BEE-HIVE FROM THE FRONTISPIECE OF THE NATURAL THEATRE OF PRINCE FEDERICO CESI LINCEI PRINCE OF SAN ANGELI AND SAN POLI. I. MARCH[ESE] OF M[ONTI]CELLI. II. A ROMAN NOBLE, DESCENDENT OF G.[IACOMO] C.[ESI], WHO IS DEDICATED TO THE UNIVERSAL HONEY-MAKING FAMILY DERIVED FROM ITS FIRST GENERATION, DISTRIBUTED IN ITS SPECIAL AND DIFFERENCES IN THE VISIBLE NATURAL WORLD

The sweetness of honey makes you, Pliny, master of the pleasing natural science, you who have made known Urban bees and Barbarian bees.[1] Indeed you have perceived nectar, that nourishing fluid diluted by the dew. You have distinguished Urban bees by their customs, virtue, worthiness and barbarian bees by their swarms, purity, and harmony in singing.

Recall the greatest Urban bees. For example, it is asserted that ancient philosophers followed their swarms even to the Prophet Energia, and that they reached the oracle itself.[2] Behold, indeed,

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[1]Pliny Natural History 11. 19. 59 refers to domestic (urbanorum) and wild (rusticae) bees. Barbaria is an acceptable synonym for rustica. The terms Urban and Barbarian are puns on the name of the Pope, Urban VIII, to whom the Apiarium is dedicated, and upon his family name, Barberini.

[2]A reference perhaps to Pausanias Description of Greece 9. 40. 1. A group of sages from Boeotia in search of an oracle to tell them how to end a severe drought in their country were led to the Oracle of Trophonius by a swarm of bees.

multiplici quae mellificio, nectarea plenissimo ex Apiario virtutum effusi aere, beare undequaque probos velint, undequaque probis doctisque favere.

Quae CONVICTUS bene instituti sunt, pete ab Apibus luculenter. Provocant siquidem ad universam MORALEM PHILOSOPHIAM. Ab hisce Volucellis, praeter ipsam morum puritatem, probitatem, discenda, quae ad domum & familiam: quae ad Civitatem: quae ad opera, labores, munimenta, defensionem ipsam, spectent. quae denique ad omnem rationem vitae civilis.

Mira REGIS, mira POPULI OFFICIA: Parẽtis & sobolis, morum in quelibet animalculo. Dominus ipsis, qui à dotibus, ipsa ab virtute Imperium habet. qui praecipiendo, regendo, fovendo, dirigendo, adhortando, laboret: qui proli initia, qui educationem dederit. qui instruxerit, opere ditaverit, Pater. Populus, filij qui pareant, custodiant, defendant, sequantur; nec vel alienis oculis Dominũ laedi permittant: qui proprijs sublevent, deferant humeris, cervicibus: qui vel nascentes suppares Regulos venerabũdi respiciant: qui distributis assidùe laboribus officijsq. addicantur, certam in optimè instituto cõvictu normam servantes: Vigilias, somnos, cibos,

you have Urban bees who, according to the extent of their honey-making and by the airy nectar flowing sweetly from the most virtuous hive, are resolved that good deeds might bless whatever place they are in and that they might favor good and learned men.

Look to the bees as excellent examples of how social intercourse should be set up. Certainly they suggest to the world a moral philosophy. Also, learn purity of morals and honesty from these swift-flying creatures, who attend to their home and family, who attend to labors, work, arms, defense, and who attend finally to the procedures of civic life.

Marvel at the duties of the king. Marvel at the duties of the populace, of parent and offspring. Marvel at the customs of the little animals everywhere. The master, who has power both by endowment and by his own virtue, who labors in giving laws, in ruling, in fostering, in directing, in encouraging, who begets offspring, who gives education, who makes the labor productive, is the father. The people are offspring who obey, guard, defend, and follow; they also do not suffer the master to be disturbed by the eyes of strangers. They are offspring who lift him up and carry him on their necks and shoulders.[3] They consider the fledgling kings equally worthy of their veneration. They are continuously engaged in labors and duties allotted in the best manner according to the norm of instituted social intercourse. In accordance with what is right and proper, they have guards, a time to sleep, a time for

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[3]Pliny Natural History 11. 17. 54 says that the bees are anxious to be near the king when they are swarming, and they support him on their shoulders and carry him when he becomes tired.

horas, ordinem, sed & mores ipsos, ut ait Plinius, ritè rectèque habentes. Ita, ut nec tolerent domi suae ignavos, nec prodigos: sed eos omnes, qui aut congesta disperdunt, aut ab opere cessant, castigent; probatos autem socios mutuis semper officijs prosequentur: ad ipsa usque funera & maestitias.

Si validis viribus, si prudenti doctoquè consilio, si locorum apta constitutione constat MILITIA, quae aut invadit, aut defendit; Regem, Ducem, Militem, Apem adi; Apem consule. Metus abest: ars, agmen, ordo adest. Concordia pariter inter se, erga Maiores obedientia. Expeditiones mirae, copiarum motus, & illa agminatim procedendi ratio, BARBARUM etiam nomen Cimbris induxerit. Sunt castra & vigiles, & qui defendant. Est quovis in milite ea fortitudo, ea vis; ut absque ulla ferri ope, quo inermes nos insomis; quod & ipsi vidimus, imò & quae impetum in invadentes facerent, quamvis exaculeatae. Porrò nec durioribus parcunt; dum vires suas in ipsis pertundendis, diffindendisque

meals, regular hours, rank, and even customs, as Pliny says.[4] Since they will not tolerate the lazy or the wasteful in their home, they chastize or destroy those who have crowded together or who have ceased working.[5] However, they always accompany their worthy companions in their mutual duties, even to misery and death.

If the militia, which either invades [another country] or defends [its own], depends on strong men, on prudent counsel and instruction, and on appropriate strategy, go to the king, the leader, the military, the bee; consult the bee. Fear is absent [in him]; present are military art, the line of march, military rank. Bees are in agreement among themselves and therefore they are obedient to their superiors. Any reason for going forth, even the barbaric name of the Cimbrians, leads forth that line of march, the marvelous expeditions, and causes the movement of the troops.[6] There are camps, and there are those who guard and defend them. In any soldier you see that there is such strength and such fortitude that although he lacks the iron weapons such as we who are not armed by nature use, he is able to cut down and overthrow the enemy with weapons implanted [in him] by nature, and these weapons, as sharp as can be, make up his power in invading, as we have seen. Furthermore, they do not spare themselves very difficult tasks as

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[4]Pliny Natural History 11. 4. 11.

[5]The above passage refers to the drones, who take no part in the work of the hive and usually remain together in the center of the hive. When there is little honey or not enough room, the bees drive out or destroy the drones. Cf. Aristotle Historia Animalium 9. 40. $626^{b}10$.

[6]The Cimbrians were a barbarian tribe from northern Germany who attacked the Roman empire during the second century B.C. and who were defeated only with great difficulty by Roman armies.

ligneis corporibus exercent. nec ad ingentes moles maiorum animalium tremiscunt; dum homines & equos nocentes adoriuntur & conficiunt. Nam adversus innoxios nunquã iram conceperint; nunquã extra pugnam laeserint quemquam: ea vel in bello Apibus iustitia est. Nota Hermonactis causa. E praedonibus Dominum invadentibus, in illos missas, tres occidisse, reliquos prorsus abegisse, domum Dominumq. liberasse scimus. Scaliger & equum, & tyrunculum equitem occisos notat. Virtus certè & vis, in Apibus militaris.

Hexagonae aequis lateribus cellulae, senis forsan à cruribus, amussis adhibitae nullius ope, ad quamvis tamen amussim elaboratae: Mira, & artificiosissima substructionum ratio, pendentiumque aedificiorum, & connexio & paritas, absque ullo ponderum, & ruinae periculo: constructa domicilia, & domorum ad viventem continendam ritè rectèque familiam, disposita & decenter

when they employ their strength in pushing forward and cleaving through wooden objects. They do not tremble at the size of animals larger [than themselves], and they even attack men and horses who threaten harm. Now they have never conceived any anger against harmless things, and they have never harmed anything outside battle, for that is justice in war to the bees. The cause has been noted by Hermonactis. We know that they killed three who were sent among them, that they killed the lord, drove away the rest entirely, and delivered their home and master from the invading robbers.[7] Scaliger notes both the unfortunate horse and the unfortunate inexperienced rider.[8] Certainly there is virtue and strength in military bees.

[Bee hives] have hexagonal cells with regular sides, like those which one might observe in the supports of a bridge. No carpenter's rule has been applied in the building; however, it is as carefully constructed as anything to which such a rule has been applied. Marvel at the most artful plan of the substructures and of the suspended buildings, the joining and equality [of the sides] without any weight or danger of collapse.[9] These homes have been elegantly constructed, located and furnished so that the family might live together as is right

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[7]This is possibly a reference to a statement made by Strabo the Geographer Geography 12. 3. 18 that the Heptacometae cut off three of Pompey's cohorts by placing in their path vessels of a certain type of honey which deprived them of their senses. They were then easily dispatched.

[8]Julius Caesar Scaliger wrote a commentary on Aristotle's Historia animalium entitled . . . Historia de animalibus, J. C. Scaliger interprete (1619). It is this work, in which Scaliger evidently mentions that horses can be killed by bees, that is probably referred to. Cf. Aristotle Historia animalium 9. 40. $626^{a}7$.

[9]Pliny Natural History 11. 10. 23.

commoda: Regiae, civiles, plebeiae & serviles cellae, dignitatis, meritorum, ipsiusque operis ratione habita, constitutae. Collabentium ab exterioribus praesertim damnis, reparatio, fulcra, subductiones, statumina apposita; unde Antonomasticum nobis admirantibus Fabricae nomen; ARCHITECTURAM, MATHEMATICAS, illas inquam disciplinas; quibus tam multi ex hominibus expertes sunt, in Apibus celebrant. Militarem quoque Architecturam, MUNIENDI utilissimam illam artem, antiquiorem forsitan, quàm apud ullos homines invenias, & methodicè ac diligenter usurpatam, materijs Physicè insumptis, Mathematicè in figuras dispositis; si quae circumcirca obducunt, & adaggerant ad arcendas & propulsandas quascunque iniurias, consideres; si in lapideos tubulos, constrictos aditus, & quae huiusmodi in Alvearijs plura, respexeris. STATICAM ipsam, si praecisius exquiris, arreptis, dum se

and proper, just as the home is constructed according to what is right and proper. There are royal cells, citizens' cells, plebian cells and servants' cells placed in order, each formed in a manner in accord with the dignity and worthiness [of the inhabitant] and with the plan of the work itself. Under the ruined exteriors of collapsing cells are placed posts, foundations and props by way of repairs. From this Antonomasticus[10] we have the name builder in admiration. People praise the architecture and mathematics of the bees, and those are disciplines in which so many men are unskilled. Bees also have military architecture, that most useful art of fortification, more ancient perhaps than any art you might find among men. It is practiced methodically and diligently according to natural science in the materials employed and according to mathematics in the order of the forms of fortifications. You will see [these arts] if you consider what they draw up all around and what they heap up for shutting out [enemies] and repelling all harm and also if you consider the tubules made of stone,[11] the constricted openings, and the many things of this sort that are in beehives.[12] Turn your attention to statics. If you seek out [some bees] which are apart from the

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[10]Antonomasticus--a term derived from Greek meaning the use of a proper name in place of an epithet or descriptive phrase. In this case bee is used as synonymous with builder.

[11]It is true only of South American and tropical stingless bees that they construct narrow tubular entrances to their hives out of a very hard, rock-like substance. See Charles D. Michener and Mary H. Michener, American Social Insects (New York: D. Van Nostrand Co., Inc., 1951), p. 99. Cf. also the reference to the work of Pierre Cieca de Leon on p. of this translation.

[12]Aristotle Historia animalium 9. 40. $623^{b}27$-35 says that bees smear their hives with gummy substances to ward off attacks by other creatures and constrict the entrances of the hives with the same substances if they are too wide.

saburrant adversus furiosos ventorum impetus, lapillulis, adverte. ASTROLOGIAM si vis, haud inanem, haud superstitiosam [qualis in hominibus persaepe ridenda & principibus viris incassum Aulicorum in gratiam vano & temerario ausu minitans] rationem habitam temporum ab ipsis syderibus; & aeris regulas, indeque praesagia considera. Adde & Vicarios lucis usus, ut omnem ASTRONOMIAM senioribus praesertim in Apibus, plenissimè demireris.

PHYSICIS, ut eas instructas artibus credas, quamvis Peripatum non attigerint; respice quos lambunt flores, omne considera mellificium. Physiologus fortasse ignoraveris, aut quod crebriuscule evenire solet, dubitaveris; quid ipsum, & cuias Mel sit: quid Cera: ambo quae multiplici usu sunt semper prae manibus.

rest, you might creep upon them gently while they load themselves with small pebbles as ballast against the furious force of the wind.[13] Consider astrology, if you wish, for it is not at all vain or superstitious (although it is often ridiculed as such among men and is considered vain and rash, a thankless pleasure, among the chief men of the princely court), but it is the order of the times according to the very stars and the rules of the atmosphere, from whence comes foreknowledge.[14] Add also the vicarious uses of light that you might wonder very greatly at all astronomy, especially in the older bees.

So that you may believe that they have been instructed in the arts although they do not attain the Peripatum of natural philosophy,[15] see what flowers they taste. Consider all things concerning the honey-makers. You might be ignorant of, or because it is wont to flow forth so abundantly, you might have doubts about how and from where, physiologically, honey is made and how wax [is made], for both of which many

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[13]Pliny Natural History 11. 10. 24. Cf. Samuel Purchas, A Theatre of Politicall Flying-Insects. Wherein Especially the Nature, the Worth, the Work, the Wonder, and the Manner of Right-Ordering of the Bee, is Discovered and Described. Together with Discourses, Historical, and Observations Physical Concerning Them. And in a Second Part are Annexed Meditations, and Observations Theological and Moral, in Three Centuries upon that Subject (London: Printed by R. I. for Thomas Parkhurst, 1657), p. 11. Purchas mentions the story that bees use ballast in the form of small rocks when they fly in a high wind, but he dismisses that tale as a "false relation." Cesi repeats the story without making such a distinction. The source of the story seems to be Aristotle Historia animalium 9. 40. $626^{b}25$.

[14]Aristotle Historia animalium 9. 40. $627^{b}10$-15 says that bees can tell the approach of rought weather or of rain.

[15]Peripatum--the place where Aristotle walked while teaching at the Lyceum in Athens. Cesi evidently means that although bees cannot be considered as having attained Aristotle's level of knowledge, they are admirably learned in the knowledge of their own world.

Plurimi certe ignorant, & multi nominis Scriptores. Bene autem innotuisse Apibus, dum undique congerunt, decerpunt, fatearis necesse est. Succos, lachrymas, flores, fructusque discernunt. Classes herbarum non praetereunt, nec transgrediuntur, & a Viola quidem ad Violam, ordine procedunt imperturbato. Amicas persaepe plantas petunt: circa Tuberosam dictam Iridem, & Orchides, Apiato quae flore conspicuae; nec non omne circa Acorum, quod minimè ab re Apum Piper dictum est; frequentes vidimus. Nam & Aromata MEDICAE sibi norunt. Dixeris meritò ab HERBARIAE ipsius, ad CHYMICAE usque penitiora artificia, omni prius homine illas pervenisse; omnibus quae seculis praestantissimum hunc laticem elicuerint, extraxerint: & aeris ad illum, & ad illius collectiones omnes; dispositiones quascunque praesenserint: usque ad illa. quae METEOROLOGIS ignota, vel maxima controversa sunt.

Aurum tu quidem nunquam aut eliquasti, aut potasti Chymista, nisi è cerebrosis vanè sperantis animi figmentis, & Chimericis potiùs, quàm Chymicis cogitatiunculis. En, quae supra omnem Chymiam, citra omnem aut fumum, aut indurantae lucri

uses are always at hand. Most people and many famous writers are ignorant [of these things]. You must admit, however, that it must be well known to the bees, for they swarm together from all sides, and they pluck [the wax and honey]. They learn of the sap, the juices exuding from certain plants, flowers, and fruits. They do not wander among different kinds of plants; indeed they go from violet to violet in an undisturbed order.[16] They chiefly seek friendly plants. We see swarms around the tuberose called iris, and around orchids, which are remarkable for their parsley-like flower; also we see them all around the acorum which, since it is so small, is called bees' pepper.[17] And now the aromas of clover float to them. You might correctly say that the more internal arts, all of those which are more important according to men, came to chemistry from the knowledge of botany, according to which [the bees] have extracted this most excellent fluid throughout the ages. For that purpose and for their collections they have foreknowledge of the weather and of the order of plants, and they always know those things which are unknown to or greatly disputed by meteorology.

Indeed, you have never clarified or drunk gold by chemistry, except in the feverish fantasies of a spirit hoping in vain and knowing more of Chimera than of chemistry. Behold, bees distill the most outstanding nectar, the sweetest and most harmless of foods, drinks and medications for us and for themselves, and they do so far more than all Chymiam [alchemy, which is] on the one hand all smoke, or on the other

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[16]Aristotle Historia animalium 9. 40. 624[a]3-5. According to Aristotle, bees feed on only one kind of flower at a time.

[17]Acorum--an aromatic herb, probably the modern calamus or sweetflag, a flower similar to the iris.

cupidine mentis lapidem, sibi nobisque dulcissimum innoxiumque cibis, potibus ac medelis praeclarum nectar constillant: quod AURUM, quod POTABILE dicas: nec sumptuosè aut laboriosè habeas.

Quod maius doctrinae experimentum; quod praeclarius unquam a Physico facinus; vel etiam à MAGO, quem scilicet in Naturae penetralibus edoctum faciunt, quid tandem mirabilius esse potest, quàm eatenus suimet constitutionem omnem pernoscere; ut delectis è materiis similes sibi quis filios propriis manibus componat, absoluat, in vitam pertrahat? cui id Animalium vel peritissimo, vel perfectissimo datum est? Nonne ille Paracelsi [quem Mysteriarcham, quem scientiarum Monarcham dixere nonnuli; risere multi] Homunculus; ridendus potius, quam risibilis fuit? Constructa certè prolifica ab Ape Apicula, in opus pariter prosurgit, ac provolat consimilis. En admirabile opificium conficiendae sobolis: GIGNENDI purissimam ARTEM, & extra omnes libidinis cancellos positam; singulare prorsus, ac mysteriis plenum in omni Naturae Theatro spectaculum.

a stone [the philosopher's stone] of profit, hardened by the desire of the mind. You can have what you may call both gold and potable, and it is not so costly nor as laboriously [gotten].

What experiment can be greater, according to science? What deed can ever be more outstanding in physical science or to a wise man whom people consider most thoroughly learned in the investigation of nature? What, finally, can be more marvelous than to know so completely one's own nature that one might compose from selected materials, bring to perfection, and bring forth into life by his own hands offspring similar to himself. To what animal, either the most skillful or the most perfect, is that [power] given? Is not the Homunculus of Paracelsus (a man whom some call the Mysteriarcham,[18] the monarch of science, and whom many others ridicule) more to be laughed at than he is able to laugh?[19] The little bee, who has certainly been constructed and begotten by the bee, surges forth like [its parent] to its work and flies in the same manner [as its parent]. Behold the admirable duty of consuming tender buds and the purest art of bringing forth young, [for bees] are placed beyond all weaknesses of carnal desire; behold this spectacle which is absolutely singular and mysterious in the entire natural theatre.[20]

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[18]Mysteriarcham--one who presides over secret sacred rites.

[19]Paracelsus (Theophrastus Bombastus von Hohenheim, c. 1493-1541) believed that a homunculus, or little man, could be grown from the sperm of a human male and that it would live and grow like a very small human child. See Walter Pagel, Paracelsus: An Introduction to Philosophical Medicine in the Era of the Renaissance (New York: S. Karger, 1958), p. 117.

[20]Pliny believed that bees gathered from flowers the material from which they formed their offspring. Aristotle gave several reasons why this was not true and seemed to believe that bees reproduced by

Quibus Apé TITULIS concelebraveris; aut potius quos titu-
los omiseris? cumulatim profectò agendum. Nedum enim Aeria, Vaga, Levis, Agilis, Diligens, Sedula, sed & Studiosa, & Daedala; nec laboribus tantum addicta assiduis & perseverans; aut exercita semper, Vigilans, Sollicita: sed Ingeniosa & Sapiens tandem. Simplex praeterea, Pia, Parca, Innuba, & si ipsum considéres opificium; Rorilega, Florilega initio; inde Melliflua, Faviflua, Mellis mater, seu divini effectrix Mellis ipso in complemento. Suis in exordijs & Melligena, & Florigena, & si Homerum audis, Sole genita. Parva ipsa hisce multis magnisque iure merito titulis condecoratur; quos & ipsa magis, magisque parvitas extollit. ARGUMENTOSAM & hic fatearis, & ab Apiculae multijugis dotibus argumentum aemulationis sumas vel ipsis in moribus; unde Plinius Argumentum habuit admirationis.

APIS ab APICE si mavis, deducatur. Fastigium intellige quo cumulus insurgit laudatis ex moribus; imo & Sapientiae,

By what titles do you praise the bee? What greater titles do you neglect? How many more you should surely give. Do not call them airy, wandering, light, agile, diligent, busy, but [call them] studious and artful; [do not call them] vigilant and sollicitous, for these are epithets given to continuous and persevering labors or to those which are always exercised; instead, [call them] wise and ingenious. Moreover, they are guileless, pious, thrifty, celibate, and if you consider the work that they do, [they are] first dew-gathering, flower-gathering; then they are honey-flowing, honeycomb-flowing, the mother of honey, or, in filling themselves, the effectrix of divine honey. In their beginnings, both the honey-like juice and the flower-producing plant were engendered by the sun, if one listens to Homer. This very small bee is adorned by many great titles, which are certainly merited, and even the small size of bees praises them the more. You must admit [that their smallness] is an argument, and you might assert the argument from the many qualities of the little bee or from the emulation of their customs. Pliny had his argument for admiring them from these things.[21]

The bee is destroyed if you crush the summit [of the hive][22] See the height to which the mound rises in accordance with its

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sexual intercourse although he did not seem entirely satisfied with this explanation. Virgil believed that bees gathered and consumed the seeds of their offspring from flowers and then gave birth to the young in the hive. Cf. Aristotle De generatione animalium 3. 10. 759^{a}10-35, Virgil Georgicon 4. 200-202, Pliny Natural History 11. 16. 46.

[21]Pliny Natural History 11. 4. 12. "Nature is so mighty a power that out of what is almost a tiny ghost of an animal she has created something incomparable!"

[22]Ibid. 11. 12. 29. "They build large and splendid separate palaces for those who are to be their rulers in the bottom of the hive; these project with a protuberance, and if this be squeezed out, no offspring is born."

Prudentiae, Consilii, Imperii, Industriae, Laborum, Sedulitatis, Concordiae, Pietatis, Temperantiae, Munditiae, Frugalitatis, Utilitatis summae, Civilis, Naturalis scientiae, Politiae praesertim, artiumq. Regendi omnium, & inviolatae lustitiae; confertis undique laudibus, & talis quidē extollitur; ut ipsa VIRTUTUM PHALANX; ipsa admiranda, & vix effabilis moles, uno APIARII nomine Plutarcho dici potuerit.

Non aliunde FAVORIS nomina, ipsumq. favere, quam ab ipso FAVO, cuius gratia & flores suavis ille FAVONIUS prolicit, alitque: Pythagorica missa facito legumina Etymologe: ad Apes, ad Alveos accede favoris causa. Nae optimè, plenissimè illae faverint nectareis, perpetuis, caelestibus succis.

MELISSEUS dicat IUPITER Apum beneficia. Idearum Apū ipsiusq. MELISSAE, à qua antesignana Gēti nomen. Scilicet melle enutritus; scilicet in antro protectus, servatus Idaeo, ab Patris nativori execrandis dentibus; Apum industria benignaque ope periculum evasit, quale nec maius haberi, aut concipi unquam potest.

praiseworthy custom; yea, the bee is praised for wisdom, prudence, counsel, power, industry, labor, business, concord, piety, temperance, cleanliness, frugality, the greatest usefulness, citizenship, natural science, especially for all arts of ruling the state, and inviolable justice. Indeed [the bee is the subject] of such praises from all sides. Thus this phalanx of virtues, admirable in itself and of so great a number as can scarcely be counted, Plutarch says in one word, Apiarius.[23]

From no other place except from the beehive itself, whose pleasant and sweet flowers the West Wind brings forth and nourishes, can you be favored by the name of the diety Favor and by the diety himself. Make the bean Pythagorean sent, according to etymology, and add this cause of favor to the bees and beehives. Truly the West Wind and the honeycomb promote best and most the celestial, perpetual nectar-like juices.[24]

Jupiter Melisseus is the benefactor of bees, of the bees of Mount Ida and of Melissa herself, from whom, as forebear, [we have] the name of the species. Jupiter, who by the industry and kindness of the bees was nourished by honey and protected and preserved from the cursed teeth of his offspring-eating father in a cave of Mount Ida, escaped a danger nothing greater than which can ever be undergone or

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[23]Apiarius--relating to bees.

[24]This is a very confused passage whose main point, it seems, is an elaborate pun on the words Favoris, meaning either the deity Favor or the noun favor, Favo, meaning honeycomb, and Favonius, meaning West Wind. The reference to the bean may come from the fact that bees often gather nectar and pollen from bean plants, but Pythagoras is supposed to have forbidden his followers to eat beans, so the "Pythagorean sent" bean is a confusing statement.

Excogitata huic numquam malo remedia, cuius nulla praecessit cogitatio; nedum suspicio. Praevertit vel intestinas, vel iunctas labes APUM BENIGNITAS. URBANAE Idaeis multò potiores, quae praestanti virtute, non ullo in antro, sed orbis in APICE enutrire, liberare, quemvis possint, ad illas qui confugiat. Quae probitate summa, sanctisq. legibus, quaecumque mala, quovis cortice tecta, ipsisque in abditis magis meditulliis conclusa; excludere, deiicere exterminare possint.

Quid verborum Divinator Goropi? An è tuis illis priscis Teutonicis vocibus genuinas Mellificum horum animantiũ laudes eruis. BIE, ab IMPERII magisterijs normisque admirãdis, a

imagined.[25] No remedy for this evil, of which there was no knowledge but only suspicion beforehand, has ever been devised. This kindness of bees is more important than either their internal defects or those imposed upon them. More powerful than the bees of Mount Ida are the Urban bees who by their outstanding virtue are able to nourish and to liberate, not only in a cave but on the summit of the globe, anyone who flees to them. By the greatest probity and by the sacred laws they are able to exclude, drive out, and exterminate any evil whatever, protected as it may be by any cover and even concealed in the hidden center itself.

What of Goropius, the diviner of words? From his ancient Teutonic voices he calls forth genuine praises of these living honey-makers.[26] You can picture to yourself the Bie,[27] if not very elegantly certainly very accurately, by admiring the mysterious and the ordinary

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[25]Cf. Lucius Junius Moderatus Columella Res rusticana 9. 2. 3. ". . . nor indeed is it a fit question for a husbandman to ask whether there ever existed a woman of surpassing beauty called Melissa, whom Jupiter changed into a bee, or whether . . . the bees were bred from hornets and the sun, and that the nymphs, the daughters of Phryxon, reared them, and that soon after they became the nurses of Jupiter in the Dictaean Cave and that, by the gift of the god, they had allotted to them the food with which they themselves had reared their little foster child." The danger which Jupiter escaped by being concealed in the cave in Mount Ida was from his father Saturn, who ate his offspring alive as soon as they were born because a prophecy had foretold that they would overthrow him. Jupiter's mother, Rhea, fed her husband a large rock and concealed her infant in the cave where he was nourished with honey by nymphs.

[26]Cesi refers to Jean Becan (1518-1572), also known as Goropius Becanus, a French linguist. Purchas, Politicall Flying-Insects, p. 3 says "The word bee, according to Goropius, is originally Dutch, and therefore English; and so composed (saith hee) because it affords us many things. . . ."

[27]Bie--A Middle Dutch form of the word bee.

confertis bonis utilitatis sūmae, quod multa nobis OFFERANT, PRAEBEANT, si non elegantiùs, veriùs certè praesumis. Interim Mysteria nobis aperis: Praebere et Imperare eiusdē muneris esse, & mutuo converti, quod is qui omnibus imperat; omnia pariter praebeat: & qui praebet, imperet. Bie Belgis, Bien Germanis Apes, Imperij perpulchras imagines, necnon uberrimè fructus exhibeant: quae Mel cibis, Mel & Propolim Medicinae; Ceram sacris & solemnibus magis fulgoribus, Animis exempla; monita plura quidem & praeclara, bono & nomine & omine nobis contribuant. BONIS, OPTIMIS certè APIBUS.

Non sit satis MUNIFICUM a Plinio animal intellexisse: aut Divitias case a Lucano, Apes. Agnoscamus & ipsi UTILISSIMAM humano generi Apum familiam, caetera supra animantia; Apesq. opes omnino dicere, quas apisci ipsarum beneficio aptissime liceat. Gratis prorsus nobis mellificant. Mille ad usus vitae, ita enim lego, laborem tolerant Plinio. Nil suis pro laboribus,

procedures of power and by admiring good things of the greatest usefulness brought together because bees offer and hold out many things to us. Meanwhile you reveal the mystery to us. To bring forth and to rule are parts of the same duty and are reciprocal because he who rules all things brings forth all things in the same way, and he who produces rules. The Bie to the Belgians, the Bien to the Germans, bees, the most beautiful models of power, always produce the fruits of labor most abundantly. They give us honey as food, honey and propolim as medicine,[28] wax for the most sacred and solemn brilliance, examples for the soul, also many clear admonitions both by their good name and by their omens. Certainly the very best things [come] from bees.

An animal might not be munificent enough to have been known to Pliny, or rich enough [to have been known] to Lucan. We see that bees and the family of bees are most useful to the human race, moreso than are other living creatures. Indeed one may most aptly call those things which we acquire from their beneficence riches. Completely without recompense they make honey for us. They endure labor of a thousand uses in life, as indeed I read in Pliny.[29] They demand nothing for themselves

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[28]Pliny Natural History 9. 6. 16. "The first foundations are termed by experts commosis, the second pissoceros, the third propolis, between the outer cover and the wax, substances of great use for medicaments."

[29]Ibid. 9. 4. 11. "But among all of these species the chief place belongs to the bees, and this rightly is the species chiefly admired, because they alone of this genus have been created for the sake of man. They collect honey, that sweetest and most refined and most health-giving of juices, they model combs and wax that serves a thousand practical purposes, they endure toil, they construct works, they have a government and individual enterprises and collective leaders, and, a thing that must occasion most surprise, they have a system of manners that outstrips that of all the other animals, although they belong neither to the domesticated nor to the wild class."

aut quotidianis operis exigunt. Nec custodiae, nec victus ergo quidquam: nec pascua, nec pastores. Nullum fructum laedunt Aristoteli, & si quid atterunt, dum subtilissimum contrahunt Plinio succum; adeo minutè hoc faciunt; ut vix summos flores lambere videantur. deturbant, destruunt, usurpant nihil. Innocuae vivunt, innocuae operantur: nulliusque damno aut iniuria, fluentes Domino thesauros congerunt. Mira examinum propagatione maiorem semper in operae fructum multiplicantur. Divitias ex agello iugeris magnitudine, ad dena millia in annos sestertia; & alvearia locata quotannis millibus pondo mellis, & quae huiusmodi miri proventus; à Varrone & agrestis doctrinae Praeceptoribus audiveris. Multa habes, si Apes habes. Mira profectò frugalitas absque ulla fruge, & impĕdio. Quàm multis nos OPIBUS ab APIBUS donatos tandem fateamur; quàm multum Apum ope ditatos. Scis Grãmatice à lepidissimo saltem Plauto, sive Ploto, vel in olla, & aula, quàm facilè invertatur litterula. Dulces

in return for their labors or daily works. They have neither guards nor any of the necessities of life, neither flocks nor shepherds. According to Aristotle they do not harm any fruit, and according to Pliny, if they brush against anything while they are gathering the most subtle juice, they do this so lightly that they seem scarcely to taste the largest flowers. They do not disturb, destroy, or usurp anything.[30] They work harmlessly. They gather the flowing treasures for the lord, not to cause injury or damage to anything. Your works are always multiplied into greater profits by the marvelous propagation of the swarms. You will add as much as ten thousand _sestertia_ a year to your riches from a small field when beehives have been placed there, and you will have thousands of pounds of honey yearly produced from this kind of field. You have heard Varro and other teachers of agriculture marvel at these things.[31] You have many things if you have bees. Marvel at the thrift of bees, for indeed [they produce their fruits] without expending any produce of the fields and without any other expense. Finally, we must bear witness to the many resources bestowed by bees and to our enrichment from the resources of the bees. Certainly from grammar you know how easily a little letter might be altered, from the most witty Plautus or Plotus, or in _olla_ and _aula_.[32] Bees certainly produce

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[30]Aristotle _Historia animalium_ 9. 40. $624^{a}35$-$624^{b}2$, describes the bees gathering honey, and Pliny _Natural History_ 11. 8. 18 says "No harm is done to any kind of fruit" but in neither instance do these authors make the kind of statement attributed to them by Cesi.

[31]M. Terenti Varro _Rerum rusticarum_ 3. 16. 10-11. Two men with a "_iugerum_" of land built apiaries and never received less than ten thousand _sestertia_ for their honey.

[32]_Olla_ and _aula_ are variations of the same word which means a small earthen pot. Plautus and Plotus are variations of the same name.

certè opes: opulenta dulcedinis plenitudo.

Fructus ab Apibus quos habes? MEL, CERAM, COMMOSIM PROPROLIM, PISSOCERON, ERITHACEN, FAVOS ipsos. Haec tibi plura, nec unius modi, aut facultatis cõgerunt; haec componunt, in corporis plura quidem beneficia, praesignes certè succos, perutilem materiam. At potiora longè, digniora, dulciora, quae mentibus animum si advertas, instillaverint. Ex morali mysticaq. naturae penu MONITA: EXEMPLA: SIGNA. Adiecerint & STIMULOS ad virtutum & laborum ineundos cursus. adversus quamvis ignaviam, & otij damna. Ipsam haec mentem perpungere aculeo longe validiori poterunt. Pudor sit, si minima animalcula humanis ingenijs anteire videantur. Dum Apes opes animi, corporisque consertim tibi cumulant; tu vel habere, vel uti nescias?

Quae NECTARIS, quae AMBROSIAE celebritas? quàm decantatae laudes? Huius odores, illius sapores, vel caelestibus dapibus à Poetis illati, nec alij aut cibi, aut potiones, ab illis in supernis cõvivijs admissi; quòd prestantissimis & exquisitissimis hisce complerentur, quae epulantiũ omnes gustus explere, & omni ex parte satisfacere possẽt. Quid autem MEL ipsum, nisi & odor &

sweet resources, an opulent plenitude of sweetness.

What products do you have from bees?--honey, wax, commosim, propolim, pissoceron, erithacen, even honeycombs.[33] These things certainly bring together the most excellent juices, material most useful to you not in one way only or for one faculty only but indeed for the greatest benefit to the entire body. But if you stand off and look, there are better things, more worthy things, and sweeter things that they instill in the mind. From the moral and mystical sanctuary of nature they are warnings, examples, and signs. They have given stimulus to undertaking the paths of virtue and work and against any laziness whatsoever and the defects of idleness. These things are able to pierce the mind itself by a long and very strong sting. It would be a shameful thing if the smallest animals should surpass human nature. While the bees heap up their riches of mind and body about you, are you ignorant that you have them or of how to make use of them?

What is the fame of nectar and of ambrosia? How much do you praise them again and again? The odors of the latter and the tastes of the former, especially, have been pictured by poets in celestial feasts, and no other foods or potions have been allowed a place in supernal feastings because these things, which can satisfy all appetites of banqueters and satisfy them in every way, are most excellently and exquisitely complete within themselves. What is honey itself, unless it is

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[33]Pliny Natural History 11. 6. 16-7. 17. "Commosis is the first crust, of a bitter flavor. Pissoceros comes above it, as in laying on tar, as being more fluid than wax. Propolis is obtained from the milder gum of vines and poplars, and is made of a denser substance by the addition of flowers. . . . Besides these things a collection is made of erithace, which some people call sandarach and others bee-bread. . . ."

sapor? utrumque è floribus & spirans & diffundens; utrumque è rore caelesti? Quid aliud odore gratum, sapore quod excellat, vel potius totum sapor, dulcedo totum sit; quod è Caelo mitti, quod caeleste prorsus videri possit: invenies unquam? Et cibo Mel, & potu placitum, ut cecinisti Ausoni: Sacrum Lucane, Donum caeleste Virgili. Hoc tibi Galene, Iupiter ipse pluit. Hoc tandem, hoc nectar, vobis Virgili & Martialis. ipsissimum certè nectar. Quis modo Ambrosium succum illum Orphei de rore perenni, Ambrosiam inquam [nunc recedant fabulae] vel in ipso negaverit Ambrosio? quis D. Ambrosij gratiâ sacram non dixerit? Hoc & nectare & Ambrosia; & sitim explere & famem possis; quo ferè unico, ablegatis quibusvis immundis & crudelibus escis, missis multifarijs iusculorum, pulmentorumque impuris miscellis, absque ulla sive aliorum viventium; sive propriae sanitatis iniuria; Pythagoricè vivas; vel solo odore, quasi conspirantibus flosculorum praesuavium halitibus, ita nutricante & recreante, ut sensio

both odor and taste, the one breathing forth and spreading out from flowers, the other from the dew of the sky. What other pleasing thing will you ever find that excells honey in odor or in taste? or what that is more wholly taste, what more wholly sweet, which seems to have been sent from the sky and to be wholly celestial. Honey is pleasing as food and drink, as you Ausonians have sung. It is sacred, according to Lucan, and a heavenly gift, according to Virgil.[34] Jupiter himself rains it down on you, Galen.[35] Finally this nectar is indeed the nectar, for you, of Virgil and Martial. Who can refuse in any way that ambrosial juice of Orpheus, that is to say, ambrosia (now the tales cease) or in ambrosia itself? Will anyone not say with Ambrose that this is sacred?[36] By this nectar and ambrosia you can satisfy both thirst and hunger. According to Pythagoras, [you can almost live] by them alone. You may forego any impure and bloody food, mixtures of many broths, and impure combinations of food without taking any other organic food,[37] without any injury to health; or, according to the authority of Democritus, [you can live] by the odor alone, as if by [breathing] the agreeable exhalations of the sweetest flowers and thus nourishing and recreating [the body],

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[34]Virgil Georgicon 4. 1. ". . . aerii mellis caelestia dona" (honey, the heavenly gift of the air).

[35]Purchas, Politicall Flying-Insects, pp. 130-31. "Galen speaking of the same, acknowledgeth THAT IN HIS TIME IN Asia, this kind of honey was found so plentifully on the leaves of trees, that the inhabitants said Jupiter rained honey. . . ."

[36]St. Ambrose Hexameron 5. 21. 107. 70.

[37]There is some controversy over whether Pythagoras forbade his followers to eat the flesh of animals. See Kathleen Freeman, The Pre-Socratic Philosophers, a Companion to Diels, Fragmente der Vorsokratiker (3rd ed.; Oxford: Basil Blackwell, 1953), p. 79.

confectum ut abiturientem e vivis Democritũ pro arbitrio, retinuisse potuerit.

Quis te Pythagorea MELISSA, non summoperè laudet ametque, caelestibus quae cibis allatis mortales a vorandis carnibus, a cruentis cadaverosis dapibus, avertisti? CIBUM attulisti, quo lõgaevi illi Patres, diu in suo robore vitaque perstiterunt: quo senes experientia, Philosophi ratione ducti, usi sunt: POTUM, quo Democritus, quo Antiochus ille Medicus, quo Romulus Pollio, annorum secula superarunt. Quis Mulsi laudes? quis Mellitas taceat? Anne Cyrnij illi vivaces, melliuori, vel Dites beati, pulchri & ad millesimum usque longaevi, Macrobij inquam illi Orphici, qui

---- dulcesque cibos terrestribus herbis,
Ambrosiumque bibunt succum de rore perenni?

An Aristoxenus, cui quotidiana Mella omnibus morbis quẽvis praecludunt aditum? En certè vitales succos. Hisce non reliqui

it would be possible to restrain one who is aging and about to depart from the living.[38]

Who would not praise and love you exceedingly, Pythagorean Melissa, you who have turned mortal men from the eating of meat and from bloody, fleshy food by [bringing] the celestial food. You brought the food by which those long-lived fathers remained so long in health and life and which active old men, guided by the reason of philosophy, used, the drink by which Democritus, Antiochus the Physician, and Romulus Pollio overcame the aging effects of their years.[39] Why do you praise wine sweetened with honey? Why pass over in silence anything as sweet as honey? Should we not mention those long-lived Cyrnic honey-eaters, or the gods, blessed, beautiful, and long-lived even to a thousand years,[40] and also those Orphics of Macrobius who

> ---- drink both the sweet foods from earthly grasses,
> And the ambrosial juice from the perennial dew?

Or Aristoxenus, for whom honey daily prevents the access of disease?[41]

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[38]Ibid., p. 293. According to certain anecdotes, Democritus tried to prolong his life by smelling hot bread and honey.

[39]Romulus Pollio is perhaps C. Asinius Pollio, a Roman man of letters who was born in Rome in 76 B.C. and died in 4 A.D. See August Friedrich von Pauly, Pauly's Real-Encyclopädie der classischen Alteriumswissenschaft; neue Bearbeitung unter Mitwirkung Zahbreicher Fachgenossen, Herausgegeben Georg Wissowa (40 vols.; Stuttgart: J. B. Metzlerscher Verlag, 1894-1919), I, 2493. Antiochus was a Roman physician who lived in the first century A.D. He kept himself vigorous even to the age of eighty. See George Sarton, Introduction to the History of Science (3 vols.; Baltimore: Published for the Carnegie Institution of Washington by the Williams & Wilkins Company, 1927-47). Vol. I, From Homer to Omar Khayyam, p. 197.

[40]Pliny Natural History 12. 2. 27. "The Indian race of Cyrni according to Isagonus live to 140; . . ."

[41]Aristoxenus was a Greek physician who lived at about the time of Christ. He wrote on medicine, and his work influenced Galen.

tantum cibi, potionesque omnes, gratiam habent; vel arte iectis, vel Natura adiunctis; sed eatenus in alimentum cedunt viventium, quae reliqua usurpantur; quatenus de illis participare solent. MEL siquidẽ omne, NUTRIMENTUM est: NUTRIMENTUM omne MELLEUM est. Simplex Mel ita est; ut rebus in omnibus mixtis plus minusue inclusum lateat, ut sibi fere simile Physico compareat, particulis ad minima propè redacta aequitate, paribus; licet asperiusculis, & quae aqueas facile admittant, compactum; ita denique, ut compositorum plurium, unum vires, spiritusque maximè contineat: maximè sibi adsciscat, & exerat. Inde medica Energia multiplex: sed & multiplicior usus. ROSCIDA, FLORIDA, & quae CANNARUM sunt, si mella abstuleris, non mulsa tantum Melitite ac Melicratũ, ipsasq. medicatas aquas, & Sarmatica Hydromella Medon, Cambri Meteglin, aut Hispanica Aloia: sed & omnem simul tum Medicina cibariam sustuleris. Ut cibus ferè nullus, ita & multò minus Pharmacum: nulla artis Miscella est, quae hoc Nectare non cõpleatur. Aegyptius ille Propator APIS, haud immerito medicinam invenisse dictus est. Tuus ille

Behold indeed the vital juices. Do not other foods and all drinks owe gratitude to them? Men are accustomed to partake of them whether they are injected by art or added by nature as far as they creep into living food and other things that are used. Honey is entirely nutriment; all nutriment is sweetened with honey. Honey is so simple that it may be hidden more or less in all things, mixed so thoroughly with them that it might appear nearly physically similar to other particles when they are brought together in equal parts [with it]. That honey in which the water evaporates most easily is valued rather more dearly, and it is thickened finally so that one batch contains the greatest spirits and forces of many [bees] who have made it, and as a result it receives and gives forth [these forces and spirits] most strongly.[42] From this honey there is complex healing energy, but also there are more numerous uses. If you remove the dewy honey and the honey from flowers and reeds from Melitite and Melicratum and from healing waters and from Sarmatic Hydromella, Medon, Calabrian Meteglin, or Hispanic Aloe, you will have removed all foods which have medicinal value.[43] Thus there would be scarcely any food and even less medicine. There is nothing compounded by art which cannot be brought to perfection by this nectar. The Egyptian ancestor of the bee is said, not undeservedly, to have invented medicine. Your

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[42]Pliny Natural History 9. 13. 32. "But at the start it is honey diluted as it were with water, and in the first days it ferments like must and purifies itself, while on the twentieth day it thickens."

[43]Pliny Natural History 14. 11. 85 says that Melitites is a drink of wine, honey and salt boiled together. Hydromel, or Melicraton, is a mixture of honey and water allowed to ferment. Pliny does not mention Meteglin, but he says (21. 43. 76) that honey and aloe mixed together are a good remedy for marks and bruises.

OSYRIS Melissa, Aesculapiusq. APIUS nominatus. Haud immerito tuae Apes, plenis examinibus funera Hippocrati Medicinae parenti, sepulchro insidentes, ducere, exornare voluerunt. Vitae quae servatrices, melleis alimẽtis conservata, mellitis medicamentis restituta sanitate, nuncupari mereantur, amplioribus titulis unius mellis. Perẽnis certe Natura caelestis, vatibus vel sacris cõcelebrata, qua vel ipsa licet horaria poma cõclusa perennẽt: quae purioris, que immutabilis aetheris privilegia Peripateticis referre, vel saltem redolere possit. Iatro-Chymicis vero mirabiliter redoleat.

Nempe non nisi à CAELO hos SUCCOS Plini, caelestes scilicet, praestantĩa admiraris: doles simul, quod è tanta cadentes altitudine, plurimum infernis sordescant, & succis corrumpantur florum. Praeconia promis liquoris aetherei, sudo qui è Caelo exciderit, Caeli Sudorem, Salivam siderum, aeris succum. Ut

bees, in thick swarms around the funeral rites of Hippocritus, the father of medicine, not undeservedly sitting on the sepulcher, intended to escort it and to adorn it.[45] These preservers of life, bees, deserve to be praised by greater titles than those of honey alone, since health is preserved by honeyed food and restored by honeyed medications. Certainly the nature of the eternal skies, praised by the sacred prophets, which one might say is like a clock enclosed in long-lasting fruits, can be represented by the Peripatetics as very pure and immutable air with its own special law, but nevertheless it is able to breath forth an odor.[46] Iatro-chemistry also can breath forth marvelously.

You are indeed amazed at these juices from the sky, Pliny, which are certainly celestial in [their] excellence. At the same time you grieve because they become soiled, falling from such a great height to the lower depths, and they are corrupted into the juices of flowers. You praise the aetherial liquor which falls from a dry sky, the perspiration of the sky, the saliva of the stars, the juice of the air, so that

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[45]Ulisse Aldrovandi, De animalium insectis libri septem, cum singulorum iconibus ad vivum expressis. Autore Ulysse Aldrovando in almo gymnasio Bonon: Rerum Naturalium Professor Ordinario ad Sereniss. Franc. Mariam Secundum, Urbini Ducem Sextum, cum indice copiosissimo (Bologna: Apud Clementem Ferronium, 1638), p. 36.

[46]At this time clocks were still in a crude state of development, and the mechanisms were often very large. Clocks were often made up in the form of dials set in cases that were carved to resemble fruit and which enclosed the mechanism of the clock. Cf. Willis I. Milham. Time and Timekeepers Including the History, Construction, Care, and Accuracy of Clocks and Watches (New York: The Macmillan Company, 1942), pp. 138-39. Cesi here seems to be making an elaborate metaphor between the nature of the heavens and such a clock and comparing the special laws which governed the celestial world and the perfect and immutable fifth element of Aristotle to the unchangeable nature of the artificial fruit which endured as the time which it enclosed moved on.

inde coactas Caeli partes in guttas, stillantesque dulces à sideribus Salivas, Solis aquas alij recolant. Ut consertis titulis nostri seculi eruditiores, stillas, effusiones, vindemias, alius atque alius concelebrent. Apollineasq. simul Apes cura, vindemia, conservatione; collectrices, custodes, administras, autumẽt, accinẽtq. eleganter. Manneos dulcior Calabria uberius à Caelo liquores expectat: blandos magis diffluente saccharo conspersos India succos. Tu vel nostrati melleo rore, ab Apiculis expetito, MELLI-PLUUM certè agnoscis cum Galeno Caelum. Dicito & AUREOS IMBRES, à Iove non impurae in Danaes sinus, cum Horatio, profusos; sed Rhodijs nascente Minerva, cum Claudiano, demissos. qui pariter in nos pluant, summi demum Herois auspicijs nascente virtute, nõ quidem speciosis fulvi metalli damnis graves; sed qui praedulci, & verè nectarea bonorũ effusione, fructu plurimo, nostra irrigare secula, omniq. ex parte beare possint.

afterwards others restore the parts of the sky having condensed into drops and the sweet dewy saliva from the stars and the waters of the sun.[47] Our ancient learned men, now this one and now that laden with titles, praise the drops, the effusions, the harvest. And at the same time they sing of and praise the Apollonian bees most elegantly for their care, their harvest, their conservation; they praise the collectors, the guards, the administrators. The pleasant, fertile Calabria awaits the manna-like liquors from the sky. India awaits the pleasing juices more moist than the flowing saccharin.[48] You certainly recognize in the honey-sweet dew of our native land, which is sought after by the little bees, the honey-rain from the sky which Galen tells of. And you must have heard of the golden showers of Jupiter pouring forth onto the chaste bosom of Danae, as Horace tells,[49] or the golden showers that were sent down on the Rhodians at the birth of Minerva, as Claudianus says,[50] or golden showers like the great auspices at the birth of Hero. They rain likewise on us, but they are not heavy with the splendid weight of golden coins. Honey, by its outstanding sweetness and by the nectar-sweet effusions of good things, can bless and nourish our generation with much fruitfulness in every way.

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[47]Pliny Natural History 11. 12. 30-31.

[48][Anon.] De mirabilibus auscultationibus 17-19. 831^{b}23-32, a pseudo-Aristotelean work associated with the Aristotelean corpus. Saccharin is a sweet juice distilling from the joints of the bamboo plant and serving as a kind of sugar.

[49]Horace Carmina 3. 16. 1. Danae was the mother of Perseus by Jupiter who visited her in the form of a shower of golden coins while she was imprisoned in a tower.

[50]Claudius Claudianus De consul Stilichonis 3. 226.

Cur autem has divitias deliciasque TELLURI denegemus? Flora haec mellis Mater: Apum haec Altrix: nec OPIS tantum, quasi APIS de nomine nuncupata; sed & APIA Scythicè, teste Herodoto. Agnovit optima ibi mella Plinius, ubi optimorum doliolis florum receptarentur. At non leve discrimen, nec quod ex contractu diversis à vasis provenire queat, nisi facilioribus ingenijs. Nec enim & dulcia, & altilia solummodo es magis & minus: sunt quae acorem à plantis habeant, amarorem ab ipso Absinthio, quo Sardum improbatur, & Colchicum; pravitatem à Buxo, Anacardio, peiusque à Nerio ad insaniam usque Menomaenon dictum: virulentiam tendem ab Aconito, vel Ixiferi Chamaeleonis floribus, ut Bellonio

Why, however, should we refuse these pleasures and riches of the earth? The flower is the mother of honey; it is the nurse of bees. It is proclaimed not only by the name of its fruit but by the name of bees, and according to Herodotus, there is the Scythian Apia.[51] Pliny found the best honeys there where they were gotten from the little casks of the best flowers.[52] But there is a not slight danger that nothing can be drawn out of the diverse vessels on account of contraction except by the most facile talents. Indeed the vessels are not both sweet and full at the same time just as they are not both large and small. They might have bitterness from the plant, sourness from the absinthe, for which Sardinian honey is found fault with,[53] and from the colchicum,[54] uneven quality from the boxwood and the Anacardio, and worse things from the oleander, perhaps even the insanity that is known as Menomaenon.[55] Finally they might have a stench from wolfbane or from the flowers of the chamaeleon plant, as Bellon believes.[56] For these reasons all

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[51]Herodotus says that the Scythians call the Roman goddess Tella (the personified productive power of the earth) Apia. Herodotus History 4. 59.

[52]Pliny Natural History 11. 12. 33. "It is always of the best quality where it is stored in the calyces of the best flowers."

[53]Purchas, Politicall Flying-Insects, p. 142. "Galen mentions it, saying, if any honey bee bitter as the Sardinian, it is of a mixt faculty, as if some of our honey were tempered with wormwood." He refers to Galen's De simplicium facultalibus medicamentorum 7.

[54]Colchicum--an herb with a poisonous root.

[55]Pliny Natural History 21. 45. 77. "There is another kind of honey . . . which from the madness it produces is called maenomenon. This poison is supposed to be extracted from the flowers of the oleanders which abound in the woods."

[56]Bellon is Pierre Belon (1518-1555), a French naturalist, who

placet: quibus Sannorum Heracleoticum Ponticumque omne reijcitur. Galbanarium è ferulis Galbaniferis ad oculos vim medicam obtinuit. Praeterea, sicciori ab Erica quodammodo arenosum habitum est, & Varroni liquidum è Siseris flore, spissum e Roremarino Mel cognitum; aliud fluidum, aliud crassum magis. Praestantissimum inter Hymettia Straboni ab argentarijs fecturis est, quod argenteum intervenientibus spirationibus existimes. Unde ipsismet in plantis & inferioribus mella contrectare liceat. Trogloditicis tyrannis expressum Mel è floribus: factitium è palmis in Assyria ab eodem intelligas, & de arundineo Indico, quod è Canna Statius, ipsumque nobis Saccharum. Adde ex summis illud arborum germinibus

honey of the Sanni and the Heracleotic Pontus is rejected.[57] One obtains galbanarium[58] from the galbaniferous stalk.[59] Moreover, just as honey from the heath is less watery in accord with its sandy nature, and honey from the flower of the Siser is watery, according to Varro, it is known that bees make thick honey from rosemary.[60] Some honey is fluid; some is very thick. The most outstanding honey is that from the silver mines of Hymettus, according to Strabo, which you value as much as silver because it is made without smoke.[61] It might be pleasing to dwell on the honey in the plants themselves and even in lesser things. You know that honey is pressed from flowers by the tyrants of the Troglodites, that it is made by the same art from palms in Assyria, and that Saccharin comes from the reedy indigo, according to Statius. Add also the honey from the highest branches of trees, which produces madness in the

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is quoted in Purchas, Politicall Flying-Insects, pp. 141-42. "Pet. Bellonius saith, These Countries of Pontus abound with an herb called Black-cameleon, the root whereof hath an excrescency called Ixia, which is a deadly poyson, and kills presently those that drink it. Now, saith he, if the Bees gather the substance of the honey from the Chameleon-flower, there is no doubt but the honey is very dangerous. . . ." Purchas also mentions wolfbane (p. 141). "The honey is bitter near Phasis and about Heraclea, a City of Pontus, from the plenty of Monks-hood, or Wolfes-bane, saith Dioscordes." Dioscorides Herbal 2. 103 mentions a certain honey of Heraclea which produces sweating and provokes sneezing by its smell, but he does not mention "Monks-hood, or Wolfes-bane."

[57]Pliny Natural History 21. 45. 77. The honey that produces Menomaenon comes from a "district of Pontus among the people called Sanni."

[58]Galbanarium--a strong medicine for the eyes.

[59]Galbanum--a resinous sap from an umbelliferous plant in Syria.

[60]Varro Rerum rusticarum 3. 16. 26.

[61]Strabo Geography 9. 1. 23. Pliny Natural History 11. 15. 45 says that smoke will increase the activity of bees but that too much smoke will taint the honey. He mentions a special kind of honey called "smokeless" by the Greeks.

insanum Pompeianis: Melque ẽ Ceratiae filiquis pressum, & quod Apum aemuli Mellifices Zizantheres in Africa ẽ floribus conficiunt: Mannamque Mellsaccharum dictas, quas discisis ab aboribus provocatur. Pariter Germanorum Betulam melleo succo manantem. Infer Nectaream nobis dictam herbam, in qua tota Mel ipsum & sugere possis, & manducare. Subiunge Melliflũ ẽ Mexico METL, Caeli-uorã illam admirandi incrementi, quae Mellis nomen & rem, trans Herculeas columnas retulerit; plus Mellis, nihil Aloes, nisi vocabulum habens, ineptumq. illud ab inani Phytonomorum frondispicio.[a] Livonica quidem & Lithuanica unde deduxeris affluentia Mella; si teste Cordo rarissime in illis Regionibus

[a]The word frondispicio should be a form meaning leaf-seeing, but spicio may be a misprint for spico, which would mean spiky, and spiky-leaved would better fit the context of aloes, which are noted for sharp taste.

Pompeians, and honey pressed from the pods of Ceratia[62] and that honey which the honey-making Zizantheres in Africa, emulating bees, make from flowers. I name manna and Melisaccarum[63] which are produced from cut trees, and also the birch of the Germans flowing with honey-sweet juice. Below these there is the grass which we call nectarous from which you can suck and eat honey. Add to this the honey-flowing Metl from Mexico, that celestial food of admirable growth, which has carried the name of honey and the thing itself across the pillars of Hercules.[64] It has much honey and no aloes, unless one uses that inappropriate word because of the empty spiked leaves of the Phytonomorum.[65] There are Livonica and Lithuanica from whence one can have the most abundant honey.[66] If, according to the witness of Cordus,[67] there is very little moisture in

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[62]Ceratia--a plant with a single leaf having medicinal value.

[63]Manna and Melisaccarum--sweet juices which ooze from the cut stems of plants.

[64]Francisco Hernandez, Rerum medicarum novae Hispaniae thesaurus seu plantarum animalium mineralium Mexicanorum historia ex Francisci Hernandi novi orbis medici primarii relationibus in ipsa Mexicana urbe conscriptis a Nardo Antonio Recchio Monte Corvinate Cath. maiest. medico et Neap. regni archiatro generali iussu Philippi II Hisp. Indar. regis collecta ac in ordinem digesta a Ioanne Terrentio Lynceo Constantiense Germ.ᵒ Phō. ac medico notis illustrata nunc primum in naturaliū rerū studiosor gratia et utilitate studio et impensis Lynceorum. Publici iuris facta Philippo IV magno dicata (Rome: Ex Typographico Iacobi Mascardi, 1628), p. 333. Metl is a plant evidently similar to sugar cane from which a kind of honey is made.

[65]A possible translation of this word is "fruitful ones." The word itself does not appear in the Latin dictionary.

[66]The reference here is probably to modern Lithuania whose ruler seized the territory of Lavonia in 1561.

[67]Valerius Cordus (1515-1544) was a French naturalist who wrote on fossils, trees, and drugs.

rorat; nisi è plantis habeas? En melligenas stirpes: en mella terrestria, intestina floribus plantisq. mella.[b]

PATREM, Regem, Dominum supremum; nitore, forma, ac Diadematis quodammodo praeclaris in fronte lituris, praestantem. Aculeo hic apud Columellam caret, cui recentiores ferè omnes [ex Diogenianis fortè sermonibus] subscribere videntur. Potîus tamen eo, & Praepotenti quidem, non utitur; ut ait Aristoteles, accedente D. Ambrosio. Quamvis non desint, qui cum Aeliano & Plinio dubitent. Verùm decorus hic Princeps, adeò omnibus numeris absolutus est, vel ipsis ab incunabulis; ut statim & penniger, & conspicuis artubus, plenoq. in corporis statu, suaq. in magnitudine compareat; nec certè aculeo expertem illum faciîe quisquam existimaverit; à quo omnes aculeatae Apes producuntur, caeteriq. pariter ortum Reges habent: ipsi enim genitalis Apum materia substernitur. Hanc nil aliud à melle Cardanus cogitat; quo Apes omnino gignantur. Respuit, sed ita Scaliger, ut Melleam tamen fateri videatur, & concinnè insuper architectum calorem Apis

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[b]This marks the end of the first section of the Apiarium, the column on the left-hand side of the page.

those regions, where can you get honey except from plants? Behold the honey-producing stems; behold the honey of the earth and the honey within flowers and plants.

The father, the king, the supreme lord is outstanding because of his beauty, his form, and because of a shining diadem that is marked on his head.[68] According to Columella, he does not have a sting,[69] [a fact] to which nearly all recent writers (perchance from the Diogenian teachings) seem to subscribe. However, Aristotle says that the more influential and certainly the more able bees do not make use of [the sting], and Ambrose agrees with him. Nevertheless, there are those who, together with Aelian and Pliny, doubt whether these bees lack a sting.[70] Truly this elegant prince is absolute over all others even from his birth. He is obvious at once because of his wings and his remarkable limbs and his full stature and his size. Certainly no one could easily consider him from whom all bees with stings are brought forth to be devoid of a sting. Other kings likewise have their origin from him because the material for the generation of bees is strewn by him. Cardan thinks that it is nothing other than honey from which bees spring forth entirely.[71] Scaliger denies this, but he seems to indicate that the bee nevertheless adds honey-sweet liquid and, moreover,

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[68]Pliny Natural History 11. 16. 51.

[69]Columella Res rusticana 9. 10. 1.

[70]Aristotle Historia animalium 9. 40. 626^{a}21; Ambrose Hexameron 5. 21. 107. 28; Aelian On the Characteristics of Animals 5. 10; Pliny Natural History 11. 17. 52.

[71]Girolamo Cardano, De subtilitate libri XXI nunc demum ab ipso autore recogniti, atque perfecti (Lugduni: Apud Gulielmum Rouillium, 1554), p. 363.

addere. Atqui legitimo Plinij & Aristotelis testimonio compar ea melli è floribus est; praesertim Cerinthae, Oleae & Arundinis. Nutriuntur melle Apes, quo constant. Mellea exordia: melleam compagem sagaci praesensione, appetitu, facie ipsa, referunt. Mel autẽ sedatae iam naturae liquor; illa fermenti quadam virtute quae in motus ire debeat, materia est, ex ipsis florum decerpta selectaq. visceribus, proprijs scilicet mellis latibulis. Sed minutiùs quoque inspicere ut conemur, operaepretiũ videtur; & ea propter hic aliquantulum subsistamus, dum Melissophilos ab exteriori tabula ad interiores avocare discupimus.

Succo materia praegnans haud aequè disposita, indigestis prioribus magisque simplicibus figuris, particulas in rudiusculum heterogeneum concrementum interclusas ita habet; ut madore ab ipso, dum evaporatio impeditur, primùm calores concipiat, qui in meditullijs pulsent & cieant, intestinis in fervorẽ suffocationibus. Ebullienta verò mole multiplici remixtionae varîe

the heat elegantly appropriate to the construction [of the young].[72] But nevertheless, according to the equally legitimate testimony of Pliny and Aristotle, the bee is made from the honey of flowers, chiefly Cerintha, Olea, and Arundinis.[73] Bees are fed by honey, a fact about which [Pliny and Aristotle] are in agreement. There are the honey-sweet origins; bees bring back the honey-like connection with shrewd foreknowledge, with desire and with form. At this time, however, the honey is a liquor of tranquil nature; it is the material, selected and plucked from the viscera of flowers, their own special hiding place for honey, for fermenting a certain virtue which must quicken. But it seems also that we should undertake to examine more closely the value of the work; and we must stop here for a time while we are most desirous of turning the attention of honey-lovers from the picture of the exterior to that of the interior.

The material, swollen with juice, is not nicely arranged. It is at first in a disarranged and rather simple form. The heterogeneous mixture has particles hidden in small, crude limps. Since it is suffused by moisture, at first it contains heats which by evaporation pulse and quicken in the center from the internally stifled heat. Many

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[72]Julius Caesar Scaliger, Exotericarum exercitationum lib. XV de subtilitate, ad Hieronymum Cardanum. In fine duo sunt indices: prior breviusculeus, continens sententiae nobiliores: alter opulentissimum, pene omnia complectens (Frankfurt: Apud Andream Wechelum, 1576), pp. 623-24.

[73]Pliny Natural History 11. 16. 46; Aristotle De generatione animalium 3. 10. 760a1-10. Aristotle says that it is doubtful that bees are generated from the parts of flowers butattributes generation to the kings. He does not, however, say how it comes about. Pliny mentions both generation from parts of flowers and sexual generation, but he offers objections to both theories.

conscripta varijs & solutionibus & appositionibus, aliae atque aliae contexuntur superinductae figurae, ad organorum usque claustra: Hisce incipientibus concitationes replicantur, eae concutiunt non parum, ac secernunt, mutui ab internis colluc-
365 tationibus sive complexus, sive abscessus fiunt, perturbatae ac confligentes particulae, aptis intus extraque finitionibus, eam, quae comprehendat atque compescat, connexionem paulatim subeunt. Quae provide stabilitur; dum, fluentes ductibus, spirantes meatibus, factis; pendentes statuminibus labiles parietibus
370 appositis; & omnibus recte distributis, construuntur partes: donec placida coagmentatione situq. peraccõmodo, corpus constiterint in unum. In quo, reducta dispositio spatia reliquerit pervadentibus, frenũ furentibus iniunxerit, & in fluorem alijs, alijs quidem in duritiem actis, qùa rarius, qùa spissius
375 iungendo; sicciora, solidiora quae contineant, a contentis ipsis mollioribus dispertierit; & ne quid prorumpere, aut concidere vel posset, vel deberet, motiones quiete, libertatem blandis obligationibus temperaverit, Ita ut expiratio ad vitalis caloris opera citra febrim prohibita; citra resolutionem permissa sit,
380 mediaque in furoris ac torporis moderatione, calor ille suavis, veluti factis radicibus, insideat: quem caelestem, quem a

things have certainly been written about the bubbling, mingling mass, the various solutions and applications. Now the one and now the other of the forms caused by the heat are united for the completion of the organs. These quick movements are spread out in their beginnings. They stir around a great deal, and they dissociate by mutual internal strugglings into parts which either become closed in or disappear. The particles, disturbed and moving vigorously, little by little undergo that joining which holds and restrains them in appropriate boundaries within and without. [The body of the bee] is carefully made solid, and while [the grubs] hang from the supports of nearby walls, the passages for flowing and the passages for breathing are made,[74] and when all things have been distributed according to what is right, their parts are constructed. At last, by a calm collecting and at a convenient site [the parts] gather together in one body. This disposition leaves empty spaces in [the body] for the flowing [of liquids] and reins in the furies, bringing together some things for the purpose of flowing, while some other things have been compressed, joining those things which are thinner and those things which are thicker. It divides the drier, more solid things which contain from the softer contents, and quietly and with soothing obligations it tempers the motions, the freedom from restraint which should neither be able to nor ought to break forth or waste away. In this way, on the one hand the exhalation of the vital heat in the fever of work is checked, and on the other hand a release is provided and that pleasing heat, as if formed into rays, can settle in a moderate middle

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Pliny Natural History 11. 16. 48 says that the offspring look at first like white maggots and cling so tightly to the wax that they seem to be part of it.

stellis dicunt mystice magis respondentem elemento stellarum; quamvis origine & domicilio terrestris sit. Hoc, Animae functiones spirituum [tenuiorum scilicet & assidue concitarum productarumq. partium, interiori pulsatione ad animam usque continua] instrumentis, molisque ipsius, utpote musculis varijsque membris & organis omnibus, distributa obedienti a exerceri possint, libratione retractione, impulsu, pressione statuque varie excitatis. Quippe mutua & coordinatio & conspiratio totius & partium figurarumque omnium persistentium ex magis minusque implicibus ac remotis compositarum, operis tenet complementum; & animalis constitutionem statuit, in qua geminum illud ex movente & moto, soluente & soluto, appareat huiusmodi ex opificio resultans. Quod unicum, quod multijungum naturae opus, difficile verbis repraesentaveris. Faecunditas haec quidem operosa magnae illius Matris esse solet, quae immerito foedum putredinis nomen in Scholis sortita videtur. haec ipsius in alvo proveniunt: nec mirum videri debet, si unica eius ope plura e viventibus produci queant; cuius in viribus illorum parentes contineantur. Multo tamen facilius hoc contingere consentaneum rationi est, dum ipsi quoque parentes adstiterint; nec aliena, aut longius petenda materia fuerit; dum scilicet causarum

path between frenzy and laziness. They call it celestial heat, they call it heat from the stars mystically corresponding to the element of the stars, whatever its terrestrial origin and home might be. The functions of the vital principle of the souls (that is to say, of the more tenuous and constantly excited and extended parts always connected with the vital principle by interior pulsations) can be exercised by the instruments of the mass itself, namely the muscles and the various limbs and all the organs logically and compliantly arranged, variously excited by levelling, by withdrawal, by impulse, by pressure, and by posture. Certainly the mutual coordination and harmony of the whole, of the parts, and of all the forms, which rest in an orderly fashion from large to small and from distant to closely connected, maintain the completed work, and it forms the nature of the animal, in which that double nature of moving and movement, of freeing and being free, might appear as a result of a maker with such a nature. Only with great difficulty can you represent in words that single work which is of a multiple nature. This fruitfulness is certainly wont to be the industry of that great Mother, who seems unworthy of the name of foul filth received in learned debate.[75] These bees come forth of themselves in the hive. It should not seem marvelous if by a single one of their works many living creatures can be produced, the parents of whom are preserved by their powers. However it is much easier and agreeable to reason to mention this, that so long as the parents remain near (for material far away or unsuitable should not be

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[75]This statement is perhaps a reference to the idea that bees could be generated from the putrified body of a bullock. See Virgil Georgicon 4. 295-314, Varro Rerum rusticarum 3. 16. 4, and Columella Res rusticana 9. 8. 5.

vires in unum iunguntur. Iam materia, quam Apum genituram dicunt, à melliferis floribus exsucta praesto est, in qua non fortuito concursu partium, apina emergere debeat connexio; sed lecta consimilis adeò sit, ut posterioribus suis figuris, particulae quàm proximè & paucos per gradus in Apem iturae sint si ultimò conlocentur & imprimantur. Lacteus color spermaticam dicit, & condensis finitionibus spumosam, initijs organicis aptam, necnon prioribus nutrimentis, si ad ubera, si ad ova, plura semina, & ad oleosas, aqueas, salsasque mixturas respiciamus, fermentis itidem natam, qua melleà & paulo succosior est, si mellis ipsius motus & ebullitiones, factis praesertim cum aqua miscellis observaveris: nec enim aliud quidquam est, quod vaporosum magis, quod facilius fermentescat. Ex hac certè absque alio spiritu, subventaneis quid analogum ovis facillimo negotio confici à Natura posset. At ipse, qui deligit Rex pater instat. Eius subigitur opificio, collocatur, disponitur, vel ipso ore delibuta, & excocta, nec interno tantum suopte prioris fermenti, & concludentium focorum motu, sed seminalibus etiam ab eo spiritibus immissis, calores habet: quibus magis cieatur & suscitetur,

gathered) so long will the powers of the causes be joined in one thing. Now the material, which they call the generating material of bees, is present, having been plucked from honey-bearing flowers, and in that material a bee-like structure ought to emerge from a not accidental collection of the parts; but having been collected it is so similar to the [bees'] own forms which follow [from it] that the particles ought to be much closer to and go into bees in a few steps if they are gathered and compressed far away. The milky color [of the material] indicates that it is sperm-like and foamy and that, condensed within its bounds, it is appropriate for the formation of organs but not as the first food, such as we would consider mother's milk, eggs, many seeds, and oily, watery, and salty mixtures. It is the result of fermenting, of wetter honey [which you will see] if you observe the movement and bubblings of honey, especially that which is mixed with water. Indeed there is nothing more vaporous that ferments more easily [than honey.] From this [material], without any other spirit, [bees] can be produced quite easily by nature (a helpful analogy is an egg). But the king, the father himself, presides over what he gathers. By his work the material is made smooth, is placed in order, and is distributed after it is anointed and refined by the mouth [of the bee]. It has heat not so much from its own internal motion of its first fermentings and from its surrounding heat, but from the seminal spirits injected by [the king).[76] It is very greatly agitated and stirred up by these spirits, and in

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[76]Scaliger, Exercitationum, p. 624. He believed that little worms grew in flowers and that these were gathered by the bees and taken back to the hive where, after they had been injected with generating heat from the parent, they grew into larger grubs and finally became bees.

talique inspiratione in nexum promptius permovetur & excrescit, vivacibus non secus ac à Patre primordijs ipso in fervore comprehensa, eo insistente & urgente paulatim ultimos per gradus, figurarum superplicatione & complexu in organa omnesque articulos agitur. Semina verò hic omnino agnoscenda sunt. Compluribus ea physicis nil aliud, quam condensi simul spiritus existunt: omnibus quamvis addita corpulenta mole [potius ad priora nutrimenta] semina spiritu abundant plurimo: saltem quibusque in confesso est, ipsam vim & energiam seminis in spiritu esse. Apis hic completum, ipsissimum, purissimum semen nempe spiritum habemus primordialem [ut ita dicam] à patre, qui materiae suae illico superveniens partes magis magisq. similes provocat, ut promptissimè simul ac fortissimè Apis vita implantata remaneat, praemissa pariter locali dispositione, plastica insuper, & longè quàm Scaligerea Architecturà efficacior: vel etiam admirabili illa, quàm animulis, domos sibi exaedificandi ac complendi, concinnius multò quàm explicatius Physiologi contribuunt. Non igitur aliud quidquam in paterno prolis edendae munere desideres; sed potius Patrem admireris, qui non molliores ullos lusus, non vesanae irritamenta libidinis cognoscat, nec immunditias aut Veneres ullas;

intermingling with such spirits it is more readily excited and springs forth with its original vigor just as it would from a father. When it has been seized by the fervor which pursues and urges it gradually through the last steps of the folding and encompassing of all forms, it is confined into organs and all the limbs. These generative materials must be completely understood. They are thought by a number of scientists to be nothing more than a substance similar to condensed spirits. Although they have added the fleshy body (better for the first food) the generative materials overflow with spirits. In any case it is allowed that the force and energy of the generative material are in the spirit. Without a doubt we have the purest material, the primordial spirit (as I call it) from the father, which brings the bee to completion. The father, coming upon the material, immediately produces more and more similar parts so that the life of the bee, having been implanted most promptly and most strongly, remains, sent forth equally by the disposition of the place, capable above all of being molded, and far more efficient than the architecture of Scaliger.[77] And it is admirable too how natural philosophers, building and furnishing homes for themselves, unite with these little spirits in a manner more elegant than plain. You might ask nothing more of the paternal office than the production of offspring, but you must admire more the father who knows no easier sports, no excitement of lustful madness, no impurities or veneries.

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[77] Ibid. "Nonne e roribus vermiculos creare dicebamus in follis? Quanto commodius lectus ros ille atque fotus calore parentis genitali, tanquam ab architecto in schadone animabitur?" "Do we not say that little worms are created from dew in flowers? Is it not more fitting that when the dew is gathered and the fetus made by the generative heat of the parents, it is brought to life in the cell as if by an architect?"

sed contra quàm alijs contingat, rem cognoscat plurimum ignoratam: nec enim ignavus aut ignarus progignit Author, opusque sobolis inscius, patrat; sed liberalem prorsus liberis dat operam, nec absque studio. Pleniora forsitan semina exigeres, quae molem aliquam haberent? Non haec ab Apis corpore petenda sunt, aut in eo intrinsecus per ingluviem receptis superfluis alimentis, per membra omnia ducenda elaboranda, & figuris consignanda, quae abundè exterius propè iam figurata prostant, ipsique bene nota & congenita similitudine disposita, patri praesto sunt quae ad opus sumantur. inquinari mundissimum non debuit corpusculum, talibus vorandis, tanquam remotioribus; si proxima existunt, imò suamet, ex quibus constat. Spiritus ipsi sufficiunt, qui huic materiae in genitali constitutione imprimantur, qui dum toto à corpore Patris demittuntur, benè distincti, ac quasi multiplicis spirationis delatis sigillulis, conscripti firmioribus impressis figuris, eam & intus, & in cute positionem statuunt; qua nexus Apinus omnimode resultet. Nec tali modo eos distinctos haesites, licet videre nequeas; maternos namque characteres positione varia, particulae referunt, quamvis nostros oculos fugiant. Ita de saporibus ac odoribus, varijs particularum ictibus discernis;

What entirely opposite things he seizes upon. He knows the unknown, for an ignorant or slothful author does not produce, and he accomplishes unknown work and offspring, but [the Father] gives work befitting a free man to free men, with zeal. Should you perhaps throw out the fuller materials which are rather heavy? These should not be sought by the body of the bee because [bees] do not have a craw for taking in food which they cannot use. [Such food] should not flow through the limbs nor should it leave any mark on the forms [of the bees] which are outstanding now since they have been well formed by an outside force. [Those bees] who are employed in work, well known, formed together with and disposed similarly to the father, are outstanding. The very delicate little body should not be polluted by eating strange food if foods on which the body depends exist close by. The spirits alone, which are imposed on the generative constitution of this material, are sufficient. They are sent forth entirely from the body of the Father. They are well distinguished, and they are like so many spirits which are sent forth ornamented with the small form [of bees] just as [ideas] are put down in writing with firmly impressed letters. The spirits establish that posture both inside and out. From the joining [of spirit and form] the Apinus results in all its forms.[78] You should not doubt those distinctions of form, although it is allowed that you cannot see them. The particles in their various positions convey the maternal characteristics, though they escape our eyes. Thus, you can discern things by tastes and odors, by the various strikings of particles [upon the senses]; and

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[78] Apinus is the name of the tribe to which the species apis belongs. See Michener and Michener, American Social Insects, p. 105. Cesi is apparently using the word to mean the species itself.

rerumque fumos, quamvis eiusdem omnino aspectus, tamen diversos naribus percipis: atque etiam minimè corpulentos, nulloque modo conspicuos à Moscho per totum cubiculum effusos, Moschaceas inquam, partes persentis. Et si ipsam odoram canum vim, caninas scilicet peritissimas nares consulas, halitus diversos à singulis animalium corporibus missos, vestigijs etiam post multum temporis & ablutionum, in vijs pertinacius remanentes, perceptos disces. quos certè, nisi particulae in maternae compositionis figuris persisterent, minimè illae quidem referre, minimè eas distinctè sensus ulli recipere advertereque possent, quae ab illarum finitionibus pendent omnia, quibus applicatae sensibus, inscribantur. Apinum seminium, quamvis conspici non possit, in halitu & spiratione bene impressa totius corporis, imo in spiritu totum longè efficacius est; cui nequaquam alia elaboranda similitudo, aut adiungenda moles, praeterquam quae exterius substrata & recipiat, & concipiat. Progressus à Vermiculo est, quasi germine, maturante natura, in ovi initium praemisso, inde quasi in ovum conglobato, ad complementum conclusa quiescente Nympha, & vires constitutis principijs sumente; tandem promissis cruribus & brachijs, protensi alis, in Apem ventum. Nec de Matre interim, ac maternis officijs solliciti simus. Materculae statim adsunt, Incubae Apes regios foetus confovendo, donec ad complementũ usque

you can perceive the odors of things, however diverse, wholly through your nostrils rather than by the sight of them. You can perceive even the smallest invisible bodies effused by Moschus throughout an entire bedchamber. I say that you can perceive the Moschaceus parts.[79] If you consider odor as the talent of dogs, that is to say the most skillful canine nostrils, you should learn about what they perceive, the diverse exhalations from the body of a single animal, the traces clinging persistently in the trails despite much time and washing. These exhalations could certainly not be perceived distinctly or could not attract the attention of the senses unless the particles on the outside retain the maternal form. The material of bees, although it cannot be seen, is well impressed on the breath and breathing of the whole body, but it is impressed much more effectively in the spirit. The spirit assimilates nothing whatsoever that elaborates its own likeness or adds weight to it except what the outer parts [of the body] assimilate. It has progressed, like a bud maturing in nature, from a little worm at the beginning which turns into an egg, where it is gathered up into a round ball, as if in an egg. At its completion it encloses a resting nymph which gathers strength from its chief components. When at last arms and legs have grown out and its other parts have been stretched forth, it is made into the bee. We are not able to summon forth the mother, meanwhile, to all her maternal duties. Little mothers are steadfastly present, fostering the kingly fetuses of the resting bees until they

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[79]An English dictionary defines moscate as having a musky odor and moschus as the species which includes the musk deer. Cesi is evidnetly using these terms as examples of a powerful odor which, though not visible, is readily perceived by the nostrils.

perducantur, quas inferius habebis, cum alijs operarum manipulis. Magna prius Natura Mater in his aviculis operatur. Pater inde excitat, promovet opus, atque confirmat: tandem nutriculae istae. Vi mira in hac generatione praestantissimi animalculi colludere natura cum parentibus videatur; vel potius cooperari, pariterque congignere. Partes siquidem à materiae motu illo putri-nomine in ea habes: & materia ipsa simili: habes & ab illis impressas. Conspiratione verò figuras utrinque & nexus, calores tum primigenios, tum etiam subsequentes, & complexuum & incubationum: similia statim ad corporis molem alimenta. Ut si mota per se remotior materia; multò magis, quae proxima & spiritu figurata, plurium adiuvantium concursu accedente, Apes magno parenti enitetur. Praecipua verò & Naturae & Patris vis in novellis Regibus, mirabili certè compendio, conficiendis. Praestantioris delectus materiae, [ea condensa aureo-mellea est] conserta spirituum multitudo, ut ocyssimè perfectionem habeant, nec in vermiculo inchoati, aut Nympha sopiti, vel tantillum morentur, sed corporis ac ingenij modulis maximè elucescant tanquam electo fiore, ut ait Plinius, ex omni copia facti: regia generatione, & Leoninae quodammodo rationis. Ut denique non quidquam aliud deesse videri

are finally brought to completion. You should consider these little mothers as being of a lower rank along with the other bands of workers. First the Great Mother Nature operates on these little birds. Then the father produces, advances and confirms the work. At last there are the little nurses. Thus the marvel in this procreation of excellent little animals is that nature seems to act together with the parents. She even seems to cooperate more and to bring forth [offspring] just as [the parents do]. You have certain parts of your substance from the foul-named passion, and you have parts from material similar to it and marked by it. Through the harmony [of bee and nature] there are, on the one hand, forms and on the other their connection, heat now producing the first and then the succeeding forms, both the uniting and the resting. There are always foods similar to the substance of the body. As the material itself is further away, much more is formed by the spirit which is at hand, and the great parent, happening onto an assembly of advantageous things, brings forth bees. There is a truly unique force of nature and of the father which brings new kings to completion in a remarkably short time. They select the most excellent material (this is a golden-honey condensate), a multitude of thickened spirits, so that [the new kings] can reach perfection most rapidly and so that they do not have to linger as unformed little worms or as a sleeping nymph or such a small thing, but they grow most rapidly in size of body and of nature as though made from the choice flowers of all those available, as Pliny says. In this certain way are kings generated according to the leonine principle.[80] In this way, then,

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[80]Pliny Natural History 11. 16. 48. "The king is from the start

possit gignendi in Apibus, nisi quod impurum, fatuum, aut minus serium aestimari queat: quod pellicere, quasi molles puerulos illos possit, soleatque; qui multò quidem minus aviculis istis prudentiâ duci videntur, quae citra ullam Venerem in successores populumque sibi intendere sciant, ut virtutis laboribus devoveant, & Colonias in fructus pariter constitutas, alias atque alias mittant. Profecto virgineo in Apum Gynaeceo, absque admiratione, vel parum oculos immittere non licet. Officina Physiologis plurimum inaccessa est, in qua filiorum compositio fiat, inaudita etiam pluribus: quorum folia, sive è scholasticis contentionum promptuarijs; sive suavioribus contemplationum involuoris educta; ameas illa origines vulgatas magis ac communes, historicè protulerunt. Hoc verò Apum industrium Prolificium, nec historia quidem satis spectatum videri potest, quin potius vix indicatum, & ambagibus involutum: magnae & ambiguae quaestionis Aristoteli, & Plinio: nedum alijs. In quo tertius nascendi modus, qui mirabiliter priores, parentum se commiscentium unione, vel coitus aut concalefactorum mixtione vel coniunctione provenientes; in unum pure compraehendat:

nothing whatsoever is lacking in the generation of bees except that which is considered impure, foolish, or less than serious. Anything which can and does tempt weak young slaves [is absent]; indeed [those slaves] seem to be guided much less prudently than these young birds, who know much earlier [in life] how to direct any venery in themselves to the purpose of successors and subjects so that they can dedicate the labors of their strength equitably to the fruits of setting up colonies, and they send forth now one and now another. Truly one cannot look into the virgin women's chamber of the bees without admiration or with too little admiration. The workshop of physiology in which the composition of the offspring is done is completely inaccessible. It is unheard of by many, whether they are guided by the scholastic storehouses of striving or by the more pleasant cover of contemplation, whose pages have mentioned that according to history the sisters of the king are of common and ordinary origins. This industrious prolificacy of bees certainly does not seem to have been observed enough in history, and for that reason it is hardly known and is confused by ambiguities. It is very obscure to the questioning Aristotle and to Pliny and much more so to others. The third manner of bringing forth young, which is as remarkable as the others, is the generation from the union of the parents, either in intercourse or in a mixture of warm substances, or a begetting from this conjuncture. It

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of the colour of honey, as if made from a special blossom chosen out of the whole supply, and is not a maggot but has wings from the start." Aristotle Historia animalium 5. 22. $554^{a}24$-27. "The egg of the king bee is reddish in colour, and its substance is about as consistent as thick honey. . . ." The "Leonine principle" might refer to the theory that bees are generated from the putrifying bodies of lions and thus have the courage of lions. See Purchas, Politicall Flying-Insects, p. 42.

nova quasi natura constituta videtur; plastico penè in sobole conficienda exercitio, quo magni Parentis munere [unde Maes solus in tota familia; sed perperam existimatus est] Rex, Dominus ipse, fungitur. Populum qui sibi milites, famulos, administros, & quidem filios omnes ex voto fabrefacit; quibus pleno iure imperitat; quibus ad opificia, & officia industriè utatur. Nec alijs operarum laboribus ullis, aut curis dignis minus, sed summis tantum negotijs addicitur, scilicet Populis regendis atque condendis.

COHORTEM, ad Regis stipationem selectis ex Apibus, & quasi senioribus, quae circum Principem, in comitatu ac custodia caeterisq. huiusmodi officijs, persistit. Aeliano à mellificijs operis immunis. Satellites, Lictoresq. Plinius notat; assiduos Authoritatis Custodes.

DUCES, inde Regios administros, quos cum Rege confundere solent Scriptores ferè omnes, & multos ita Reges, vel optius Optimates inter Apes statuunt. Nos porrò multo potius, admirandis in hisce Volucellis Monarchiam agnoscimus; bene suis munijs,

joins [them] naturally into one. It seems as if a new nature had been constituted. The king, the lord, occupies himself almost entirely with the practice of bringing forth offspring who can be formed. It is the duty of the great parent (for which reason he is considered the only male in the whole family, but wrongly so). He most skillfully makes the beings who are his soldiers, slaves, administrators, and even sons according to the oath,[81] whom he rules with full rights and whom he industriously employs in works and duties. He does not take on any other labors or any cares of less importance than the greatest occupations, the actual ruling and keeping together of the people.

There is a cohort, or a retinue, selected for the king from the older bees. It remains around the leader in attendance and guardianship and other such duties. [Its members] are excused from the honeymaking labors, according to Aelian.[82] Pliny notes these attendants, the careful guardians of [the king's] authority.[83]

There are leaders, who are the royal administrators whom nearly all writers usually confuse with kings and thus say that there are many kings, or better, aristocrats among the bees.[84] Moreover, we ourselves can well recognize the monarch when we admire these swift-flying bees

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[81]The Roman people periodically took an oath to protect the good health of their emperor.

[82]Aelian On the Characteristics of Animals 1. 10.

[83]Pliny Natural History 11. 17. 53.

[84]Pliny Natural History 11. 16. 51; Aristotle Historia animalium 5. 20. 553[a]25; Columella Res rusticana 9. 10. 2; Varro Rerum rusticarum 3. 16. 18 all believed that there were king bees which were red and inferior kings which were black and mottled.

membrisq. uno solidoq. in corpore constabilitam; quàm rimis hiulcam, & multiplici compositione labilem Aristocratiam; Aristotelis quoque verba non discrepaverint; si τὸν βασιλέα, τοὺς ἡγεμόνας Unum illum Dominum ab adstantibus, iussa qui propè capessant; qui agminatim Populum ducant: distinguere volueris. Hisce Ducibus seditionis crimen interdum attributum intelligas; & quandoque minus obsequentes, aut alioquin culpabiles, extra alveos Regia procul ab Aula, interemptos.

I. OPERAS, Apes ipsas praecisius dictas: Regis secũdariam prolẽ, conformatione ex Vermiculo, & Nympha, in volucellas perductas: Rege, & Fucis minores: quae tertio à Rege generationis gradu Fucos producunt. Distinguuntur autem

A. Corporis constitutione, ex observationibus nuperorum, Germanorũ praesertim

1. Aculeo praeditas, quas Masculas dixerunt forte FUCORUM PARENTES, quae Regi natura proximiores, spiritu abundent, genitalemque Melliginem illam legere, & disponere valeant, spiritibusq. immissis, sed imbecillius excitare; ut proles magni quidem corporis, laboribus

from a distance. He is well-established in his own duties, and his limbs are on a solid-[colored] body. How ill-formed, with rifts, and how uncertain are the aristocracy in their multi-[colored] bodies. Also, the words of Aristotle do not agree [with the opinion that there are several kings] if you consider that τον βασιλεα, τους ηγεμονας [thou king, thou leader] distinguishes the one lord from those outstanding bees who undertake the command and who lead the line of march of the people. You know, meanwhile, the judgment pronounced on seditious leaders; whenever they are less than compliant or in some other way culpable they are driven a great distance away from the beehive and from the royal courtyard.

I. Those bees, more precisely called workers, generated by the king as a second sort of offspring, and in their conformation evolving from a little worm and a nymph into a flying insect. Smaller than the king and the drones, who produce drones in the third step of generation from the king. They are distinguished

   A. By the nature of their bodies as recently observed, chiefly in German [bees].

      1. [They are] the parents of the drones, armed with a strong sting which they say is worthy of a male.[85] They are very similar to the king by nature, overflow with spirit, and are strong enough to gather and place in order that generative honey-sweet juice and to produce spirits which are discharged [into the juice] but which are weaker [than those discharged

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[85]Aristotle De generatione animalium 3. 10. 759b4-6.

tantum onerarijs devovenda, hebeti subnascatur ingenio, spiritibus vix ad propriam vitam, nedum ad eam generatione propagandam, sufficientibus.

Aculeo expertes INCUBAS, quas domi contentas alveolis, as fovendos regios foetus xlv. totos dies insidentes, Gallinarum more concoquentes, foeminas ab officio dicunt, non a coitu, aut sexu. Hae continendi servandique succrescentis igniculi muneribus, non eam tantum vicem supplere videntur, quae conceptaculi & corticum est, si plantas; tegminum, & complectentium, si ova; uteri & tunicarum, si maiora animantia, consideres: sed etiam regiorum spirituum exordia promovere, concepto insistentes operi calorem sugere, spiritus proprios, secundarios, ac veluti faemineos superaddere, commotione cum murmure, & strepitu maiores ultimo calores ciere, ut a Plinio notatum, ad exclusionem examinis universi, quasi ex ovis effractis folliculis, & membranis: demum

by the king].[86] The result is that the offspring, although it has a large body, is destined to such burdensome labors that it grows up with a dull nature, with spirits scarcely sufficing for its own life, much less to propagating by generation.

[There are] nurses, armed with a sting, who are closed up at home in the hive, sitting on the fetus fourteen whole days for the purpose of warming the kings and maturing them just as is the custom of hens.[87] They are females because of their duty, not because of sex or intercourse. They, tending and preserving the growing little fires by their work, do not seem to serve the same function as receptacles and bark do for plants, as the shell and surrounding material do for eggs, or as the uterus and skin do for higher animals, but they promote the generation of the incipient kingly spirits, add heat to the work of conceiving, and add besides the appropriate spirits of a secondary sort, as one might call them, the feminine [spirits], and with a murmuring commotion they stir these up to greater heats as if for the hatching of the whole band from the broken shells and membranes of eggs, as noted by Pliny.[88] Then finally they

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[86] Ibid. 759[b]25. Aristotle says that the brood comes into existence even if a king is not present.

[87] Pliny Natural History 11. 16. 48.

[88] Ibid. 9. 16. 49. "As time goes on they give them drops of food and sit on them, buzzing more than at any other time, with the object, it is thought, of producing the warmth needed for hatching out the grubs, until they break the membranes that enclose each of them like eggshells and the whole band emerges."

alumnarum adinstar cibos instillare, & ad laborum initia perducere; ut Materculas, ut Nutriculas dicere possis, quae omnibus ipsius, Matris & uteri-partibus, in Apibus à conceptu ad editionem usque asserendis, satisfaciant.

B. Officijs, laboribusque Aristoteli, Plinio, & Aeliano: & dubium sit, an vicaria, & aetatis ratio servetur.

1. Intus quae operantur: natu maiores inde hirtae magis.
   a. Architecte, aedificantes favos
      i. Plastides
      ii. Figulae
      iii. Polientes
   b. Onera suscipientes
   c. Purgantes, quae immunda asportant.
   d. Excubiae, Vigiles.
2. Ad opus, quae extra pergunt: pugnant: occidũt Fucos, & Noxios: & ferè sunt glabrae magis, & Iuniores
   a. Custodes ad portas Virg.
   b. Exploratrices
   c. Anteambulatrices

provide the food for the nurslings and guide them to the commencement of their work. For this reason you can call them little mothers, nurses, who take care of all the duties of the mother herself and of the womb in bees, from conceiving to giving birth by freeing [the bees from their cells].

B. By duties and labors, according to Aristotle, Pliny, and Aelian; and it must be doubted that the slave is preserved because of his age.[89]

1. Those who work inside, the oldest ones, who consequently are very hairy
   a. Architects, building combs
      i. Molders
      ii. Potters
      iii. Polishers
   b. Burden bearers
   c. Cleaners, who carry out filth
   d. Guards outside the house
2. Those who go forth to the work which is outside. They fight, they kill drones and obnoxious creatures. They are almost entirely without hair and are the young ones.
   a. Guards at the gates
   b. Explorers
   c. Those who fly ahead

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[89]The divisions which appear in this section are found in Pliny Natural History 11. 10-11, Aristotle Historia Animalium 9. 40. 626^{b}9, and Aelian On the Characteristics of Animals 5. 11.

d. Aquam ad cellas afferentes & melli miscentes;
nisi totum hoc laboris Fucis tribuendum sit

e. Ergophorae materiam adferentes

i. Mel

ii. Ceram

iii. Erithacen

FUCOS, Lixas, Apum servos, Hydrophoros illos, Apum Masculi nominis ut indicatum, vel etiam Emeritarum omnium illarū prolem, ut existimant nonulli, quod ab exterioribus laboribus dum cessant, minimè Apibus otiari liceat; sed operibus intra domicilia vacare debeant; quale est, servorum producendorum in familiae complementum. Fusca haec proles est magis, aut subnigra, gravior, aculeo carens. Aculearij tamen ab animo & voluntate, Fuci vocantur; cum grandiori & ipsi corpore deficiente Rege, superbiunt: tunc enim digniori loco quoque, in Apum loculamentis gignuntur, unde & audaciores. Nam eo vivente seorsim dumtaxat locum

d. Those who carry water to the cells and mix the honey, unless the whole of this labor must be attributed to the drones.

e. Work-bearers who carry material

i. Honey

ii. Wax

iii. Erithacen

[There are] drones, the sutlers, the servants of the bees, their water-bearers, designated by the masculine name of bee. Some think that they are the offspring of all those who have served their term [of work] because when they cease their labors outside they, least of all, are allowed to be lazy but they must be relieved of duties within the hive.[90] They are designated as producing slaves in the complement of the family. This offspring is very tawny or somewhat darker and heavier [than other bees] and does not have a sting. The drones are called stinged however because of their nature and will. Although they are not as large as the kings, when there is no king they are proud for then they are produced in a more worthy place in the cells of the bees, and because of this they are more audacious.[91] Since they live apart according to

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[90]Pliny Natural History 11. 11. 27. "The drones have no stings, being so to say imperfect bees and the newest made, the incomplete product of those that are exhausted and now discharged from service, a late brood, and as it were the servants of the true bees, who consequently order them about, and drive them out first to the works, punishing laggards without mercy."

[91]Aristotle Historia animalium 9. 40. 624^{b}12-17. "As long as the leader is alive the drones are said to be produced apart by themselves; if he be no longer living, they are said to be reared by the bees in their own cells, and under these circumstances to become more spirited: for this reason they are called sting-drones, not that they really have stings, but that they have the wish, without the power, to use such weapons."

obtinent mediastini, negotijs prorsus illiberalibus addicti, &
aliorum etiam vices opportunè supplere coacti, veluti abscedentium quandoque Incubarum. Pluribus quidem steriles sunt: quamvis nonnulli sint, quibus Aristoteles de ipsorum pariter, ac Apum prole, loqui nonnunquam videatur. Cephenas appellatos legas, χηφῆνες enim Graecis Fuci. Sunt, qui imperfectos adhuc Sirenes vocent, ut quae Apum Nymphas. Spurium quid, & sterile praeseferunt; unde ignaviae vitio quandoque notantur, cuius & subinde paenas luunt. Scaligero APIASTROS appellare libuit.

SUBREPTORUM mellis, Fucorum Collegam alium, spurium certè; nigrum, ampla alvo [an cum nigro seditioso convenientem?] in familia Plinio grandissimum: Fucis minorem Aristoteli, qui dum apud Scriptores cum illis solet confundi; in causa est, ut

to the proper order [of the hive], they hold the rank of common servants. They perform in addition the tasks unworthy of a freeman, and they are even constrained to fulfill the destiny of others, for example that of the emerging incuba.[92] They are sterile, according to many. There are several things concerning which Aristotle seems to say the same thing about them and about the offspring of bees. You should read the name χηφμνες, Cephenas for Greek drones. There are those who call these imperfect ones Sirenes inasmuch as they correspond to the nymphs of bees.[93] [Drones] produce what is false and sterile, and because of this they are noted for their vice of laziness, for which they continually suffer punishment. It pleases Scaliger to call [them] Apiastros.[94]

[There are] the honey thieves which, according to Pliny, are another group of drones who are certainly illegitimate and are black with a great round belly (is it perhaps accordant with black sedition?) They are the largest of the family.[95] They are smaller than the drones according to Aristotle who, since he generally confused them with the [worker bees], is the reason that [other writers] hear the same thing,

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[92] Ibid. 626b8. "When the honey runs short they expel the drones. . . ."

[93] Pliny Natural History 11. 16. 48-49. "The remaining throng when they begin to take shape are called nymphae, while the sham ones are called sirens or drones."

[94] This statement might refer to Scaliger's commentary on Aristotle's Historia animalium. Apiastra means a bird that lies in wait for bees, a bee-eater.

[95] Pliny Natural History 11. 18. 57 says that some people believe that this group forms a separate species of bees apart from the drones.

simul & ipsi malè audiant. Nigrum hunc potius KACHIM, M. Alberto dictum crediderim.

SCLERUM, sive CHLORUM recensent nonulli, contubernalem ex Aristotele & Plinio [male enim ita à duritia cum Dalechampio, vel colore cum Scaligero legere, quàm, quod plures faciunt, dignioribus nominibus hoc in abortivo, abuti] Vermiculum infestum Apibus Aranei specie, PYRAUSTAM aeguivocè etiam dictum. Hi Apum abortum cum Plinio faciunt. Alij Animalculum ex favis putribus educunt. Faciłe quis hoc existimans ex corrupta potius Apum genitura; incubationis defectu, aut ipsius miscellae, vel extranea aliqua iniuria; rem composuerit; & proprius forsan attigerit.

Subiungitur OESTRUS quidam ex Plinio, ab Apibus qui

and that wrongly.[96] This black bee I believe is better called Kachim after Albertus Magnus.

Some call Sclerum or Chlorum a companion after Aristotle and Pliny (for it is evil either because of its harshness according to Dalechamps or because of its color according to Scaliger, [who] pick and use the names that are fitting for this abortion because it causes abortion).[97] The little grubs of bees are molested by a species of spider ambiguously called Pyraustam. These cause an abortion of bees, according to Pliny.[98] Other little animals come forth from the filthy honeycombs [where the bees are aborted]. One better explains this happening and perchance comes closer to the [cause] when he deems that this happens because of the corrupt generation of bees, because of a defect of incubation, or of the mixture itself, or because of some other injury from outside.

The Oestrus also is considered a kind of bee that is produced

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[96]Aristotle Historia animalium 9. 40. $624^{b}23$-26 believes that this group is a distinct kind of working bee separate from drones.

[97]Sclerum might be a variation of scelerus meaning wicked or abominable. Chlorus might be a form of the word chloreus meaning greenness, and it would explain the reference to color. Jacques Dalechamps (1513-1583) was a French physician and botanist who among other works edited Pliny Natural History. Since Dalechamps edited this work and Scaliger wrote a commentary on Aristotle's Historia animalium, the words sclerum and chlorum are probably their and not Pliny's or Aristotle's.

[98]Pliny Natural History 11. 21. 65 mentions spiders who build webs in the hives of bees. He also mentions moths which eat the wax and deposit their grubs in the combs. He calls these moths ignoble creatures that flutter around lamps which are lit, hence the name Pyraustam, an animal who lives in fire, although Pliny himself does not apply this name to the moths. He does mention (11. 42. 119) an animal named pyrausta which is observed in copper melting furnaces and seems to be bred in fire. Cesi's reference to the Pyraustam may be a confusion of these two passages from Pliny.

proveniat in extremis favorum partibus. Foetus grandior, ut Regem ipsum quibusdam mentiri potuerit, corporis amplitudine. Domesticus hic, & irrequietus hostis vel etiam confuse inde dictus; quòd ipsum ita examen agitet, ut nunquam conquiescere sinat. Credas consimili modo ipsum cum Sclero genitum, sed copioso magis spiritu ad furorẽ usque sequaci in materia ampliuscula quidem cõgesto: quod exteriori magis ab impetu, & internis madoribus in focis, qui putredinis nomine ignorari solent, concitatius conclusa exarserint: turbulentumque fermentum furentis bestiolae prorsus reddiderint; fortè examina assiduè, quasi quibusdam stimulis excitantis, ne ulla pigritiae labes irrepere unquam possit. Ut nihil ferè locum sub Apinae familiae tectis habere possit, quod ad rem ipsam & opus aliquo modo non faciat. Ita spirituum & molis proportio, commixtio, fermentum: excoctiones, prout diversè se habuerint, gradus in Apum domo constituent. qui non parum inter se differant, optimaque in regiminis administratione, alijs atque alijs distributis munijs & operibus convenientissime distinguantur.[c]

URBANAE Plinio & Aristoteli optimae, in rotunditatem compactiles, breves, variae, aureo-fulvae. tertium fortè M. Alberti genus, quod Columnale appellat.

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[c]This line marks the end of the middle left section of the text.

in the outer parts of the combs, according to Pliny.[99] It is a larger fetus that because of the size of its body is able to imitate the king himself. This domestic and disquieting enemy is thus confusedly called a [king] because it drives the swarm [from the hive] and does not allow it to be at rest. You think that its generation is similar to that of the sclerus but with much more abundant spirits spreading through the material leading even to madness. While the creatures are closed up, they are violently stirred up by any blow on the outside and by the internal heats in the hive, and they are usually mistaken by the name of foul filth. The little beasts immediately cause a turbulent ferment. The swarm thus driven harshly as if by a goad is never able to insinuate itself into the unproductive ruin [of the hive]. Thus nothing can have a place under the roofs of the family Apina which does not contribute [to the home] in some way. Thus [bees] are situated in their diverse forms according to the proportions and mixing of spirits and mass, by the ferment, and by thorough boiling. The diverse kinds of bees constitute steps in the house of the bees. Some are distinguished as greatest in the administration of the regimen, some are distinguished by their duties, and others by their labors.

According to Pliny and Aristotle, the best Urban bees are thickset, round, short, and a varigated golden-red color.[100] According to Albertus Magnus they are perhaps a third sort of genus which he calls Columnale.

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[99] Pliny Natural History 11. 16. 47.

[100] Ibid. 11. 19. 59; Aristotle Historia animalium 9. 40. $624^{b}23-25$.

Longiusculae, similes Vespis, glabrae, quae Plinio minus probantur. an secundum genus M. Alberto?

Longiusculae aliae, similes Vespis, pilosae, deteriores Plinio, & Aristoteli: quae convivendi arte, favosque & domicilia disponendi, multo prioribus cedant.

Vastae, nigrae, hirsutae, glomerosae, Columellae.

Minores, rotundae, horridi pili, infusci coloris Columellae, an Tussicum genus M. Alberti: quod horridum, pilosum, malum, iracundum dicit.

Exiguae magis, obesae, latae, meliusculi coloris, Columellae.

Minimae, graciles, acuti aculei, ex aureolo variae, laeves Columellae.

Peculiares quandam, forma ab alijs aliquantulum differentes, Germani alunt, quae doceri quodammodo possint: ita enim instruunt Mellitores, ut per alvearia discurrant, & mel

There are somewhat longer, hairy bees which are similar to wasps. They are less highly esteemed by Pliny,[101] although might they be a second genus, according to Albertus?

According to Pliny and Aristotle there are other somewhat longer, hairy bees, similar to wasps, that are of a lower class. They are inferior to the first two kinds in the art of living together and of arranging their comb and their dwellings.[102]

There are ones of enormous size, black and shaggy, like a ball of yarn, according to Columella.[103]

There are, according to Columella, smaller bees which are round, shaggy haired, and dusky colored,[104] although according to Albertus Magnus these, which he calls shaggy, hairy, evil, and irascible, are the genus Tussicum.

There are those which are even smaller and are fat, broad, and of a somewhat lighter color, according to Columella.[105]

There are those which are smallest and are slender, have sharp stings, and are reddish gold varying to a lighter [color], according to Columella.[106]

The Germans raise certain peculiar bees which differ somewhat from the others in form. They can also be taught after a certain fashion, and they build Mellitores as they go about in the hives, and

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[101]Pliny Natural History 11. 19. 59.

[102]Ibid.; Aristotle Historia animalium 9. 40. $624^{b}25$-27.

[103]Columella Res rusticana 11. 3. 1-2.

[104]Ibid.

[105]Ibid.

[106]Ibid.

Dominis suis copiosum conferant: unde caeteris ingeniosas magis, magisque Sagaces existimare par erit: quae & astu & dexteritate simul antecellant.

Ut autem animi viribus Germanicae praedictae pollere videntur, utpote quae instrui possint in hominum obsequia; ita robustiores corpore in Samogithia à Cardano notantur, quae & frigoribus resistant, & optimum mel elaborent. Adiungere autem ex Olao Septentrionales possumus; & quae apud gelidos & glaciales Scythas sunt ex Aeliano, apud Sarmatas certè Pinetis maximè iuvari traditum. Ad Tanaim plurimum mellis Scaligero.

Magis autem & opere, & corpore validas, Apulas existimemus; quas ad Cerinolani Castri moenia, Doctrina, & Genere conspicuus D. Fabius Columna Lynceus observavit; feracissimas illas Apes, & mellis, & sobolis, nobis retulit, ut decem e quovis Alveario, perbrevi tempore examina prolifirent: Mel copiosum, crassum & excòctum magis congererent: Cerae quoque multum; a qua Castro nomen suspicamur inditũ; uti fortè & ab Apibus regioni:

they collect abundant honey for their lords. For this reason they excel the rest by their adroitness and dexterity and are thought to be the equal of the very clever and sagacious. Just as the above mentioned German spirits seem to be powerful in moral strength inasmuch as they can be instructed in obedience to men, those in Samogithia are noted by Cardan for their very hardy bodies which both resist the cold and make the best honey. However, we can add the Septentrionalian [bees] from Olao[107] and those which are present in the cold and icy Scythas, according to Aelian.[108] Sarmatians[109] believed that bees are greatly benefited by pine groves. There is more honey on the Tanais[110] according to Scaliger.

We must judge the Apulian bees as the stronger, however, both in their work and in their bodies. D. Fabio Colonna Lincei, who is noted for his teaching and his character, has observed them at the walls of the camp of Cerinolani. He brought back to us those bees that are so fruitful both in honey and in offspring that from any beehive ten swarms will proliferate in a very short time. They gather a very abundant, thick and pure honey and also much wax, from which we surmise the name of the camp is taken.[111] [Honey and wax], refined

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[107]Samogithia--a country on the east shore of the Baltic Sea. Septentrionis is further north than Samogithia, according to Cardan, De subtilitate, pp. 26-27.

[108]Aelian On the Characteristics of Animals 2 53. Scythas--a country in Asia near the river Don.

[109]Sarmatians--a Slavic people living between the Vistula and the Don.

[110]Tanais--a Latin name for the river Don.

[111]The Latin word for wax is cera; thus the name Cerinolani could easily be derived from this word.

agrum capitato Thymo, angusti-folio Pulegio, Libanotide Cachrifera refinosa, refertum esse, alijsq. Umbelliferis odorata glutina exudantibus; In Samnitum autem illorũ, quod hodie Molisios appellant, frigidioribus locis, minus quidē ab Apibus haberi mellis; quod tamen magis fluat, dulciusq. sit, albicans, nec sine granis. Calabriae & Gecalae collis prope Nolam, mellis causa; tepida, florida, fructiferaq. loca non parum laudantur.

Albae sunt circa Peruanam Carthaginem Cardano, quae Albis Ponticis Aristoteli & Plinio bis in mense mellificantibus, respondere videantur. Portè & mel ipsis respondet concolor. an è floribus, rore, & aere, quibus Pontica mella malè audire solent?

Quae autem mitiori animo sint, & in Dominorum obsequium eatenus mansuescant; ut & ipsas, & ipsarũ favos, mellaque contrectare liceat, nostri Aquaspartani & Carsulani ad Portauram in Umbria alunt: quorũ oppidorum in agris, praesertim montanis,

from headed thyme, narrow-leaved Pulegio, and Cachrifera Libanotide, sticky and odorous with other umbelliferous oozings, are carried by the bees in this region.[112] In Samnium, however, and in colder sites of those who today are called Molisians, less honey is to be had from bees.[113] This honey, however, is very sweet, and it flows easily, being white and granular. A hill of Calabria and Gecala, near Nola, cannot be praised too highly as a cause of honey, a warm flower and fruit bearing place.[114]

According to Cardan there are white bees around Peru and Carthage.[115] They seem to correspond to the honey-makers of the north, which are called the Albus Ponticus by Aristotle and Pliny, and their honey corresponds closely to the bee for it is the same in color.[116] For what reason, either from the dew or the air, do they generally hear that the Pontic honey is bad?

Certain bees, however, are very mild mannered and grow tame in their obedience to their masters; our Aquaspartans and the Carsulians at Portaura in Umbria raise [them] because it is pleasant to handle them and their honey and their combs. In the fields of their towns and

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[112]Pulegio--fleabane. Cachrifera Libanotide--capbule bearing rosemary. These are flowers particularly visited by bees.

[113]Molise is a district in central Italy.

[114]Nola is an Italian city in the territory of Campania near Mt. Vesuvius. Calabria is the territory that occupies the toe of the Italian peninsula. It is nowhere near Nola. I can find no identification of Gecala.

[115]Cardano, De subtilitate, p. 167.

[116]Aristotle Historia animalium 5. 22. $554^{b}8$-14; Pliny Natural History 11. 19. 59.

probatissimū, vel in Sacchari quandoq. aemulationē, mellificium; seu colorem spectes, seu duritiem, vel ipsum denique usum. Siquidem temperatis caelestibus auris, solum Serpillo vulgari, Hyssopo, Dauco, odoratisq. pluribus stirpibus tegitur: quinimo & ipso Apum gratia, concelebrato Virgiliano Amello, apertae magis sylvae ridere solent: pratis hinc inde hilariter chrysoianthino decore cōspersis: in quibus nō quidē Naiades illae Homericae Nymphae versantur, quarū in antro mellificent Apes: Sed Naiae discurrēs rivulus gratos Apibus irrigat flores.

Multiferas quoq; in Etruria, & probatissimas melle, opere, omniq; cultu ac ingenio, odoratissimis extractibus illis scimus, quas è florenti, praecipuè ipsius Florae sinu prodeuntes nō satis unquam laudaveris.

Urbanas praesignes, Urbs ipsa potius suscipere & colere; quam ex se emittere potis fuerit. Adeò autem semper Apibus gratam fuisse sedem, vel ipsa que deformata remanebant, moenia indicaverint. Deditam Apibus Urbem, antiqua a flore nomina dicant; Moenia ipsa, quae insidentibus Apibus, quae spontaneis scatent, vel ipsis in ruderibus, alvearijs, Urbanas Apes, & Apum Urbem plenissimè expresserint. Admaeniani certè huiusmodi mellis, sunt

especially in the mountains is the most excellent honeymaking and the production of saccharin, which you can see emulates [honey] both by its color and its hardness, or finally even by its use. Certainly it is concealed by the temperate celestial air, by the common thyme, hysop, parsnip, and by many odorous branches. The great open fields crowded with Virgilian starwort generally smile with pleasure upon bees,[117] in the meadows gaily sprinkled with golden violet elegance in which do not abide those Homeric niades whose bees made honey in a cave. But the flowing rivulet of the Naia waters those flowers which are pleasing to bees.

We also know of the [bees] of those most odorous regions in Etruria who are highly praised for the fruitfulness of their honey, their work, and their complete refinement and cleverness. You can never praise enough those bees who spring forth from the flowering cup, from the very bosom of the flower.

The city itself has been better able to sustain and cultivate the illustrious urban bees rather than sending them out from itself. The walls, when they remain as fashioned, would indicate that the home was always pleasing to the bees. The ancient names dedicate the city devoted to the bees according to a flower. The very walls, which swarm with settling bees who live there of their own free will in beehives in the plaster, describe most fully urban bees and the city of bees. There are balconies for honey, as it were, which collect great amounts. All ought to discover that sweet city, walled on all sides, surrounded

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[117]Virgil Georgicon 4. 271. The starwort is a plant whose flowers are used as a cure for certain sicknesses of bees.

qui non parum colligant: ut dulcem Urbem, melleq. ipso Apum beneficio circumundique obductam, circumundique munitam; fateri omnes debeant.

Favent nobis benignius illae. Optima mella optimis ex Apibus, ad Styraceta prope Urbem, & Terebinthi Sylvulas nostri in Latio Caelij, Patulique ac Iani montis, ad antiquam Meduliam, elaborantur; indeq. & aliunde, propinquorum e locorum felicibus beneq. florẽtibus viretis, praestantissimo melle Aromatopolia, & Opsonopolia in ipsa Civitate complerentur: nisi in eam copiosius id exquirentem invecta Mercatorum haud ferenda impostura, plerumque [quae insolens fermenti ratio] licentius multo, quàm decentius, exaugeretur; dum prorsus importuno, & iniquo consortio, fabae favis iungi solent. Certe Hispanicas, Hybleas, Hymettias Apes praecelluerint; mellaque inde ipsa, si purius exceperis, & servaveris.

Si magis quoque mites Volucellae placent: Aethiopicae adeo domesticae ac mites dicuntur; ut inter hominum cubilia examina conficiant, quod ibi forsan innatum propriumque omnibus existit. Nam interdum & nostratium in domorum partibus, vel etiam cavaedijs, examina confedisse compertum: quod meis in aedibus non sine gaudio, utpote omni animi studio & propensione

on all sides by the kindness and the honey of the bees.

[Bees] favor us most kindly. The best honeys are made by the best bees at Styraceta[119] near the city and in the forests of our turpentine trees, in the skies, the plains and the passages of the mountain in Latium, in ancient Medulia.[120] In these and in other places the Aromatopolia and Opsonopolia in the state are filled with the most outstanding honey from the flourishing and flowering greenswards nearby.[121] If unscrupulous merchants desire to have more honey, the honey may be increased exceedingly although in a manner more rash than seemly, to an unfavorable and unjust share by placing beans in the honeycombs (contrary to the reason of causing fermentation). Hispanic, Hyblean and Hymettian bees will excell, and you can preserve the honey of these regions if you draw it off unadulterated.[122]

If any of the swift-flying, gentle [bees] are very agreeable, they are the domestic, gentle ones called Ethiopian because the swarms make their homes among men and exist there almost naturally and with all propriety. Now I have observed at times and in parts of our native homes, or even in caves, that swarms have been tamed. I have observed this phenomenon in my own buildings, not without delight, inasmuch as

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[119]Styraceta might be some combined form of the word styrax--the storax tree.

[120]Medulia is a section of Aquitaine Gaul.

[121]Aromatopolia and Opsonopolia are fanciful names taken from polis, Greek for city, Aromaticus, Latin for fragrant, and Obsonium, Latin meaning that which is eaten with bread (here, honey).

[122]Hyblea is a mountain of Sicily which abounds in flowers and is famous for its honey. Hymettus is a mountain of Asia Minor from which the very best honey supposedly comes.

ipsis addictus, observavi: Quod insigne ac praeclarum, in Urbanis verè totius Urbis, totius inquam, Orbis laetitijs, summo ipso in Vaticani vertice admiratus, veneratus sum.

Halizonicae autem Apes libere cum hominibus vagantur, & pabulatum cum illis exeunt, nullis constrictae Alvearibus, & opus passim faciunt; illudque ita concretum, ut mella à Cera nequeas seiungere, Pausania teste. Hostilianas Padanas, navigantes illas adde; quae navigia sequantur ad nova semper pabula Mellitorum ductu, Plinio referente.

Sed supra Amissum Aristoteli, necnon in Ponto sunt; quae Mel candidum, crassumque, sine favis conficiãt.

Cappadociae item sine favis, Aeliano, sed olei crassitudine.

Que uberrimè ipsis in arboribus congerant, ad nectarea diffluentis mellis stillicidia pluribus in locis notantur. Medorum arbores mella fundere, non tantum ab Euripide scriptum. Strabo enim id fieri in Matiana Mediae, non semel confirmat;

the zeal and inclination of each spirit is added to the very buildings. I have rejoiced in the urban [bees] of the whole city, truly, of the whole world because [they are] outstanding and truly remarkable, and I have venerated and admired those on the highest vertex of the Vatican.

However, the Halizonican bees wander freely with men, and they go out grazing with [the cattle] and are not constrained to the hives, and they do their work here and there; and their [honey] is so hard that you cannot separate the honey from the wax, according to the testimony of Pausanius.[123] Consider also the Hostiliana Padana, those sailors who under the leadership of the honey-makers follow them in their boats to new pastures.[124]

But those dismissed by Aristotle above are also in the Pontus, and they make hard white honey without benefit of honeycombs.[125]

Likewise there are those in Cappadocia [who live] without combs, but [their honey is] of the consistency of oil, according to Aelian.[126]

What they gather most fruitfully from the trees is known in many places as the nectar-like drops of flowing honey. That the trees of the Medes pour forth honey is recorded not only by Euripides.[127] For Strabo confirms more than once that the same thing happens in

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[123]Pausanius Description of Greece 1. 32. 1.

[124]Pliny Natural History 21. 43. 73. "Hostilia is a village on the bank of the Padus. When bee-fodder fails in the neighbourhood the natives place the hives on boats and carry them five miles upstream by night. At dawn the bees come out and feed, returning every day to the boats, which change their position. . . ."

[125]Aristotle Historia animalium 5. 22. $554^{b}15$.

[126]Aelian On the Characteristics of Animals 5. 42.

[127]Euripides Bacchiads 714.

additque, in Hyrcania, Fortunatis scilicet in pagis, idem evenire; & in Sacasena, & Araxena Armeniae. Mellifluam Hyrcanam arborem Querciformem, & Diodorus refert. Harum arborum folia multo melle tincta Q. Curtius ait. Mela quoque ita ferax Indiae solum, ut in eo mella ex arborum frondibus defluant. Traditum & apud Citheronem, dulces è ramis guttas fluere, mellaque in Thracis in arboribus nata, ut advertit Rhodiginus. Notat etiam Herodotus a Thracibus affirmatum, Regionem trans Istrum innumeris Apibus scatere. De Libya pariter ac de Thracia dictum. Idem in Cumana Insula sit Petro Hispano: ut Sibyllinum Virgilij oraculum his regionibus evenisse dicas.

Matiana of Media; and he adds that the [honey] comes forth in Hyrcania, also in the countries of the Fortunates, and likewise in Sacasena, and in Araxena of Armenia.[128] And Diodorus refers to the honey-flowing Hyrcanian oak-like tree.[129] Quintus Curtius says that the leaves of these trees are wet with honey.[130] The most fruitful land of India also has honey in the same manner, as it flows from the leaves of the trees in that place. It is recorded that among the Citherones sweet drops flow from branches, and that honey is engendered in the trees in Thrace. Thus says Rhodiginus.[131] Herodotus also notes the assurance from Thrace that the region across the Istus abounds with innumerable bees.[132] The same is said about Libya and about Thrace. The same is true in the Isle of Cumana, according to Petrus Hispanus.[133] You might say that the Sibylline oracle of Virgil came forth in these regions.

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[128]Strabo Geography 2. 1. 14; 11. 7. 2.

[129]Diodorus Siculus The Library of History 17. 75. 3-6.

[130]Quintus Curtius Rufus Historiarum Alexandri Magni Macedonis 6. 6. 22.

[131][Lodovico Ricchieri], Sicut antiquarum lectionum commentarios concinnarat olim vindex ceselius, ita nunc eosdem per incuriam interceptos reparavit Locovicus Caelius Rhodiginus, in corporis unum velut molem aggestis primum linguae utriusque floribus, mox advocato ad partes Platone item, ac Platonicis omnibus, necnon Aristotle, ac Haereseos eiusdem viris aliis, sed et theologorum plerisque, ac juraconsultorum, ut medicos taceam, et Mathesin Professos. Ex qua velut lectionis farragine explicantur linguae Latinae loca, quadringentis haud pauciora fere, vel aliis intacta, vel pensiculate parum excussa. Opto valeas, qui leges, livore posito, ΑΥΤΗΡΑΡ ΑΝΤΙΡΕΛΑΡ ΤΩΣΙΣ ΙΚΑΝΗ [Venice: In Aedibus Aldi, 1516], p. 662.

[132]Herodotus History 5. 43.

[133]Petrus Hispanus was born in Lisbon sometime between 1210 and 1220 and died in 1277. He was a zoologist, physician, and philosopher. Purchas, Politicall Flying-Insects, p. 205 says "Aldrovandus citing Hispanus saith, that in the Isle of Cumana, the swarms hang on the Trees, and flow down with hony."

Germani plurimum mellis in sylvis habere se dicunt ex Apibus, quae sua sponte in arborum cavitatibus nidulantur; pari-
785 etum quandoque, praesertim prope vetustiora templa. Agri Lamio abundant.

Sylvestres pariter in Moscovia Apes frequẽtissimae ac praestantissimae dicũtur, optimo melle & cera [prima illà praesertim] suapte natura alba, ut & de Punica dicitur. In Podolia
790 praeter Alvearia, arborũ, riparum, ipsius soli cavitates quoque ab Apibus coluntur; ut melle tota Provincia mirum in modũ, sicut & odoris floribus, abundet in Prussia quoque cavae omnes arbores Silvestrium favis replentur.

Sed apud novos quoque Indos, haec prodigentis Naturae
795 munera. Mexicanas Apes parvas, subnigras, hirsutulas, absque aculeo, in arborum cavitatibus, cereos favos, & mel optimum conficientes Nardus Antonius Recchus assert: qui Materiam Medicam novae Hispaniae, novus alterius Orbis Dioscorides, decem libris diligenter ac methodicè complexus est. Cõfirmat & voce P.
800 Gregorius Bolivar, qui diu in illis Regionibus cominoratus, multa Dei opera in illis observavit. Sub dubitare quis posset; an

The Germans say that they get much honey from bees in the woods, who build their nests of their own accord in the cavities of trees, and sometimes of walls, particularly near the more ancient temples. They abound in the fields of Lamia.[134]

In the same way forest bees are said [to be] most excellent and most abundant in Moscovia. The white nature of the best honey and wax (particularly of the former) is noted there and about Punica. In Podolia hives are established by bees in cavities of trees, of river-banks, and even of the ground.[135] As a result the whole province abounds in honey in a marvelous manner just as [it abounds] in odorous flowers. In Prussia also all hollow trees of the forests are filled with honeycombs.

But also among the new Indies, [there are] these gifts of prodigal nature. Nardo Antonio Recchio, the new Dioscorides of another world, who has diligently and methodically brought together the Materia Medica of New Spain in ten books, asserts that there are small Mexican bees, blackish, hairy, without stings, making waxen honeycombs in the hollows of trees and making the best honey.[136] And P. Gregoire de Bolivar, who for some time has been in danger of his life in these kingdoms and who has observed the many works of God in them, confirms it orally.[137] Who

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[134]Lamia is a city on the Malian Gulf above the Greek peninsula.

[135]Moscovia is the modern district of Moscow in Russia. Punica is the area of Carthage on the coast of Africa. Podolia is a district of Russia.

[136]Hernandez, Rerum medicarum, p. 334.

[137]Gregoire de Bolivar was a French Franciscan monk who lived during the seventeenth century. He was a missionary to the New World and

eadem sint cum Apibus, Muscae magnitudine aculeo carentibus Occidentalis Indiae Ouiedi, favos maximos in cavis arborum faci-
entibus. Muscarum itidem magnitudine nigras in Brasilia exesis
805 in arboribus mellificare, Ioannes Stadius refert, secundo constitans loca . . . aijs quas primas ferè cum nostratibus conferri posse dicit, & Levinus Hulsius in regione M--ehcahius Apes valde exiguas, & sine aculeo notat. P. Bolivar certe familiares dicit, quibus quisque impune mella quandocunque eripuerit.

810 Mexicanas quoque Recchus alias habet, Tlalpipioli dictas, nostratium magnitudine, nigro & luteo colore variae, absque aculeo.

Sed Maiores Hispanicis Peruanas Cieca tertio loco describit, quae aculeo careant, & nihilominus in Mellitores impetum
815 faciant, mirequè se illorum capillis & barbis implicent, probatissimum Mel ad duodenas fere in singulis Alvearijs libras

can doubt that these Occidentalis India Quiddi, which are the size of flies and lack a sting, are the same as bees. They make large combs in the hollows of trees. Joannes Stadius reports in a similar tone that in Brazil black bees the size of flies make honey in rotted out trees, and he sets these up as a second class, but of the others he [makes] a first class, which he says can correspond almost exactly to our native bees.[138] And Levinus Hulsius notes bees exceedingly small and without a sting in the region of the M--ehcahius.[139] Indeed, Bolivar names certain species from which anyone might take away the honey at any time without harm.

Recchio has other Mexican bees, also, called Tlalpipioli, which are the same size as our native bees, black and yellow mottled, and lack a sting.[140]

But Cieca describes as a third sort the larger Peruvian bees of [New] Spain that lack a sting, but notwithstanding this they attack the honey gatherers and entangle themselves in an extraordinary manner in their hair and beards. They bring the most highly praised honey, as much as twelve pounds in a single hive. They situate themselves in

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visited Mexico and Peru where he was in constant danger from unfriendly natives. In 1626 he published Memorial de arbitrios para la reparacion de Espana. He had been in contact with Faber and was cited numerous times in Faber's Animalium. See Odescalchi, Memorie istorico, p. 179.

[138]Hans Staden, The True History of his Captivity 1557, trans. and ed. Malcolm Letts (New York: Robert M. McBride & Company, 1929), p. 167.

[139]Levinus Hulsius, who died in 1606, was a Dutch navigator who wrote and edited works of famous voyages and of geography. Included in these works are some which deal with the New World.

[140]Hernandez, Rerum medicarum, p. 334.

ferant; quae sibi in Ceybae vastae arboria aliariumque huiusmodi cavitatibus constituunt.

Alias Mexicanas itidem Recchus minores, alatis formicis similes, absq; aculeo, que in saxis atq; arboribus suspendant Alvearia, vocata Micatzonteca mimiaoatl, corijs quodãmodo & paleis constantia.

Tlalneuhtli quoque dictas, adnotat Apes parvas alias Mexicanas Recchus, aculeo carentes, favos orbiculares construentes, mellis amariusculi & acidi, subterraneis in locis.

In Themiscyra ad Thermodoontem fluvium, tam in terra, quam in alveis favos construentes Aristoteles scribit: in quibus pauca admodum cera, mel crassum, favus laevis atque aequalis est. Plinius duo haec Thermodoontica genera facit. Aliarum, quae in arboribus mellificant: aliarum, qua sub terra triplici cerarum ordine, uberrimi proventus. Sed triplices in terra condentiũ favos, aliud à praedictis genus Aristoteli est, quod persaepe vermem nullum habeat. Subnascentem vermiformem prolem si intelligimus [ut congruum omnino videtur] sterile hos plerumque erit.

the hollows of deserted trees and in other places of the same sort in Ceyba.[141]

Recchio notes in like manner other smaller Mexican bees, similar to winged ants, without a sting, who suspend their hives in rocks and trees. They are called Micatzonte camimiaoatl, and [their hives] are built in a peculiar manner from animal hides and chaff.

Recchio adds other small Mexican bees, also called Tlalneuhtli. They lack stings, construct circular combs in underground places, and [make] somewhat sharp and bitter honey.[142]

In Thermiscyra, near the flowing Thermodon, Aristotle writes about [bees] constructing hives sometime on the ground and sometime in deep excavations. In these hives there is hardly any wax, but instead thick honey, and the comb is smooth and uniform. Pliny considers that there are two of these Thermodon races: the ones who make honey in trees and the others who construct a most fruitful triple row of wax combs underground. But there is another species besides that previously mentioned by Aristotle who fashion triple combs in the ground, and this species never has grubs. If we understand this offspring as growing out of little worms (as seems entirely suitable), this species will be very much sterile.[143]

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[141]Pedro de Cieca de Leon was born in Seville in 1614 or 1615. He served under Pizarro in the New World and wrote Chronica de Piru (Seville, 1553). See Purchas, Politicall Flying-Insects, p. 204, for an account of his observations on bees.

[142]Hernandez, Rerum medicarum, p. 334.

[143]Pliny Natural History 11. 19. 59; Aristotle Historia animalium v. 22. 554b10-12, 19-20.

Tolutanae Americae Nicolao Monardi nigrae sunt, nigramque elaborant Ceram; qua Indi veluti cochlearia ad excipienda Balsama parant, arboribusque adnectunt, plurima vero Hispani delata ad funalia primum, sed tetri odoris, inde ad medicamina usi sunt, quòd calida refinosaque sit: sed in terrae hiatibus, subterraneisque cavernis nidulari has sit, quarum & meminisse videtur Franciscus Lopez Gomara.

Nigras quoq; Peruanas assert Cieca secundo loco, quae Mel Hispanico cõpar ad Congij mensurã in cavae arboris delecto sibi alveario, elaborent, aptato orificij tubulo ex cera in lapideam duritiẽ alijs commixta: confirmaro videtur Ioannes Lerius, Muscisq. nostratibus similes dicit Americanas in sua Brasilia Apes, quae Yra-Yetic, Indis favos dictos; scilicet Yra, Mel probatum, Yetic Ceram, Picis modo nigram obstructionibus Incolis prorsus addictam conficiunt in exesis similiter arboribus.

According to Nicolas Monardes the Tolutana of America are black, and they make black wax, which the Indians prepare in the form of a little spoon for drawing off balsam [sap] and stick on the trees. At first [the sap] was brought to Spain for torches, but it has a foul odor; therefore it is used as medication when it is hot and gummy. But he says that the [bees] build nests in apertures of the earth and in subterranean caverns, and Francisco Lopez Gomara seems to recall [the same thing].[144]

Cieca also reports as a second species black Peruvian [bees] who make almost six pints of Hispanic honey in hives chosen by them in the hollows of trees. The orifices [of the hives] are fitted with tubules of wax mixed with other things which becomes as hard as stone. Joannes Lerius seems to confirm [it], and he says that the American bees in Brazil are similar to our native flies. Their hives are called Yra-Yetic in the Indies; that is to say Yra, very good honey, Yetic, wax. In hollowed out trees [the bees] make a black wax used as pitch stoppers by the natives.[145]

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[144]Nicholas Monardes, Joyfull Newes out of the Newe Found Worlde Written in Spanish by Nicholas Monardes Physician of Seville and Englished by John Frampton Merchant Anno 1557 (2 vols.; London: Constable and Co. Ltd.; New York: Alfred A. Knopf, 1925), pp. 42-43. Francesco Lopez de Gomara, La historia generale della Indei Occidentali, con tutti li discoprimenti, & cose notabili, che in esse sonno successe, da che si acquistorno fino a hora. Scritta per Francesco Lopez de Gomara in lingua Spagnuola, & tradotta nel volgare Italiano per Augustino de Cravaliz. Co'l privilegio del sommo pontefice, & della maesta Cesarea per disce anni: si come si puo vedere nella prima parte della Historia del Peru, gia da noi stampata (Rome: Per Valerio & Luigi Dorici, 1556), p. 28.

[145]Joannes Lerius (1534-1611), whose given name was Jean de Lery, was born in France. In 1556 he was sent to Brazil to found a Protestant colony. He wrote Historie d'un voyage fait en la terra du Bresil, autrement dite Amerique (Rouen, 1578). Purchas, Politicall Flying-Insects,

Anthredo in Hyrcania volucre [cum Tenthredo & Anthredo aliorum diversis Insectis ne confundas] animalculum, Ape quidem minus Diodori [& quid aliud, quàm Apicula?] maxime autem nobile & conspicuum, quod montanos flores delibans in concavis petris, & arboribus caelo tactis, alveolos habens, favorum cellas confingit, & liquorem ut ipse ait, eximiae dulcedinis melle non inferiorem, constipat. Mel certè ipsissimum Diodore, à minuscula Ape.

Sunt autem & parvulae magis. Culicum perexiguo corpore a Ioanne Stadio tertiae traduntur, in Brasilia; nec ob id non laudati Mellis feraces: optimum siquidem in cavis congerunt arboribus. Narrat praeditas aculeo quàm nostrates, minus acri; quod ab imbecilli corporis modulo crediderim: Irruere tamen catervatim illas in mella auferentes Incolas, & ita inhaerere, corporibusque impingi; ut nuda è cute removendis vix manibus

There is the flying Anthredo in Hyrcania (do not confuse Tenthredo and Anthredo with diverse other kinds of insects[146]), a little animal, indeed a very small bee according to Diodorus (and what other than an apicula? [little bee]). It is most celebrated and distinguished, however, because it feeds on mountain flowers. Since it has hives, it fixes the cells of its combs in concave rocks and in trees blighted by lightening, and it gathers a liquor of uncommon sweetness which [Diodorus] says is not inferior to our honey. According to Diodorus, it is certainly honey that is made by this very small bee.[147]

There are those [bees], however, which are even smaller. They are recorded as a third kind by Joannes Stadius. They are as small as gnats and live in Brazil. Their small size is no reason why they should not be praised for their fruitfulness as honey makers. Indeed they gather the best honey into their hollow trees. He tells how they are endowed with stings which are larger than those of our native [bees] but which are less sharp. I believe that this [dull sting] is in accordance with [the bee's] weak body. However, they attack in swarms those natives who are taking away their honey, and they cling so and sting them with their bodies so much that [the natives] can scarcely

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p. 205, gives the following account from Lerius. "The Brasilian Bees are very unlike to ours, and differ not much from the little black flesh Flye, which annoy us in Summer, and make their combs usually in hollow trees; they call the honey Yra, which they eat as wee do, their wax is as black as pitch, which they call Yetic, they use it not for candles, as wee do, but to stop their great Canes, wherein they keep their feathera that they bee noteaten by a kinde of Butter-flye, which they call Araveis."

[146]See Aristotle Historia animalium 9. 42. 629[a]1-30 for descriptions of Tenthredo and Anthredo, which are forms of wasps.

[147]Diodorus The Library of History 17. 75. 7.

sufficere possint: se quidem, dum operi interesset, adèo molestè compunctum, ut primò eas ferre non posset, sed flumen petens immersione ipsa abigere conaretur.

Culicibus paulo maiores, Albae Peruanae à Cieca primo loco statuuntur, quae in cavis arboribus singulis in familijs libras ferè, sed acidiusculi mellis ferant.

Mexicanae, quae oblongum orbem; Acomimiaoatl, fabricant: Reccho maiusculae quidem Brasilijs; sed nostratibus minores, fulvae, aculeatae.

Ex Americanis vero sylvestribus Lachihuana magis commẽdantur, quae ex P. Bolivar relatione oblongae, alatis formicis similes, ex fulvo rubentes sunt, & perniciosi aculei. Favos in arbusculis componunt glomeratos dispositione mira in varios orbes, qui avidissimè & utilissimè, ipsa etiam cum Apum tenella prole in cibum usurpantur, imò complures ex Indigenis alunt. Cellularum materia non Cera; sed tenuissimum quid ex paleis,

remove them even with their hands. Indeed, when [Stadius] went to his work among the bees, he was at first not able to tolerate it when he was stung but, seeking the river, he tried to drive them away by immersing himself.[148]

The Albae Peruvana, which are slightly larger than gnats, are set up as a first species by Cieca. They live in single families in hollow trees and usually make libras of honey, but it is somewhat sour.[149]

There are the Acomimiaoatl of Mexico who build an oblong hive. According to Recchio these are a little larger than the Brazilian [bees] but smaller than our native bees, are golden colored, and have stings.[150]

Of the American forest bees those most commended are the Lachihuana who, according to the relation of P. Bolivar, are oblong, similar to winged ants, golden reddish, with a harmful sting. They build their hives in small bushes by the most remarkable structuring of a collection of various round globes. The natives most eagerly and most usefully employ these bees and even their grubs as food. These [bees] nourish many of the natives. The material of the cells is not wax but the most

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[148]Staden, History of his Captivity, p. 167.

[149]Purchas, Politicall Flying-Insects, p. 204 gives the following account from Cieca. "In Peru, especially about the City Cartago, are many Bees, which breed in hollow Trees, and make as good Hony as the Bees in Spaine; there is one sort of Bees not much greater than Gnats, these stop up the hole, or passage into the cavity of the tree, and by a pipe of waxe as great as the middle finger, goe in and out to their labours, their Hony is thin and somewhat sharp, they get usually about a quart of hony out of a tree.

"There is another sort of Bees which are somewhat greater, and black (for the former are white). . . ."

A libra is a Roman pound of twelve ounces.

[150]Hernandez, Rerum medicarum, p. 334.

foliolisue exsiccatis. Mel optimum, durescens sacchari modo. Suppares videntur Micatzontecamimioatl fabricantium apud Recchum.

I. Apes D. Ioannis forte Aldrovando, quae mel non spernendum congerunt pariter, & Ceram: musco, paleis, & quisquilijs favos cotẽgunt.

A. Sylvestris ab eo describitur, quae venusta, hirsuta, colore ex atro rubeat, rariores favos obrotundis tellis conficiat.

B. Alia minor, quae ex rubro nigricet; minores densioresq. favos construat.

II. Magnitudine iã hae ampliores titulos apud Hollandos cõsequutae, Imperatorias dictae, sunt quae ad lapides nidulantur acerrimo aculeo instructae, Aldrovando recolente.

A. Magnapes Auoni Bononiẽsium

1. Hirsuta lutescent
2. Candidior & Minor aliquanto

} Aldrovandus Ceram ex his quandoque in luto offendit.

B. Corpulentae potiùs

1. Nigrae

a. Maior, maculis luteis minoribus

b. Minor, ijsdem maculis maioribus intensiori colore

2. Virides, & aliorum colorum.

flimsy stuff such as the chaff of dried leaves. Their best honey is similar to hardened saccharin. They seem nearly similar to the Micatzontecamimioatl of Recchio in their building [of hives].

I. Bees chiefly from D. Ioannes Aldrovandi, who gather honey and do not separate out the wax. They cover their combs with moss, chaff, and the rubbish from trees.[151]

A. Forest bees that are elegant, hairy, and vary from red to black are described by him. They make rather sparse combs with round cells.

B. The others are smaller, and vary from black to red; they make smaller and denser combs.

II. Now these [bees] are called by greater titles among the Hollanders because of their size. The following are called Imperatoria, who, furnished with sharp stings, build nests in rocks according to the recollection of Aldrovandi.[152]

A. Magnapes Auoni Bononiesium[153]

i. Shaggy, partial to mud
ii. Very white, and somewhat smaller
} Aldrovandi finds their wax in mud

B. With more fleshy bodies

i. Black

a. Larger, with very small yellow spots

b. Smaller, with some very large spots of intenser color

ii. Green, and other colors

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[151]Aldrovandi, De animalium insectis, p. 190.

[152]Ibid., p 191.

[153]Bononiesium--from Bologna. Magnapes--a combined form meaning large bees.

III. Atactum quorundam M. Alberti suspiceris, ab Attaco locustaceo corruptum nomen, solitarium dicit. Et in cavernis subterraneis favos constituere, mella quamvis fluida
905 responere; sed simul Congregationis meminit, & nomina quaedam interferit, quae non facile adaptaveris.

A. Tyrin longius M. Alberti

1. Nigrum

2. Rubeum obscurum

910 3. Varium. Citrinas hic Apes, quas Congreges dicit, videtur reponere.

B. Tyrin minus spicae figurà, quam parvam Apem mediae longitudinis facere videtur, circa radices nidisicare ait, improbamque Ceram congerere.

915 C. Yomalias maximum, varium, curtum. Ita ipse.

D. Atactum [praecisius] minimae longitudinis, maximè rotunditatis & spissitudinis, forsan idem cum Yomalia. Inter Apes siquidem Albertianas discernere difficile est.

Xicotli Mexicanae degenerantes Apes, potius quam Vespae.
920 Mellificare ait Recchus in foraminibus parietum riparumque. Nigrae sunt pallescenti dorso, aculeatae.

Guancoiro, Americanorum Apes, nostratibus duplo maiores, ex fulvo nigrae, hirsutae, corpulentae, rudes, male pungentes à P. Bolivar nobis indigitantur, quae cereos favos in subterraneis

III. The Atactum you might suspect from M. Albertus, the name corrupted from that of the sharp stinged locust Attaco. These build their combs and store up a fluid honey in subterranean caverns, but Albertus recalls the same of the Congregationis, and he imposes certain names which you cannot easily adopt.

A. The longer Tyrin of M. Albertus

1. Black

2. Dark Reddish

3. Vari-colored. Here he seems to place again the Citrinas bees, which he calls Congregas.

B. The smaller Tyrin is pointed in shape, which seems to make this small bee of medium length. He says that they build nests around roots and gather inferior wax.

C. The largest Yomalias, vari-colored, short. Thus it is by itself.

D. Atactum is shorter in length, but larger in roundness and thickness. Perhaps it is the same as Yomalia. Indeed it is difficult to discern among Albertus's bees.

There are Xicotli, degenerate bees of Mexico that are larger than wasps. Recchio says they make honey in the fissures of walls and of river banks. They are mostly black but are lighter colored on their backs and have stings.[154]

P. Bolivar mentions to us the Guancoiro, bees of the Americas which are twice as large as our native bees, are mottled with black and gold, are shaggy, have a large body, are ill made, and sting badly. In

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[154]Hernandez, Rerum medicarum, p. 334.

925 receptaculis muliebris digitalis modo, discretos, dispersosque, veluti favulis constituant, clarum & medicamentis optimum mel, reliqua inter omnia Indica primarium in medico usu, reponant; sed acidum fluidumque, minus in cibis gratum: quibus certè cum conterraneis supradictis Tlalneuhtli convenire videantur.

930 Uruncui, eiusdem relatione subiungimus. Apes aculeatis nostris similes facie & corpore: solitariae sunt, domesticae sunt, singulae nimirum in angulis, & parietibus domorum receptacula sibi componunt, frondibus interius in tubulos usque digitales construentes; quos prole & melle replent.

935 Uruncui aliae quoque sunt, eodem referente, aculeatae, quae lignea domuum & arborum pertundere extractaque materiâ loculos sibi excavare possunt, quibus & prolem & sicciora mella secum excipiant, haec densa sunt, & facie quadam excocti albuminis ovi: Affines roboris ratione videntur Quauhxicotli Recchi,

940 quae praelongis praeditae aculeis, punctura [ut ait] melleas Arundines, lignaque ipsa a summo ad imum usque diffindunt, sed mella Uruncui reponunt; illae potius de struere videntur, ut

subterranean receptacles they build waxen combs shaped like a woman's fingers, separated and spread out just like little combs. They store up honey which is clear and very good for medications. It is used as the chief medicine among all the rest of the Indies; but, since it is acid and thin it is less pleasant as food. Because of this honey these bees seem to correspond with their above-mentioned countrymen, the Tlalneuhtli.[155]

We make the Uruncui a subordinate relation of the same bees. They are similar to our stinged bees in form and body. They are solitary, and they are domestic. The single ones doubtless build receptacles for themselves in corners and in the walls of homes, always building among branches in finger-like tubules that they fill with offspring and honey.

There are also other Uruncui, referring to the same species. They have stings and are able to make holes in the wood of houses and trees and to dig out little places for themselves after they have hollowed out the material. They take with them into these holes both offspring and liquid honeys. These honeys are thick and rather of the same nature as the dried albumin of eggs. Because [of their habit of boring into] very hard wood, they seem related to the Quauhxicotli of Recchio, which are provided with a very long sting.[156] When they puncture (as one says) the honey-sweet reeds they always cleave them from top to bottom with their tongues, but the Uruncui store honey. The

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[155]Cf. ll. 823-25.

[156]Hernandez, Rerum medicarum p. 334 mentions Cuicalmia hoal, which have very long stings with which they pierce the sweet reeds from top to bottom.

inferiorem ab Apibus locum, vel potius medium quendam obtinere debeant cum sequentibus favisicis.

Sirenes dictae, nuperis minus, aut nil ferè cognitae: priscis Scriptoribus satis confusae. Ex Plinio ad Fucos trahunt, & ex Fucis esse, sicuti Nymphae ex Apibus, Dalecampius: Distinguit evidenter Aristoteles ferè ab ipsis etiam Apibus; sed tamen ad Apum familiam prorsus reduci videntur, ut & Aelianus facit, Maiorem nigrum & varium dicit Aristoteles.

Minor Sirenis ei fusens totus est. Alius non descripsit.

Bombyx Plinio & Aristoteli, sive Bombylium. Bombylius Suidae maximus in hoc genere, ad mella inutilis Aristoteli & Aeliano dicitur. Anceps magis videtur ex Serifico Bombyce, sed

[Quauhxicotli] seem rather to destroy, so that they ought to be considered an inferior sort of bee, or rather they ought to be placed with the following makers of combs.

Those called sirenes are scarcely recognized at all by recent writers. They are confused enough by ancient writers. According to Pliny they produce drones and come from drones,[157] but according to Dalechamps they are like nymphs from bees. Aristotle distinguishes them as manifestly different from bees themselves; nevertheless, Aelian seems to make them part of the family of bees, and Aristotle calls them a larger, black speckled [bee].[158]

The smaller sirene is completely dark. No other one is described.

According to Pliny and Aristotle, there is the Bombyx, or the Bombylius.[159] The Bombylius of Suidas is the largest in the race.[160] Aristotle and Aelian say that it is of no use for [producing] honey. It seems twice as large as Serifico Bombyce but should be entirely

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[157]Pliny Natural History 11. 16. 49 mentions Sirenes, or drones but does not say that they produce drones and come from drones. He seems to think of them as a different kind of offspring than the regular bees.

[158]Aelian On the Characteristics of Animals 5. 42; Aristotle Historia animalium 9. 39. $623^{b}10$-12.

[159]Pliny Natural History 11. 25. 75; Aristotle Historia animalium 5. 24. $555^{a}11$-20.

[160]Suidas was a Greek lexicographer (late ninth or early tenth century A.D.) Nothing is known about his life, and his only extant work is a Lexicon, an encyclopedic treatment of Greek history. Aristotle Historia animalium 5. 24. $555^{a}17$ mentions wax found in the honeycomb of this creature but says it is much sallower in hue than the wax in the honeycomb of the bee. There seems to be some question in the mind of the editor of Aristotle's work as to the reading fo the word translated as wax. Aelian does not mention the bombyx.

prorsus distinguendum vel Plinius monet, cui nidos luto figit salis specie applicatos lapidi durissimos, in ijsque Ceras largius, quàm Apes facit.

Bombos edentem circa Cloacas, & huiusmodi foveas Aldrovandus promit.

Amphibiam praeterea feram, Apum de genere volucellam, quae non solum volet, sed aquatica natet.[d]

Concludas, in varijs Regionibus alias atque alias magis minusq. differre, praesertim corporis magnitudine, & colore. quod Melligo, & Mel inde ipsum, maximè fecerit. quo ut dictum est, constant & nutriuntur; & cui ut plurimum concolores. Mel siquidem diversis è floribus, fructibus; diverso halitu excoctioneque; Coelo soloque diversis; non parum discriminis sortitur. Unde non ea, quae in fronte omnia; minusq. autem, quae in recessu; hoc in genere detecta penitùsque explorata. Diligentissimi quidem fuerunt, qui Physicae Historiae, sive Agriculturae dederunt operam, aut etiam Moralibus, & Poeticis figuris; in perquirendis illis, quae harum admirabilium Volucellarum sunt: Meliturgiae vel simplicis, vel mysticae magis; plures detinuit contemplatio; Amatores habuerunt Apes, qui aetate omni, affectu eas impensè prosequerentur; oculis & visu attentè insequerentur: Solensem scilicet, Aristomachum duo de sexaginta annos; Agrium

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[d]This line marks the end of the middle right section of the text.

distinguished, as Pliny warns. He attributes to it nests of mud like a kind of salt which are fastened firmly to rocks and are very hard. In them it makes more wax than bees do.[161]

Aldrovandi tells of Bombos feeding around a sewer and likewise around pits.

Besides these, there is the wild Amphibian, a swift-flying [member] of the species of bees who not only flies but swims in the water.

You must conclude that in various regions one [bee] differs more or less from another, particularly in the size of its body and in color, because they are formed from the honey-like juice and the honey by which, it is said, they are nourished and they depend upon and to which they are similar in color. Honey is selected with no little discrimination from diverse flowers and fruits, by diverse exhalations and boiling, from the sky and sun. Not the outer part of the flower or that in the nearer reaches, but that in the internal nature is detected and explored. Those men who are most diligent in studying the [secrets] of the admirable swift-flying creatures have presented their work as physical history, or agriculture, or even morality and poetry. Contemplation of simple honey-swollen [bees] or of the greatest mystery fascinates many men. Bees have had admirers who in every age have followed after them eagerly and with affection and have looked at them attentively with their eyes and have looked at their appearance. Indeed Aristomachus of Soli, for two less than sixty years, Phyliscus Thasius,

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[161]Pliny Natural History 11. 25. 75 calls the bombyx the silk worm and describes its nests in the above manner. He makes no mention of the Serifico Bombyce.

inde dictum Phyliscum Thasium; Menum Solitarium; aliosq. minoris nominis Philosophos. Habuerunt etiam nostro saeculo Germanos illos subtilissimi artificij Viros; qui, ut etiam domibus conclusas spectare possent; utque ipsa in operis ac Civitatis meditullia introspicere; perspicua è Vitro alvearia fabricarunt. Aptius forsan & commodius, quàm ex laternae cornu, vel Speculari lapide Antiqui illi apud Plinium. Multa tamen latitare credas, quae vix quidem aliquis unquam dignoverit, aut perceperit quantumvis curiosissima observatione. Non parum certè hucusque fuit, tam multa penitioris contubernij, & familiarioris Apum convictus adèo minutè internovisse; si tamen omnia ritè, & rectè perspecta, & absque ulla ingenij culpa existimanda sunt.

Quibus ex omnibus pleniorem hanc nostram Melissosynopsim haudquaquam prolixam censueris; praesertim si Apum praestantiam, dignitatem, praeclaras multiiugas dotes, perpendere volueris, simulque id considerare tot tantosque Scriptores, in hisce vestigandis, tantopere desudasse; quantum in caeterorum Animalium nullo; ac ne satis quidem unquam, & pervidere & examinare potuisse. Quod si in alijs Animalibus, vel grandioribus, beneq. conspicuis; Tabellae nostrae minores multo sunt; nequaquam certè illa cum Apibus in comparationem venire possunt, omni ex

who is also called Agrium [wild man], a hermit, and other lesser known philosophers [have done this].[162] Even in our age they have those Germans, men with the most subtle arts, who, so that they can see them even when they are hidden in their homes and so that they might look into the very midst of their work and their state, have made up a transparent beehive from glass. Perhaps [it is] more suitable and more commodious than ones made from horn or the one which according to Pliny was made by the ancients from transparent stone.[163] You must believe, however, that much lies hidden which hardly anyone has ever recognized as different or has perceived by any amount of curious observation. If, rightly and properly, all things should be observed and should be judged as being without defect of character, the number of things that have been studied to such an extent concerning the inner comradeship and the more intimate family of bees is certainly not too small.

If you wish to consider fully the outstanding dignity and the many outstanding gifts [of bees] and at the same time to consider that so many writers have exerted themselves more in investigating them than in investigating any other animal, and that they have never been able to observe and study them sufficiently--from all these things you might think that this, our extensive Melisso-synopsis [the Apiarium] is not extensive at all. But if our writings on other animals that are either larger or well-distinguished are less extensive, certainly [these animals] can by no means be compared to bees, who are admirable in every

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[162] Ibid. 11. 9. 19.

[163] Ibid. 11. 16. 49. An ex-consul of Rome made hives of transparent lantern horn. Pliny also mentions (21. 47. 80) hives made of transparent stone.

parte admirandis, in quibus vel exiguus corporis modus magnitudinem non parum augeat, & admiratione.[e]

REX Apum PATER est, castusq. & absq. ulla venerei nexus aut plexus impuritate Pater. Multos qui filios habeat, imò examina & exercitus filiorum; qui plurimum, qui syncerè amet, quem certatim omnes plurimùm ament. Quid vero aliud PATRONUS, quam ipsis sanctus legibus, fanciensque Pater? Haec dominij, haec optima ad superioris mundi Imaginem, Principatus ratio est; ut filij magni Patris simus, & summo semper Nos PATRE gaudeamus, Urbani praesertim URBANO.

Vis Monarchiam, Regnum, Regem, Principem dicere; necnon Imperantis ipsius Eminentiam, Probitatem, Sapientiam? Vis Eloquentiam ad ipsam usque Poeticam amoenitatem; Diligentiam, omnesque & Musas, & Gratias: Populi Obsequentiam, Ordinem, & quae in Regimine mysteriae? Apes dicito: Apes fingito: expresseris. Pariter reconditarum Doctrinarum, Vitae, Probitatis, Castimoniae, Beatitatis, Pacis, Sanitatis, Prosperitatis, longioris Aevi, & plurimum signa Bonorum. Ut tam multa certè, tam praeclara, dum Apes exhibent optimarum Virtutum Argumenta; non possis eas non omni ex parte ARGUMENTOSAS cum D. URBANO Pontifice nuncupare. Ita enim ille singulari eas cognominavit epitheto, dum Tutelaris nostrae D. Caeciliae multiplices laudes, cõparatione quodã multiplicis argumẽti, appositè exprimere, paucisq. explicatissimè proponere vellet: quicquid diversè nõnulli legere soleant. Sacrae profecto URBANAE MONARCHIAE insigne habet ARGUMENTUM, illis

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[e]This line marks the end of the short section of text running across the bottom of the center section.

part and the smallness of whose body augments their magnitude and our admiration not a little.

The king is father of the bees, a father both innocent and without any connection with venery or involvement in impurity. He has many sons, one might say swarms and armies of sons. He loves them above all, and he loves them sincerely, and they should certainly love him above all. Who else indeed should be their patron but their father who is holy and who makes the laws. Sovereignty is the order of these dominions, of these things which are like a reflection of a superior world, [where] we are sons of the great father, and we always rejoice in the supreme father, especially in Urban.

Do you wish to say monarch, kingdom, king, leader, and also eminence, goodness and even wisdom in ruling? Do you want eloquence always for poetic pleasure, diligence, and all the muses and all pleasures? Obedience and order and the mysteries of ruling? Name the bees, conceive of bees. You will have expressed [all these qualities], and likewise many signs of profound teachings, of life, of goodness, of purity, of happiness, of peace, of sanity, of prosperity, of very long life, and of good things. When bees exhibit in this way so much and such outstanding proof of the best virtues, you cannot but solemnly declare them, with Pope Urban, proof in all their parts. For thus he has named them with a single epithet when he wished to express appropriately the manifold praises of our tutelary D. Caecilia. He wished to prepare multiple proofs and to propose them most explicitly in a few words no matter how diversely some might be accustomed to interpret them. Truly [you have] proof in the insignia of the holy Urban monarchy,

admirando TRIADIS numero constitutis, quo reliqua omnia in plenissimum complementũ concludantur.

Suspicienda, demiranda CORPUSCULI STRUCTURA. Novisti Plini, nusquam magis rerum naturam, quam in minimis totam esse. O si Telescopio, si Microscopio usus fuisses, quid de Api praesertim de praedicasses Leonina, multi-lingui, hirsut-ocula? Quid de oris, labiorum, ipsarumq. LINGUARUM multiplicibus ad Mellificium instrumentis? Rostratis haec vaginis inclusa, fortioribus quasi & amplioribus maxillis. cava quatuor (bina opposita ad latera mucronibus exterius inflexis, & hinc inde sectis: bina fursum & deorsum, valida magis ad perforandum tundendumque acie) ad invicem sibi respondentia, veluti quae nos cochlearia dicimus; quae & succos recipere, mediam longiorem lingulam concludere, & ceu scopulam quandam sibi mutuo superposita recondere possint. Has si flexiones quoquoversum, si delambendi usum respicias, linguas dixeris: si duriusculam fortemq. aciem, qua non molliora tantum stirpium perrebrare; mellaque & ceras excerpere, favos angulatim digerere; glutinosas materias distendere, succos movere, florum tubulos aperire: sed & ligna, & quae huiusmodi duriora, incidere & excavare possint: Sique spinosas quodammodo, licet rariuscule oras ad latera consideres, rostra appellaveris, aut rostratas si malveris, linguas hae scilicet ita disposita sunt; ut varia apertione per latum

that triad arranged in an admirable number, into which all other things are drawn in the fullest complement.

Wondering at and esteeming the structure of the little body you, Pliny, have agreed that there is no greater nature of things than that which is complete in its smallest possible form. If only you could have used the microscope, if you could have used the telescope, what could you have said earlier about the lion-maned, multi-tongued, hairy-eyed bee? What could you have said about the mouth, the lips, and the tongue itself with its many instruments for honeymaking? These are enclosed in curved sheaths in four cavities which are like very large and strong jaws (two with rigid tips are the outer parts opposite each other and can be separated from each other [like scissor blades]. Two [move] up and down and are very sharp and very strong for striking and piercing). The parts correspond in turn to what we might call little spoons, which can take in juices, which can enclose a somewhat longer little tongue, and which, by folding over one another, can conceal themselves as a thin twig. If you have seen these parts bending in every direction and used for licking, you would call them tongues. If you have seen them bore through material as hard as wood, you would say that they are somewhat harder and stronger and sharper [than tongues]. They are able to spread sticky substances, to take up juices, to gether both honey and wax, to build their cells with angular sides, to reach into the tubes of flowers, but they are also able to cut and to hollow out wood and things which are even harder. If you have thought that the edges were sharp but somewhat thin at the sides, you would have called them beaks, or if you prefer, beak-like tongues. Actually, they are so placed that

circumcira adhiberi in opus debeant; in longũ media illa scopae etiã vicem subiens, quae in proboscidis modum plurimùm promitti queat, tripla ad eas extensions. Fistulosa autem ea, usque ad fugens in summo adapertum osculum diligentissimo D. Fab. Columnae Lync. observata est, & exterius limae cuiusdam adinstar articulis circumsecta, quae ipso in sectionum liris surgente villo ad latera praesertim & aspera & hirsuta conspicitur, abstergendi averrendiquè mellei succi, aut viscidi magis, attritis ipsis è meditullijs, concerpendi gratia, è floribus praecipuè, quibus haec omnia immittuntur instrumenta, quae multiplici theca ad liquorẽ continendum: & longiora illa bene conspersa recipienda, concluduntur; adpositis & stylis subtilissimis ad imas illorum partes, qui & opus iuvent. Oculi modo in aureos perpulchros fritillos reticuli specie, consignati apparent, hirtis distinguentibus per lineolas pilis. qui & in alarum extremis, licet & rariusculi & minores, consistunt. TRIPARTIUM corpusculum animae officijs seorsim constitutas officinas exhibet, functionum nimirum apud Medicos Animalium, Vitalium, Naturalium si verò ineptè distincta illis vocabula, res quidem benè in Apibus distributa vel oculis discernitur. adeo ut dissepta vix ad invicem

they ought to be used in their work through the varied, wide, surrounding opening. When they reach a long way into the middle of flowers there is a triple extension of the parts which can be pushed forward very much like a nose. This hollow [extension] in the little mouth which is always open for sucking has been observed with the greatest diligence by D. Fabio Colonna Lincei.[164] It is surrounded by hairs growing on the ridges of the outside sections. These rough and hairy parts are used for removing the honey juice or more sticky things [from the tongue], and they are worn down in the middle [from use]. They are especially useful for drawing out the juice from flowers for all the parts are thrust into the flower, and they [form] a multi-part sheaf for containing the liquid. The longer parts are well moistened and are enclosed [by the outer parts]. The very slender points aid in the labor by reaching into the deepest parts. The eyes, it has been affirmed, appear as beautiful golden dice boxes in a kind of network of hairy lines. It is noted that these [lines] are present on the ends of the wings, but there they are thinner and smaller. A tripart body shows that the workshops for physicians of animal functions, vital functions, and natural functions have without a doubt been set up separately from the duties of the spirit. If [we] separate in words those things which are separated in bees as we discern with our

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[164]Giuseppe Gabrieli, "Il carteggio Linceo della vecchia accademici di Federico Cesi (1603-1630). Parte prima (anni 1603-1609). Parte seconda (anni 1610-1624). Parte III ed ultima (anni 1625-1630). Indice," Atti della Reale Accademia Nazionale dei Lincei, Memorie della classe di scienze morali, storiche e filologiche, series 6, VII, fasc. I, II, III (1938-1942), 1085, 1111. Letters from Colonna to Cesi, January 5, 1626 and Colonna to Stelluti, March 20, 1626. In these letters Colonna points out to Stelluti and Cesi several differences between the tongues of the bees that he has observed and the tongues of bees observed by them.

committi videantur; ea praesertim, quae abdominis sunt posthabita penitus vixque appensa, & quodammodo rejecta appareant, nec partes nisi insimas obtinere, & eo tantum modo, quo superiorũ imperio omnino subiaceant. Plicatiles anuli non minus commodè, quam concinnè dispositi, villosis aureis corollis circumornantur. Manus, pedes, bracchia, & crura quaecunque plurimùm articulata, & digitis & unguibus, & nodulis ad opus apprimè accommodatis. Antennae articulis distinctae. Speciosa miraq. omnia, & singula.

Apum LABORES cognoscere vis? ipsum CORPUSCULUM spectato. Omni ex parte utile cõsidera, imo ipsius Utilitatis instrumentum. Nihil in eo est, quod reiectitijs voluptatibus addici debeat: ut operetur vivit: cunctis in opere articulis ita nititur ut tertio à nativitate incipiat die, nec ullus dum per caelum licet, pereat otio. Oris instrumentis Rores legit. Flosculos mellitasque plantarum partes eviscerat, ipsissimos dulcium sapores detergit: cavis excipit lingulis, & domum asportat, unde & mel ore in cellas vomere Aristoteli cognitum: cognitum & dentibus praeditas, quantumvis melle tantum victitent minimè conterendo. At nobis potius, quam sibi decoquendum cibum praemandere videntur,

eyes it is that having been divided they seem to be joined with difficulty one to the other. The parts having to do with the belly are deep within and are hardly noticed and even cast behind, and they occupy none except the lower parts, and for this reason they lie in that position under the power of the upper parts. Flexible rings no less properly than elegantly arranged are adorned all around with golden hairy crowns. Hands, feet, arms and legs are very jointed, and both fingers and nails and joints are suited above all to work. The antennae are distinctly jointed. All things are beautiful and marvelous and singular.

Do you wish to know the works of bees? Observe the little body itself. Consider it useful in every part, I say, and the very instrument of utility. There is nothing in it which must be considered a useless pleasure. The bee lives so that he might work. He springs to his work with all his joints. He begins on the third day after his birth, and it is not allowed that any should perish from idleness when they fly through the sky. He gathers dews through the instrument of his mouth. He sucks dry the flowery and honeyed parts of plants. He wipes up even the very tastes of sweet things. He reaches out with his hollow tongues and carries them away to his home, where he vomits forth the honey from his mouth into the cells, as Aristotle knows.[165] It is also known that although they are endowed with teeth and consume a great deal of honey, the teeth wear away very little. But they seem to chew beforehand the boiled food and to offer it to us rather than to

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[165]Aristotle Historia animalium 5. 22. 554[a]12-17.

praemansumque ceu fidelissimae Nutrices offerre. Siquidem dentibus utuntur ut durioribus è partibus stirpium Mel quandoque extrahere, & exscalpere possint, attritis. Validioribus ita maxillulis, quasi vaginis quinque illa lingui-rostra includunt. Hisce, & osseis trium digitorum unguiculis acriter citra periculum pugnant, lignaq. ipsa fodicant, excavant, aperiunt. Scabunt germina prioribus cruribus perreptantque, inde medijs abstergunt, & incurvatura postremorum excutiŭt, modo illo quo etiam ceras & glutina excipiunt, quae ut in cruribus gerere Aristoteles scripsit, ita & vidit & observavit Doctissimus D. Fabius Columna L. evidentibus luteis globulis posteriora ad crura adhaerentibus. Asperis enim omnibus artubus, & hirsuto toto corpore, laborant, ipsiusque villis arripiunt, deferunt, & extrema usque corporis acie ultimo in discrimine dimicant, nullo absterritae mortis metu.

Scis PLATONICAS, scis PINDARICAS Apes; spectato nunc aemulas Socratis illius venerandi Graecanicae sapientiae Patris, simas scilicet, compresso narium apice. Quinimo Apum Reges ex cerebro Taurino progenitos ipsius aemulos Minervae. Si hanc Iovis prolem obiecceris: & illum quondam memento eodem sub Tauro delituisse. CEREBRIGENAS interim, IOVIAS, SOCRATICAS, PALLADIAS dixeris Apes. Praeterea Api ab ipso APOLLINEAS, castitate ab ipsa DIANIAS dictas, & Musis ab omnibus MUSICAS.

themselves just as the most faithful nurses [would do]. Indeed they sometimes use their teeth in order to get honey from the harder parts of the branches by gnawing away [the parts]. They enclose the five-tongued beak in very strong jaws that are like a sheath. They fight danger fiercely with bony nails on three fingers, and they even dig into and excavate and lay bare wood. They creep through [the flower] and they scrape the twig [stamen] with their front legs. Then they wipe off [the pollen] with the middle legs, and they shake it off onto the curved parts of their back legs. In this manner they pick up wax and sticky substances. Aristotle wrote that they carried [them] on their legs,[166] and the most learned D. Fabio Colonna Lincei both saw and observed yellow globules adhering to their back legs. They use all their rough joints and their entire hairy body in their work, and they gather and carry away [the pollen] with these hairs. In danger they always fight fiercely with their bodies to the end, and they are not terrified by the fear of death.

You know Platonic bees; you know Pindaric bees; now see the imitators of Socrates venerating that father of Greek wisdom, even to being pugnosed because the tip of the nose has been compressed. There are kings of bees who spring from a bull's head in imitation of the birth of Minerva. If you would produce this offspring of Jupiter, [you might think] that it had been concealed in the mind of the bull. Meanwhile you will have called bees Cerebrigenas [born from the brain], Jovian, Socratic, Palladian. Moreover you call them Apollonian from Apis itself, Dianian because of their great chastity, and musical, from all

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[166] Ibid. i. 40. 624b1-5.

Dotibus profecto, mysterijs sacris, prophanis, heroicis, historijs, exemplis, fructu, ingenio; praesignes, nobiles Apes nullis unquam encomijs satis extuleris.

Quid surdas facis Apes Aristotelice? Musicum animal, Musarum Volucres Varroni, & alijs? Scio PARTHENIAS castimonia ab ipsa, quinimo virginali corporis integritate, nulla libidine, nedum coitus voluptatibus, aut partus doloribus tentata. MONTICOLAS etiam, & FLORIVAGAS novi, quibus solummodo de causis, Musis dicatas velis, vel etiam Dianae Ephesiorum, ut confirmantibus nummis eruditissimus D. I. Riquius Lynceus observavit. Nec tamen id satis ad Musaeum, cognomen; si à Musicis omnibus aurium excluderentur defectibus, HARMONICIS [quicquid obijcias] retinentur, alliciuntur, ducuntur concentibus. Ita surdae, ut vel sonoris plausibus, aerisque tinnitibus gaudeant, & nobis ad stuporem usque stupeant, & delectentur. Surdescent certè

the muses. You will never extol the outstanding, noble bees with enough praises for their gifts, their sacred mysteries, prophecies, heroics, histories, examples, fruits, and nature.

Why do you call the bees deaf, Aristotle?[167] They are a musical animal, the birds of the muses of Varro and others.[168] I know that the Parthenians were the unfortunate offspring of lasciviousness and pleasurable intercourse unrestrained by purity or the innocence of virginal bodies.[169] I have known the mountain dwellers and the flower wanderers dedicated the the muses in tapestries or even to Diana of the Ephesians, as the most learned D. I. Ricchio Lincei has observed on coins confirming these causes.[170] But nevertheless you do not give this name [deaf] to Musaeus[171] if people are denied his music because of defective ears. [Bees] are held, they are allured, they are led by harmonious music (whatever you offer). So, deaf one, they are delighted [by music] and they rejoice with buzzing wings, like sounding applause, and they even stun us to deafness. You rudely clamor that they are deaf, and therefore

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[167] Ibid. 9. 40. 627a15-20.

[168] Varro Rerum rusticarum 3. 16. 7.

[169] The Parthenians were the illegitimate offspring of Spartan women and helots who were born while the Spartan soldiers were at war and were driven out by the soldiers on their return for conspiring against the state. They later founded the city of Tarentum. The name Parthenian in Greek means maiden-born. See J. B. Bury, A History of Greece to the Death of Alexander (London: Macmillan and Co., Ltd., 1959), p. 104.

[170] In the library of the Reale Accademia dei Lincei there is a manuscript of a work entitled "Apes Dianiae in monimentis veterum novitet observatur: elegiacum poema Sanctiss. Principis Urbano VIII Pont. Opt. Max. Sacrum." The manuscript is undated. The author is Ricchio.

[171] Musaeus was a Greek poet contemporary with Orpheus.

importunè obstreperis, immerito Mella exposcentibus: surdescent tibi, qui eis aures pervicaci ratiocinationum impetu praeclusisti. Foramina, aut, quae excipientis vestibuli vicem habere solent; auriculae ipsas minimè apparere dices. Nec quidem Microscopio nobis. At longè minutius, quam nostris innotescere sensibus possit, à natura elaborari corpuscula, & complura quidem, vel ipso adhibito Microscopio existimes. Quo dum multa subtiliùs constructa discernis, alia ulterius illis adhuc exiliora concludas, quae omnem instrumentorum à nobis constructorum aciem fugiant, & eludant. Quod & de Telescopio nostro, dum remotiora ad oculum pertrahis, Dijudices congruum erit: alia quippe dissita magis remanere, ad quae nec ipsum ullo modo pertingat. Minusculorum igitur & remotiorum, nec paucorum aspectu aequo animo carere assuescas.

Nonne ODORES Apis odit? vide quali indignatione in unguentis perfusos & Moscho & Zibetho delibutos insidat. Rem minimè tenes. A foetoribus maximè abhorret, & ijs praesertim, corpora quos mittunt Venere, & Baccho coinquinata. Munditiae studiosissimum animalculum, Rufillos simul & Gorgonios, pastillos pariter & hircum: malè habet. Quidni pariter impuros,

you do not deserve to ask for honey. They are deaf to you because you have closed your ears to them in a stubborn attack of your reasoning powers. You say that the openings which usually serve the function of the reception of hearing look very little like ears. But this is not so according to our microscope. That which is much smaller than what we can know by our senses can become known, and you can study the many little bodies that nature has brought to completion if you apply the microscope. Any time you see many very tiny structures, you exclude many others still beyond these, which flee and elude all the sharpness of the instruments we make. And it will be the same with what you will discern by means of our telescope when you bring things very distant closer to the eye. Other things remain even more distant which it does not reach at all. Therefore you must become accustomed to missing with equanimity not a few of the smaller and more distant things.

Does the bee not hate odors? See with what indignation he attacks those who are smeared with ointments of both Moschus and Zibeth.[172] You think very little of [odors]. The [bee] shrinks back greatly from foul odors and particularly from those which bodies polluted with Venus and Bacchus emit.[173] This little animal most desirous of cleanliness has lozenges for sweetening the breath and rank body odor just as Rufillus and Gargonius do.[174] Is not anyone who is drunk also impure? But of

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[172]Moschus--the genus of musk animals. Zibeth--a kind of civit cat which emits a very strong odor.

[173]It was believed that bees would attack persons who approached them drunk or just having had sexual relations. See Varro Rerum rusticarum 3. 16. 6 and Columella Res rusticana 9. 14. 3.

[174]Horace Satires 1. 2. 27.

ita & temulentos? At pretiosissimae Moschus. & Zibethum, & primates Magnatum omnes inter odores ac unguenta, delitiae. Rectè equidem enarras; sed pretium simul & delitias in purulenta sanie; vel potius putida puris ipsius putrilagine; in putrescente inquam, bestiolarum cruore, & cadaveris partibus; in sordibus & sudoris excretarumque sordium colluvie [humanae quod miseriae est] agnosce constitutas. dignosce à pure haudquaquam odorem, sed putorem esse: oletum esse. Comparia haec Apis, puris magis, physicis magis, naribus sentit; purumque à putido, quàm optimè discernens, genuinos florum Serpillorum, Balsamorum halitus excipit; praesuaue quid, & omni ex parte salubre, & purum redolentes: nec tecum odores componit foetoribus; aut ipso deliciatur in coeno, & corruptis; luxus qui immunditijs pretiosis comples: pretiosis qui foetores habes.

Deest Apibus, qui eas inter se discriminet sexus, quod VIRGINALIS una singulis integritas, una omnibus nullius veneris conscia & pura, & multiplex FOECUNDITAS; uniformis, sibique semper similis perfectio. Quae autem in conficienda sobole diversitas, NON SEXUS ullo discrimine, sed dignitatum, sed muniorum mutuique officij, Reipublicae, operisque ratione constituta. Quod Apina corpora membraque Regimini, proficui laboribus prorsus addicta deditaque, non corporeis ullis lusibus aut voluptatibus consistant.

MAIESTATIS potentiam disce. Ita Api-Reges ab armorū usu abstinent; ita sibi à pugnis temperant, irae motus antevertunt; ut carere aculeo Columellae, alijsq. nonullis crediti sint, re

precious delights Moschus and Zibethum and Magnatum are among the first of all odors and ointments. You interpret this rightly indeed; but at the same time see the value and delights constituted in purulent diseased blood or even more in the stinking corruption of pus, I say, in the decaying gore of little beasts, and in dirt and sweat and the conflux of filth and excrement (which is miserable to men). Recognize that this odor is in no way from pus but is dirty and filthy. The bee senses these things with purer and more natural nostrils; and discerning so much better the pure from the filthy, it takes the natural breaths of balsam and of the flowers of thyme and anything that is most pleasing and healthful in every part and is pure smelling. [The bee] does not collect the odors in foul smells as you do, nor does it delight in filth and corruption, you who aodrn your luxury with precious impurities, you who have costly stenches.

Sex, which distinguishes among them, is not present in bees because there is virginal chastity in each. All are pure and know no venery. But there is manifold fecundity. Their perfection is always uniform and they are all the same. The diversity in producing offspring is not due to any distinction of sex but to the established order of dignity and to the duties of defending, of the state, and of working. Because the Apinum bodies and limbs remain wholly dedicated and agreeable to direction and to beneficial labors, they do not place themselves in the way of any lusts of the body or pleasures.

Tell of the power of majesty. Thus the king bees abstain from the use of arms. They restrain themselves from fighting, and they avoid the movements of anger. Columella and several others believe that they

ad Plinij usque indignationem dubia, Aeliano & pluribus: cum tamen validissimo polleant. Nempe armorum, viriumque pondus in aestimatione potius, & opinione longè latequè se effundente; quam in usu apud Principes est: etenim hic vix aliquos coerceret; dum illa interim plurimos simul absterrere, compellereque potis est, ac cohibere. Scholastice, POTENTIAM sive passivam, sive activam latissimè fundi, si in actum non reducatur, considereres; quo maximè finiatur, & arctis limitibus circumundique scribatur. Indefiniti nimirum ea amplitudo est, quae quoquoversum terminatas quascumque magnitudines semper excedat; ea vis in nomine fusisque in rumorem vocibus, quae rerum latitudinem & pernicitate & occupatis spatijs, longiùs multò & latiùs semper antecellat.

Apum Regiam perlustra, qui magnitudinis in illis, quae Corporis, quae Fortunae sunt, rationem habes. Fuci Apibus grãdiores sunt: Fucariae cellae minores ijs, quae Apibus destinãtur. ANIMI MAGNITUDO est, quae virtutũ, quae ingenij mole, non Corporis aut fortunae extensionibus mensuratur. Concluduntur sanè homunciones angustius, qui fastu tument, qui inanibus formae deliciarumque spacijs agitantur; qui Fortunae levitate tolluntur in altum. Ampliora longè, augustioraque exerceant dominia, qui heroico spiritu, eam, quae vera est beneque conspicua,

do not have a sting, but this is indignantly doubted by Pliny, Aelian and others since they are in any case the strongest bees.[175] Certainly the influence of arms and strength is greater when it is spread abroad in estimation and opinion rather than being put to use among princes. Indeed [the use of force] coerces others only with difficulty while [the opinion of it] is better able, meanwhile, to drive away the enemy by fear and to coerce and control at the same time. Rhetorically, you can consider power, whether active or passive, as most wide spread provided that it is not confined in its actions by boundaries or if it is not hindered by being limited and hedged in by written agreements. Its amplitude, which always exceeds the magnitude of its bounds on all sides, is unlimited. That force which exists in name and in the far reaching voices of rumor excells in its swiftness and its ability to occupy lands abroad.

Having traversed the kingdom of the bees, you understand what magnitudes of body and of fortune are in them. The drones are larger than the bees; there are smaller drone cells for them which are designed for the bees. The [bees'] spirit, which is measured by their virtue and by the power of their natural character, not by the size of their body or of their fortune, is great. Little men who are puffed up by pride, who are excited by empty forms and opportunities for pleasures, who are carried into high places by the levity of fortune, are certainly limited. Those who have their greatness because of their heroic spirit which is

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[175]Aristotle Historia animalium 9. 40. 626a28. "The kings are the least disposed to show anger or to inflict a sting." Columella Res rusticana 9. 10. 1; Pliny Natural History 11. 17. 52; Aelian On the Characteristics of Animals 5. 10.

magnitudinem habent.

Septennium ferè complet, quae mediocris; ad duodecimum longior annum traducitur animalculi vita, admirandae industriae & operis. Cuius AETATIS AMPLITUDINEM, & efficaciam, convictus & alimenti praestantiam, organorumque in corpusculo aptissimae dispositioni prorsus adscribas, velim: quae siquidem comparia aut repunt, aut volitant, plura, vix aliquorum mensium vitam ducunt, nonnulla etiam vix dierum, quae inde Ephemera dicuntur. Innoxiè certe vivendo; ingerendo innoxiè, & multùm & cum fructu vivitur.

Quis Apum ASPECTUS? Taurina facies: Leonina iuba: aurea vestis. Apem coluerunt Aegyptij & Propatorẽ Apum, Apim: cuius Microscopij beneficio, quam referunt toto capite speciem, vide. SOL autem & APIS erat. En Leonis Vellus fulvo honore conspicuum, quam benè rutila sole ab ipso, liquore ab ipso, animalcula exornare videtur; fuso veluti in radios amictu: quae etiam generationis numero Leoninae quodammodo responderent. Tauro autem sponte progenitae sunt; quae Melittam, quae Barbaram Venerem Matrem agnoscere debeant; quae & Deborae & BARBARAE ab Hebraico Dabar, plurimo nitentes auro Barbaricatae; quosuis

real and remarkable, exercise a far greater and most august dominion.

[The bee] lives about seven years, which is the average.[176] The life of the little animal, which is admired for its industry and toil, can be prolonged to twelve years. I hope that you attribute its length of life and its efficacy and its conviviality and its excellent nourishments wholly to the most appropriate arrangement of organs in its little body. There are those [creatures] similar [to the bee] which either creep or fly. Many of these live scarcely a month, and some even live scarcely a day. For this reason they are called Ephemera. Certainly although it lives and gathers [honey] harmlessly, the bee lives and produces much.

What is the aspect of bees?--the form of a bull, the mane of a lion, a golden garment. The Egyptians cultivated the bee and the ancestor of bees, Apis.[177] With the aid of the microscope see how much they recreate the species in their entire heads. The bee was the sun, however. Behold the pelt of the lion, remarkable for golden honor, which when well gilded by the sun seems to generate little animals from its liquor just as [one weaves] a garment from the spindle and the shuttles. The [bees] correspond in a certain way to the leonine generation. They are, however, generated spontaneously from the bull, and they ought to know Malta and the barbaric mother Venus. They can call forth both Deborae and Barbarae from the Hebraic Dabar[178] shining barbarically

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[176]Virgil Georgicon 4. 201.

[177]Apis was the sacred bull of Memphis who was worshipped as a god by the Egyptians.

[178]Deborae comes from the Hebrew word for bee.

Phrygiones pingente, adornante natura, provocare possint.

Dignoscatur vel ex cibo Apum PURITAS, Apum MUNDITIA, & carere pedibus; quod ipsum sonare videtur nomen: non quod huiusmodi artubus sint, aut fuerint orbatae; sed quod ab omni sorde, inquinamento ab omni [quae insima, quae pedum sunt] prorsus immunes exponamus: alludente Apinae huic munditici [ut eruditissimus D. Ign. Braccius animadvertit] Hebraeorum Barbutim, quo forte Plinio BARBARAE.

Aculeum si irritaveris, fuge. Molestus scilicet Improbus. Iniustus: Absis, vel ipsa nomine monebit Apis. Mellis dulcedinem rectè si exceperis, probus expecta. Apsis, te ad nectarea admittet recipietque Promptuaria, qua ampliora Gnavis virtutis laboribus, constructa. Aequa ratio: aequa sive praemij, sive paenae dispensatio.

Florum stirpiumque summa pervolitat Apis: indeq. existimas ni fallor, cum Interprete Callimachi, ab eodem Πανακρία dictam fuisse. Libat quidem ut vides, è summitatibus & mel haurit; verum etiam undequaque libat. Nam flores si insequitur, floribus si praecipuè insidet, reliquis omnibus animalibus ratione non utentibus prorsus ignotis, prorsusque alienis; non

with gold, as if adorning and embellishing the Phrygians by their nature.

The purity of bees, the cleanliness of bees is discerned from their food, and their name seems to tell that they do not have feet,[179] but not because their limbs are this way or because they were deprived of feet, but because we consider them entirely immune from all filth and from all contamination (these things are of the feet and the lower part of the body). Alluding to this cleanliness of the Apina (as the most learned D. Ign. Braccius has noticed) is the Barbutim of the Hebrews, which by chance are the Barbarae of Pliny.

If you have been irritated by their sting, flee. Actually it harms the wicked and the unjust. These [defects] must be absent or the bee will warn you by its very name. If you would properly extract their honey you must wait until you are morally virtuous. The vault which has been most amply constructed by the diligent labors of virtue will admit and receive you to the nectar storehouses. There is a just plan and a just distribution of both rewards and praise.

The bee flies above the tips of flowers and branches. Unless I am deceived, you might think, together with the interpreter Callimachus, that it was called Πανακρίδα [Panacratic] because of that.[180] As you see, he drinks and draws up honey from the tops [of flowers]. For if [the bee] follows and lights on certain flowers, it is those not used and completely ignored by other animals, those which are strange and alien.

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[179]This statement is evidently a play on the word apes which might be taken to mean without feet from the Latin pes for foot and the Greek prefix a meaning without.

[180]Callimachus Hymnes i. 50 speaks of Panacra, which is another name for Mount Ida, and of the Panacratic bees whose work preserved the infant Jupiter.

illi omnes plantarum cacumina tenent, cum ad latera quoque, & alas, & deorsum etiam vergentes erumpant. Virtutum potius consideres, quas attingit, quas tibi indigitat summitates, altos certè ac prominentes, nec marcescentes unquam flores; quibus ea longè lateque effulget, quibus & ipse altiùs lucere aemulus possis. Unde ab APICIBUS non infeliciter APIBUS nomen induxeris, & quidem Latina Syncope facilius feliciusque; quae simul è vulgari animantium grege eximendas eas moneat, & inferiori ipsorum è medio extollendas esse; uti verè EXIMIAS . REGIASQUE omnino decet. Nec ullo usquam modo aptè collocandas, nisi summis virtutum, dignitatum benè floridis verticibus: in quibus quoquoversum omnibus praeniteant.

Nec adhuc satis nominum existimes, aut titulorum. Adde mysterijs mysteria. CEREALES Apes, IUNONIAS Apes agnoscas. Ea scilicet Apum Maiestas Ethnicis fuit, ut potioribus omnibus fere Numinibus compleretur. Brutiorum numismata Iunonem Reginam cum Ape habent, IOVEM ab alia parte: Metapontinorum autem Triticeas cum ea Cereris spicas. Haec si HERACLIDARUM ex Argis in magnam Graeciam translato sub Imperio cusa respiciamus, quos Maiores Caesiae Gentis Fonteius scripsit; magis & Ipsi gaudere possumus,

Flowers do not all grow at the top of the plants since they also come out at the sides and in the hollows where the branches unite with the stem, and even downward. You must contemplate the greater heights of virtue which [the bee] reaches and which it proclaims to you, the lofty and prominent flowers, never the drooping ones. From them it glitters far and wide, and from them you are able to shine forth in rivalry of the most lofty places. Because of this you might, not unfortunately, derive the name Apibus from Apicibus [summits], indeed more easily and more fortunately by the Latin Syncope.[181] At the same time this warns that [bees] should be taken away from the crowd of common spirits and that they should be lifted from the midst of inferior ones as is truly fitting for their crowds and swarms. They can never in any way be appropriately gathered together except on the summits of virtue, and on the flowery vertices of dignity, from which they can shine forth in every way and in every direction.

You must not think that this is enough of names or of titles. Add the mystery of mysteries. You recognize bees of Ceres and bees of Juno. Actually, the majesty of bees was such to the heathens that it was associated with nearly all the greatest divinities. The coins of the Brutti have Juno the queen with a bee and Jove on the other side. On the coins of the Metapontians, however, you see the wheat stalks of Ceres with [the bee]. If we examine the coins of the Heraclideans from Argos, struck under their rule, which the elder Caesia of the gens

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[181] Syncope--a technical Latin term for the omission of a letter in the middle of a word.

qui sincero animi affectu, indeque & calamo Apes recolimus, si ab Antiquioribus nostris id quoque ipsis in Insignibus, & nummorum typis factum videamus: unde plusquam avita propensio nostrae devotionis, & beneficiorum amplissimum praesagium innotescant. Maiora interim mortalibus in Tritico & hisce aviculis dona, utrisque certè & mellificij, praesertim instrumẽtis, inferioris CAELI, & SOLI ipsius, sive superioris Terrae FERACITAS, FELICITAS, expressa. Regiones id ostendũt, quae ambabus famigeratae praerogativis, quae bonis utrinque plurimis perfruuntur. Apibus quidẽ caelo terraq. libamenta RORES, & FLORES, & Iuno exhibet & Ceres. Optimè insignis ille Apum Alumnus PINDARUS [quẽ Antiquis inimitabilem, nostris diebus plusquã imitatum ipsaemet URBANAE APES, vere MELICAE Apes, demonstrarunt] Sacras illas Cereris ministras appellaverit, puritate maximè conspicuas. Iovis quibus sit virtus, Palladis ingenium, Veneris, sed pura foecunditas, Dianae castitas, & integritas. Musarum Harmonici ordinis, & concentus rationes, Apollinis nitores, à quo & ortum, & altiles succos: à quibus omnibus cumulatas undique dotes obtinent. Quis verò MELLONAE mysteria arcanaque omnia penitus aperverit? quis pro rerum, quae harum Mellificum sunt, maiestate digne unquam, nisi prorsus

Fonteius wrote about, we can rejoice greatly.[182] We who write about bees with a reed pen and with a sincere affection see their figures on coins engraved by our ancestors. From these coins we know of the great ancestral propensity for devotion [to the bee] and knowledge of its very great beneficence. There are very great gifts wrested from wheat by the honey makers with their excellent instruments both from the lower regions of the sky and even the sun and from the fruitful fertile higher regions of the earth. These regions show that they enjoy the prerogatives of the celebrated ones and many good things from both places. Indeed Juno and Ceres show to the bees the dews and flowers, which are libations from the sky and earth. Best of all, that illustrious disciple of bees, Pindar (whom, although inimitable to the ancients, the Urban bees, the bees of lyric odes, show to be very much imitated in our day), named them the sacred ministers of Ceres, most greatly conspicuous for purity, in whom there was the strength of Jupiter, the cleverness of Pallas, the fecundity of Venus, but also the purity, the chastity and the innocence of Diana. These shining bees of Apollo, from whom they have both their origin and the nourishing juices from which they obtain their abundant riches, are of the harmonic order of the muses by reason of their harmony. Who has truly discovered the inner and concealed mystery of Mellona?[183] Who has ever revealed the secrets of the honey makers with the grandeur worthy of them unless he do so entirely with

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[182]Cf. Aldrovandi, De animalibus insectis, pp. 112-14. Pictured are drawings of coins, including those of the Brutti and the Metapontians. The text describes these coins, which correspond to the coins that Cesi describes.

[183]Mellona--the Roman goddess of bees and honey.

melleis exposuerit eloquijs, MELLIPHTONGIS inquam, ut ipse ait Pindarus Melopoeus. Compendio Virgilius cecinit

ESSE APIBUS PARTEM DIVINAE MENTIS, ET HAUSTUS AETHEREOS.

Festivae Apes culmina tenent. Mittit Hybla, Megara mittit, vel dicatis nummis non absque Phaebea lauro. Parthenias Diana ab Epheso, nummis quoque mittit & gemmis insculptas, & triadis numero. Regnant certè Apes, MELLEA expectemus SECULA. Quid aurea prisca aetas, mutuatis quoque a melle laudibus, canis? aliena haec sunt. Nil aurum sapit. Nil aliud praeter luxum, & damna fraudesque avarum assert aurum, execrandae devotum fami. At decore splendet. Splendet & mel aureũ, AUREIS ab APIBUS; simulq. sapit, vitamque sapit, ut eo saluberrimum cum sapore aurum habeas innoxium. Haec certè celebranda secula fructu & splendore potiora; quae mellea tota; quae vel ipsius à nomine Mellis MELIORA multo sint, metallicis omnibus. Imò nec comparaveris quidem insima Terrae concrementa. cũ caelestibus donis.

Quid modò de Apibus? quid certè aliud, quam summorum Philosophorum, summorum Poetarum, insigniorumq. inter priscos & recentes, Physicorum & Moralium, Scriptorum dixerim omnium, omni ex parte occupasse ingenia, attrivisse calamos, supra quamcumque Historiae Naturalis partem; observatione, admiratione,

honeyed eloquence? unless he do so with honeyed tone, just as Pindar himself is called Pindar Melopoeus [a musical composition]. Virgil has sung briefly

> That bees have portion in the mind of God
> And life from heaven derive[184]

The festive bees inhabit high places. Hybla and Megara send coins with the Phaebea laurel. The maidenly Diana from Ephesus also sends engravings on coins and gems, three in number. Certainly bees rule, and we await the honeyed age. Can you sing the praises of any ancient golden age without borrowing words of praise from honey? These are strange things. [The bee] tastes no gold. Gold brings nothing but luxury and the damnation and trickery of desires and devotion to detestable fame. But the bee shines forth elegantly. And the golden honey from the golden bees shines forth. At the same time that [the bee] tastes [honey] he tastes life. In this way you can have harmless gold with a most healthful taste. This race must be praised the most for its fruit and splendor, which are honey, and which, from the name of honey itself [mel], are much meliora [better] than all metals. Certainly you should not compare the concretion of the inferior earth with the celestial gifts.

What else about bees? What else indeed! How much have I said that is taken from the greatest philosophers, the greatest poets, and the outstanding men among the ancients and contemporaries, physicians and moralists, all writers. How much have I discussed their nature in all its parts. How far have I worn down my reed pen, more than in any part of [Pliny's] Natural History. Although I have distinguished them

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[184] Virgil Georgicon 4. 220.

detinuisse; nec tamen sufficienter unquam? En Aristotelem, Theophrastum, Plinium: En Varrones, Columellas, Virgilios, Lucanos: nuperos tam multos. Superadditum de Melissographiis iudicium: Diligentissimè Hygino, elegantissimè Celsum, subtilissimè Aristotelē, de his differuisse. Qui Apes vel nominaverit tantùm, & admirationis & laudis non adiunxerit notas; invenias neminem. NEC facile ABSQUE APIBUS LIBROS. Ea quidem CELEBRITAS, ea quoquoversum NOBILITAS. Nostris hisce Emblematis ardenti quidem animo, sed tumultuariè inter domesticas beneque perplexastricas cum Apiario fasis ulterius non deterenda.[f]

Aspexistinè unquam Physiologe, FLORUM URCEOLOS. quibus mel excipis quod è caelo impluit? subit enim, nec pauca admiratio, te infundibulis specillisque non instructum, arduum hoc negotium complere voluisse: talibus enim & perquam accommodis maximè opus habebas. Enimvero si vascula haec perquisieris, suxerisque in mellis indicium, plurimum & tubulis angusta, & calycuis profunda, & galericulis contecta, & situ pendentia, & roris tempore occlusa, comperies: ut pluribus instrumentis & chirurgica arte, vix aditus ad hos aerios succos intromittendos, recludere possis. Melilotum, Lamium, Periclymenum, Limodoron, Cytisum, Legumina, & Trifolia

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[f]This line marks the end of the right hand section of the text.

by observation and admiration, is that not sufficient? Behold Aristotle, Theophrastus, Pliny. Behold Varro, Columella, Virgil, Lucan. Behold so many recent authors. Add, moreover, a judgment concerning writers about bees; the most diligent Hyginus, the most elegant Celsus, the most subtle Aristotle have discoursed about them. Who has named such bees and has not added notes of admiration and praise? You can find no one. It is not easy to have books without bees. They indeed have swarms, they have nobility in every way. They are the symbols of an ardent spirit, tumultuous and perplexing mischief makers whose escape from the hive the beekeeper cannot prevent.

Have you never observed physiologically the little pitchers of flowers from which you draw the honey that rains from the sky? [The honey] lies deep, and it is admired not a little, and you, although you are not provided with funnels and probes, might wish to fulfill this arduous task [of gathering honey] because you have the very great skill [to make] many suitable [instruments]. But truly, if you will earnestly inquire into the small beehive and will imbibe the evidence from the honey, you will discover many things about the narrowness of the tubule, and the depth of the calyx, and the covering of the little rose bud, and the suspension of the structure, and the secret time of the dew.[185] And so, even with many instruments and surgical arts, you can scarcely gain admittance to the airy juices that enter [the flower]. Before this labor you ought to look at the dead-nettle, the honeysuckle, beans, Limodoron, the Melilotum, Cytisum, and Trifolia [kinds of clover],

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[185]Pliny Natural History 11. 12. 30 says that honey is chiefly formed at the rising of the stars and especially when the dogstar shines. Then honey falls like dew.

plura, respicere ante ipsum ipus debebas, spicatas, comatas, floripendulas plantas. Nec enim illarum in loculos & melle referta conceptacula, quae florum imis sinibus constituta sunt, tenuiores aquas, vel data operà summaq. diligentià, instillaveris unquam; nedum mellei roris guttulas, laticis crassiusculi, & glutinosae naturae, licet initio fluidae magis ac dilutae. Quae scilicet adhaerescere primoribus labris voluerint, etiamsi ipsa in florum oscula inciderint, quae praeterea angusta beneque occlusa haud quaquam sursum biant, ut stillicidia expectent, & transversim plerumq. cadentes succos excipere, aut ullo pacto in ipsa penetralia admittere, possint. Alijs certè mel colligendum impluuijs, alio certè modo, quàm ratiocinij laboribus mel tibi floribus immittendum erat. Ficulneis praesertim; qui, utut lateant nostros Phytonomos; minimè id impedimento est Apibus; quin te etiam nolente Varroni obsecutae, non plurimum è Ficu mel recipiant: quo melleam Antiqui Syceram habebant; pura puta melligine concretos nos fructus, sive recertes, sive caricas mandimus.

Concedat Melilotus, Mel frugum, Lotusque ipsa, quamvis Melligena dicta; Cedant Meliphylla omnia, & quaecumque alia Mellitis occurrunt nominibus, conserta praesignis Melligine MELIA Est. Melia ipsa Fraxinus, intestino quam a MELLE apud

the spiked, hairy, flower-hanging plants. You could never, even with the greatest labor and diligence, instill those tenuous, watery substances into their coffers and the receptacles filled with honey that are situated in the lower parts of the flower, to say nothing of the little drops of honey dew, which, although they are somewhat thicker than milk and are sticky, are nevertheless in their origins very watery and dilute. In fact, they want to cling to the uppermost edges even if they fall onto the little mouths of the flowers, which are not narrow or well hidden but open wide and on high, so that they await the little drops and are able to take in the falling juices from every side or to admit them by some passage into the inner parts. Certainly honey should be gathered from the rains, or some other manner, rather than given to you by reason of the labors of flowers. Although they conceal our Phytonomos this is a very small impediment to bees, especially in fig trees. I doubt that you would be unwilling to agree with Varro that bees get very little honey from the fig tree, but the ancients had Syceram, a pure and clean honey-bearing concretion, from it.[186]

The Melilotus, the honey of fruits, and the lotus itself, however much it is called honey-producing, should withdraw. All the Meliphylla[187] and whatever else partakes of the name of sweetness, should withdraw. Melia is connected with the outstanding honey producer. The ash tree,

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[186]Varro Rerum rusticarum 3. 16. 24. "Sometimes what they gather is of one kind, since from the pomegranate and the asparagus they gather only food, from the olive tree wax, from the fig honey, but of a poor quality." Syceram is a combined form of the Greek syko meaning fig and ceram meaning wax.

[187]Meliphylla--herbs of which bees are fond.

Graecos nomen obtinuisse observavimus, rem declaret Mellis. Nam a duriori SACCHARO, & liquido Nectare, tertia Mellis species admirabilis MANNA EST. Quid autem Manna est, si è Caelo est & Fraxino? Si ROS, & SUCCUS est? Quid aliud Mel omne quam Ros & succus? Excipis concisis, contritis è plantis, aut floribus, aut varîe excoctis. Asser Mellitas Oleas quae ipsum Aeleomeli fundant, Tilias, Larices, Cedros, nec unquam visas florore Ficus, mi Phytopta: Tuam mi Recche peritissime, qui medicas divitias è novo Orbe depromis, Tzonpelic Zihuitl; quam Nectaream dixi, dulcore, & melle ipso concretam: Asser Hypasita, quas Statio coquis cannas; Metlina stillicidia Mexicane, certè AMBIGENTIS MELLONAE tu nobis ostendes Calaber imperia, ipsis in tuis Fraxini, aut Fraxinastri, Orni dicti, sylvulis. Dum provocatam è corticibus Mannam; dum folijs eandem & linteaminibus à rore insidentem adportaveris. Si enim recidentia alios Mella latuerint, tu & maternis adhuc corporibus inclusa; tu, quae in altum missa

Melia itself, which we have observed to acquire its name among the Greeks from honey, shows a sort of honey within.[188] Now besides the hard saccharin and the liquid nectar, the third sort of admirable honey is manna.[189] What is manna, however, if it is from the sky and from the ash tree? If dew, is it also juice? Is any other honey complete besides dew and juice? You get [manna] by separating it from ground up plants, or flowers, or from various boilings. Bring to me the honey-sweet olive trees, which pour forth the [manna] from the Aeleomeli, the linden trees, the larch trees, the cedars, but never the living fig tree in flower, my Phytopta. My most skillful Recchio, who fetches from the New World the riches of medicine, brings me the Tzonpelic Xihuitl, which I have called nectar-like, a concretion of hardened sweet honey. You show us the Hypasitan aster, whose stalks you must boil, according to Statius, the dripping Mexican Metlina, even the Calabrian power of the ambiguous Mellona in your ash trees or in your ash aster, called Orni, of the forest. Now you bring the manna that you have gotten from the cortices [of plants], then manna from the dew on the leaves, which you have caught on linen cloths, falling honeys enclosed until now in the maternal bodies. If these hide others, you should be able to show

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[188]The Greek name for the ash tree was μελια (melia).

[189]Cf. Adam Littleton, Linguae Latinae liber dictionarius quadripartitus. A Latine Dictionary in Four Parts: I. An English Latine. II. A Latine-Classical. III. A Latine Proper. IV. A Latine-Barbarous (London: T. Bassett, J. Wright, and R. Chiswell, 1687). Littleton defines Manna as "Also a kind of honey dew which is gathered in great plenty on Mount Libanus, as Galen sayes; whence by Celsus 'tis called Ros Syriacus." Webster's Third International Dictionary Unabridged defines it as "The sweetish exudate of the European flowering ash Fraxinus ornus and of several related species, obtained in the form of flakes . . . fragments . . . or as a viscid mass. . . ."

rorulentis conspersionibus suarum ad arborum comas redeant, affatim monstrare poteris: quamvis hucusque fortè collectioni dumtaxat intentus, animadvertisti nunquam. Ita Mellis naturam plantis ingenitam, in altum quae tolli possit, & Caelo frui, indeque propria vireta comasque repetat, exploratam habeamus. Chymici haud difficile omnes Apollini, qui fumos elevet, qui fumis minimè tingatur, ipsi Furvi undequaque primas relinquent: scilicet Aegyptio Api, qui inferiorum è rerum meditullijs, penitissimos, stirpium praesertim visceribus excoctos, extraxerit succos, & sublevaverit; unde placcidis guttulis, supernis ab officinis elaboratiores distillaverint, proprijsq. repluerint in locis, ni aeris turbis fuerint impediti. Quae omnia in Thaumatōbria nostra plenius inspexeris; in qua non mellis tantum, Mannae, & Sacchari pluvias; sed & Cereas, Gummínas & Styracinas, inter complures miras alias contemplati sumus; ut pariter & FLORIDA & CAELESTIA Mellis dona, concludere possis. Caelumque, Solem APIM, Patrem, Terram, Floram APIAM Matrem; ad illum ascensus; huius repetitos sinus: Auctrices, Promas, Condas APES; quae UTRINQUE colligant, hauriant: quae rorantia Mella praesentiant, pariterque Melimela & Mellita quaecumque inferiora, ita notat compertaque habeant; ut inde APIANA apellari soleant,

satisfactorily that the ones which have been sent forth into the air as sprinkling dew return to the branches of their own trees, although you have never noticed this hitherto because you were strongly intent on collecting it. Thus we have explored the inherent nature of honey in plants, which can be carried on high, and from there like fruit from the sky it seeks the green places and leaves to which it is peculiar. It is easy for all men to abandon to the chemistry of Apollo, which causes smoke to arise but who is least touched by it, the dusky bee, wherever it may be, that is to say, the Egyptian bee, who draws forth and carries away the refined juices from the midst of the lower parts, particularly from the viscera of the plants, whence from their supernal workshops the elaborators distill the placid drops and replace them in their particular places, and they are not hindered by gusty winds. You can read of all these things more fully in our Thaumatombria, in which we have contemplated not only rains of honey, manna and saccharin, but also waxes, gums, and the resinous gum from trees, among many other marvels,[190] and you can include equally the flowery and the celestial gifts of honey. The sky and Apim the sun are father; the earth and the flower Apiam [parsley] are the mother. [The honey] ascends to the former and seeks again the hollow places of the latter. Bees are the authoresses, distributors, provisioners. They unite and draw together both [earth and sky]. They have foreknowledge of the honey dew, Melimela [honey apple] and Mellita [sweetness] alike, however much these are noted and considered inferior. For this reason [things like honey] are usually

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[190] Thaumatombria is an unpublished work by Cesi. The title is a combined form from two Greek words meaning miraculous rain. See Gabrieli, "Cesi," p. 367 and Hernandez, Rerum medicarum, p. 586.

quae ad ipsas omnino spectent.

CERAE prestantiam considera, ut Apibus magis gratus sis. Hanc dum habes, non aliud quidquam, sed lucem ipsam habes, noctuque diuque. Pertinacius haec tenebras vincit, haec Athenaeas illas Noctuas, haec Lychnobios virtutis alumnos maximè iuvat, detinetque in Sapientum colloquijs. doctarum haec lucubrationum comes est. Oleo fida magis, quae sponte sua stet in obsequio, nec fugax vasorum ergastulis coerceri debeat, intaminata quae renideat, nec lubrice alienis damnis maculosa luxuriet, ut illi ingentium, quod condiendo potius; quàm lucendo est. Faces ab ea Funerales, Nuptiales, Symposiacas, Sacras quoque; Regias, Festivas, accipis: splendorem, diem ipsum medijs in tenebris. Quàm conferta luce, quot depulisse in Urbe noctes, hoc Seculari anno vidimus Apum myriadum potius, vel innumeris nobis collatis opibus? quæ ingenti fructus multitudine, vijs guttatim obceratis, angiportibus etiam noctu lucentibus? Quis erosas illas antiquitatis plurima carie, obscuriores scaturiente fumo taedas obliteratas, desiderare amplius possit? Quis aliud quidquam, vicario lucis Solisque usui Cerae praeponere queat unquam? Haec eadem, haec olim Cera litterariae rei ministra tabellas tribuit, & Nunciorum & cogitationum: vel potius ipsis mentis humanae cõceptibus lucem dedit, & illos luci. Alia apud Medicos, Pictores, Plasticos Artifices cõplures, omnes ferè dixerim, mille ex Cera. Mille ad usus vitae, ipsissima de hac apud Plinium legere aliquis posset

called Apiana [of bees] by those who study them thoroughly.

Consider the excellence of wax that you might rejoice greatly in bees. When you have it, you have nothing less than light itself both day and night. It conquers the most stubborn shadows. It aids the nocturnal Athenians, those night-owl students of virtue, and it prolongs the conversations of wise men. It is the companion of learned nocturnal students. The very faithful oil, which of its own accord stands in obeisence, should not be coerced like a fugitive into the prison house of jars. That oil, which shines forth unsullied, should not swarm with the pollution of harmful foreign bodies. That nature is better for preserving than for lighting. You have funeral torches, nuptial torches, banquet torches, sacred torches also, royal torches, festive torches from [wax]. You have splendor and daylight in the midst of shadows. How many nights in this year and in this age have we seen dispelled when light was brought?--more than [the number of] swarms of bees or the innumerable works that they collect for us? More than the remarkable multitude of their fruits, the little drops of wax which light our paths and even light the narrow streets at night? Would anyone desire rather those torches of antiquity, the dark rotten pine torches whose light is faint and obliterated by gushing smoke? Would anyone ever want to use anything whatsoever instead of wax as a substitute for light and sun? This very wax formerly provided tablets for the writers of literary matters, both writers of news and thinkers, and even better it gave light to the ideas of the human mind and gave the ideas to the light. Concerning wax, I might name many others, nearly all physicians, painters, sculptors, and a thousand more. Anyone can read about this very thing in Pliny, about

ab Apibus compositam. Habeas certè ipsius rei arrhabonem, vel in ipso nomine: quo alludens quasi χα ῖρε expediat, nulla dolosi spe nummi, aurea & ipsa; non ventre magistro, famis nescia; censorem Persium illum acrem nequaquam timens: te statim in prospectu salutat, Ceremonijs, quae plurimum interveniat; habeas & Symbolo, quo ipsummet OBSEQUIUM exprimere solet, tuis quae obsequentissima commodis est, quocũq. eam & colore, & figura praesto esse iusseris. TRACTABILIS semper, vereque FACILIS, quae quodcumque volueris, fiat. Quale profecto Apum opus. quàm mirandum, si non ab arborum tantùm lachrymis, ipsaque vulgari Olea, aut populari Populo, florumque praesertim liliacei, & Narcissi generis furfuribus; sed vel è vilioribus Lampsana, Rapistro, & consimilibus oleribus obolarijs; hasce nobis peraccommodas, in lucem litteras, vasaque ituras aureas, niveas, multicolores massas componunt.

Ignoret necne Scholasticus, qui Physica vel abstrusa promittit: certè Apes ingenitam plantis CERAGINEM probè cognoscunt, quae rebus in omnibus latitans, & simplicis & compositi corporis, contubernalis adinstar mellis vicem habeat: quae medias inter

this composition of bees that has a thousand uses in life.[191] You have a pledge of the very thing even in the very name.[192] Jesting about the name, it is like χαίρει [he rejoices], not like anticipation of deceitful coins or gold, not like the belly of a magistrate which knows no hunger, not fearing the harsh censor Persius at all. It greets you immediately as you are in sight, which very much interrupts the ceremonies. And you have the symbol, by which one usually expresses compliance, and it is most compliant to your wishes. Whithersoever you might order it to be, it is outstanding both in color and in form. It always becomes tractable and easily worked however you might wish. Such indeed is the work of bees. How much more wonderful it is if [it comes] not from the tears of many trees, and from the common olive tree, or from the native poplar and flowers, chiefly the lily, and from the scales of a kind of Narcissus, but from the charlock, mustard, and from vile-smelling plants similar to obolariis.[193] Bees compose things most useful to us, letters in the light and utensils, golden, snowy white, and multicolored masses.

The scholastic who expounds the abstruse physics does not ignore [wax]. Certainly bees rightly recognize the wax-bearing nature of plants, which, lying hidden in all things, has the appearance alternately of both simple and complex bodies and of the companion of honey. It occupies

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[191]Pliny Natural History 11. 4. 11. "They collect honey, that sweetest and most refined and most health-giving of juices, they model combs and wax that serves a thousand practical purposes. . . ."

[192]This statement perhaps refers to the fact that wax was used for seals which often served as pledges for contracts (Ibid 33. 6. 28). The word cera can mean a waxen seal.

[193]Obolariis seems to be a misprint of oboloriis which is defined as an unidentified plant. See Columella Res rusticana 9. 4. 5 for plants that produce wax.

oleum & glutina partes obtineat. Componunt quoque, dum ea quae maximè cerosa sunt, commiscent, ac subigunt; qualia plerumque medijs in floribus eruperint, aut ad ipsos cortices exudaverint: qualia etiam trans cutim posita, ipsae minutius decerpserint, & extraxerint. Atque ita quidem factitant; ut sicciuscula pinguioribus temperent, viscidaque ad lentorem superaddant, inque massas redigant. Ex multis scilicet, non raro Ceris heterogeneam unam favis aptiorem conficiunt: genuinis prioribus ex illis, magis quidem puris, sed singulis maternae conditionis impressionem aliquam retinentibus, non secus ac Melli contigisse vidimus. Introspicere sanè, ut pulchrum atque iucundum, ita difficile & quod non parum nos in Oposcopia nostra avidos detinuerit Observantes. Interim ita contrahere liceat, ut si oleum Hygron illud Homericum, quod maximè humoris seu liquoris munere fungitur, quod maximè diffunditur, sistendū sit; crassescere, si illud & durum in corpus ire debeat; sique ex scobe vel potius excretis leviusculis sudorum furfuribus, glutinosis pinguibusque intercedentibus particulis, coalescere aliquid debeat; nil aliud quam ipsam Ceram sis habiturus, Confirmet oleaginea ipsa Cera: antiquis namque testibus ex Olea copiosè ea sumitur Particulis tandem haec &

the middle position between oily and sticky [substances]. Those [substances] compose [wax] also when they mix and work through those things which are most waxy. Substances of that kind burst forth mostly from the centers of flowers, or they exude from the very cortices. When they are placed on the surface, bees pluck off and extract them in lesser quantities. And they do this so that they can properly temper the drier substances with the wetter ones and can add the viscous ones to the pliant ones, and they collect them into masses. Actually, they often make from many substances one homogeneous kind of wax most suitable to their hives. We see that a different impression has been put upon and has been retained by those original substances which are certainly very pure but which have only their maternal condition, and they are like honey. To view soberly what is beautiful and pleasant is difficult, and it greatly occupies those of us who eagerly observe it with our Oposcopia.[194] Meanwhile it is possible to gather [wax] if that Homeric oil Hygron[195] which acts like moisture or liquid and is easily poured should be halted in its motion and should thicken into a hard mass, or if something should coalesce from the dust or rather from sweat and very fine bran chaff, the dry and the sticky particles intermingling, you can get none other than wax. The olive bearing tree confirms the wax, for according to ancient witness wax is gathered most copiously from

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[194]Opos is a Latin word corresponding to the Greek word meaning sap or juice. Oposcopia, then, would be a combined form which means an instrument for observing juices.

[195]Hygron is a transliteration of the Greek word which means moisture. Homer uses the phrase υγρὸν ἔλαιο to mean "soft olive oil" in the Odyssey 6. 79, 215 and 7. 107.

asperiusculis quidem in connexum eo pacto iunctis consistit; ut grumis crassior; ut miculis tenuior & adhaerescat, & torpeat, & maximè solubilis Vulcano copuletur, vel potius in ipsummet Vulcanum tota ferè abeat, ardoribus prorsus dicata eo modo, quo in nostris de Ardone, & Naturalibus Focis, Libris diximus.

Conferas modo & examines ad Naturae Trutinas. Dividas, dissoluas, coagmenta; si quod, compositum quod constructum objcitur, internoscere velis. In MELLE aquae iura inveneris & quae subactum bene salem sapiant. Mitius id placidiusque in SACCHARO, Olei, in Cera, necnon Sulphuris seu Bituminis. Igne pariter fere fluunt, sed illum refinosa Cera omnino in ardorem amplectitur. Gumminae vero haud expers conditionis Mel cum saccharo aliquantulum refugit, diversa res in MANNA est, & ita anceps, ut Matthiolum & Altimarum, quamvis hic propè Calabras aereas, arboreasq. Manna officinas vixerit; ille saepius collegerit, ut vel in ipsis saenisecis falcibus proprijs manibus contrectaverit, frustra detinuerit agitatione & libris. Cerae faciem, mellis saporem ea plurimum habet, medium quodammodo inter Mel ipsum & Ceram corpus; ut utrimq. ambiguum videri possit. Media quoque si ad saporem simul, & ad consistentiam respicias, inter Mel & Saccarum, eoque magis quod & liquida & durior

the olive tree.[196] However, the wax consists of rather rough little particles joined by agreement into a union. So that the little lumps can be more solid and the particles finer it adheres together and grows warm, and when it is melted it is joined with Vulcan, or rather, so that it can be entirely transformed in the fire, it is dedicated wholly to the heat in the way that we speak about in our books about fire and natural hearths.

You bring [wax] to the scales of nature and examine it, as it were. You must divide or dissolve what is melted together if you wish to know what composition or what structure will be exposed. In honey you will find watery broths that have a salty taste; in the most mild and placid saccharin, oil; and in wax, sulphur and bitumine also.[197] These melt together [with the wax] in fire, but the pure wax is wholly consumed by the flame. It is not unknown in the refining of gum that honey flows somewhat with saccharin, that it is many things in manna, and that it is of a dual nature, as the Matthiolum and Altimarum, although it lives in the Calabrian air and trees, the manufacturers of manna. It will often collect in such a way that it will even adhere to the sickles in the hands of proper mowers, resisting in vain their motion and the weighing scales. It has the form of wax and the taste of honey; it is a substance somewhat between wax and honey, and it can be seen in both of these forms. It is also between honey and Saccarum [saccharin?] if you think of the taste of the former and the consistency

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[196]Varro Rerum rusticarum 3. 16. 24.

[197]Pliny Natural History 25. 50-51, 174-82 discusses sulphur and bitumine which are mineral substances that burn readily.

comperiatur; unde Melisaccharum quoque dicta est. Porro alia noctis frigore concrescit, sole liquatur; alia aqua solvitur, & pluuijs, sole duratur. qui nodus illis fuit & disceptationis, nec quidem mitioris, occasio; dum Peripatetici decreti vis animo fortius incussa, quam ulla unquam corpori inflicta febris, disterminare quam longissimis iusserat intervallis, ea quae Caloris sunt; ab illis quae Frigoris dicuntur: nec servores illi horripilationibus nullo interstitio adiuncti, eadem geniti parente, medicam mentem movere potuerunt; quin potius prioribus illis deceptionibus acquiesceret & summopere contraria calida frigidis existimaret, fallente imbecilliori sensu, qui remissa intensis plerumque contraria facit, & ut Scholastice itidem dicamus, a respectivis ad absoluta lucrice transcendit: qui proprijs hallucinatur mensuris, & tamen is idem ustulata pariter gelidis Aquilonibus invadentibus, vel impetentibus proxime flammis, frondosa flagella, exiccatosque pariter madores, perspicere, &

of the latter, and it can be easily discovered that the one is more liquid and the other harder than [manna]. Because of its double nature it is also called Melisaccharum. Furthermore [honey] hardens in the cold of the night, but it melts in the sun. [Manna] is dissolved by water and rain and hardens in the sun. [These phenomena] were the occasion of a knotty problem rather vigorously disputed. The force of the Peripatetic doctrine, which has been impressed on the mind more strongly than any fever has ever been inflicted upon the body, orders [us] to separate by great intervals those things which pertain to heat from those which pertain to cold.[198] The fact that warmth exists in a body at the same time that the hair stands on end [because of the cold] and that heat and cold are not separated by any interval but arise in the same body, does not move the mind of the physician who agrees rather with false ideas and thinks that heat is the opposite of cold, and, mistaken because of his faulty senses, makes intension the contrary of remission.[199] We might say that like the scholastic, who speaks nonsense but says it in the proper form of argument, he transcends hazardously from the looked for to the completed. However, he is able to perceive and grasp the fact that in the same way that something can be scorched by the invading icy north wind or by the nearness of impending flames and the moisture of

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[198]Marshall Clagett, Giovanni Marliani and Late Medieval Physics (New York: Columbia University Press; London: P. S. King & Son, Ltd., 1941), pp. 37-38. The Peripatetics believed that heat and cold were opposing qualities that would not exist at the same time in the same body.

[199]Marshall Clagett, The Science of Mechanics in the Middle Ages (Madison: The University of Wisconsin Press; London: Oxford University Press, 1959), pp. 333-34. Clagett discusses the medieval concepts of intension and remission of qualities.

percipere potis est; caloresque protinus rigoribus subiunctos in nivis contactu. Siquidem Penetratio unica origio est Caloris & Frigoris. Huius si Constipatio ab ea sequatur; illius si Concitatio: partiũ in Solutione Conflictus ignis: consummata fere solutio Flamma: diductio Apertio illa, quae completae solutionis proles, Lux. quae omnia in nostra Physica Mathesi plenius contemplati sumus. Quod vero interim ad Mannas facit, non remotius petendae conditiones illae sunt, quae a partium, diverse quae exterius ingruant, receptantium dispositione proveniunt. satis hic erit ab ipsis Matribus habeamus. Scilicet Fraxinea Manna gummini terreique succi salsam concretionem habet. Cedrina illa Larigna, Iuniperina, & refinosarum Arborum pinguem & refinosam, quae ad Oleum vergat & Bitumina, Vulcanij prorsus iuris. Gummatum namque & Refinarum more, retinent etiam educta maternos quadam tenus characteres, haec quae in corporis meditullijs latebant quasi principia. qualia sive in aerem sublata, sive in ipsismet stirpium alis, in quibus nidulantur, naturam metallicam aequis fluvioribus & succis referre videntur. Unde illustrior

the leaves dried up, heat can be augmented when exposed to nearby snow.[200] Indeed there is one penetrating origin of heat and cold. A quickening movement results from the former and a thickening results from the latter. In dissolving, there is a conflict of the parts with the fire, and the solution is almost wholly consumed in flames. From the separating there is light, the offspring of complete dissolving. We have studied these things more fully in our Physica mathesis.[201] It does this to the mannas. Those conditions that break in on diverse outer parts that have a disposition for receiving should not be sought at a distance. We have it from the mothers themselves, and this is enough. That is to say, the ash tree manna has a salty concretion of gum and earthy juice. The manna from the cedar, the larch and the juniper has the gum and pitch of resinous trees which tends to be oily like bitumine or a fiery broth. When [mannas] have been exuded by the tree they retain to a certain extent their maternal characteristics, as when [they come] from gummy or sappy [trees]. These [characteristics] lie hidden in the midst of their bodies as principles. These sorts [of principles], which are either borne on the air or in the hollows where the branches unite with the stem, in which they make their homes, seem to bring a metallic nature to the flowing waters and juices. From this comes that middle nature, first produced under the auspices of bees, which has been detected and described

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[200]The doctrine of antiperistasis supposed that the intensity of a quality increased as a result of the quality being surrounded by its contrary quality, for example, the sudden heating of a warm body when it is surrounded by cold.

[201]The Physica Mathesis is an unpublished work by Cesi. See Gabrieli, "Cesi," p. 367.

quoque evadat illa quae a nobis media Metallophyti natura detecta est, tribusque libris descripta & observata felici primùm Apum auspicio producta. Fluunt autem talia varie inter se. prout particulis constant diversis. Asperitas viscositate semet ostendit & sequacibus vinculis: anguli sale sapore: obtusiones, dilatationes pinguedine: apertiones diductiones internaque spatiola, aquae olei, & ardentium ingressibus. Quae interceptione, replicatisq. mixtionibus: quae a partium figuris & compositione omnia.

in three books of the Metallophyti.[202] These [substances] flow in various ways in proportion as they are made up of diverse particles. An uneven viscosity shows pliable bondings. A salty taste [shows that the particles] have angles. Greasiness shows much spreading and bluntness [of the particles]. The ready access of heat and of oil into water shows inner spaces and the expanding and separating [of the particles]. All of these things [happen] in the taking away and in the composition of the forms from their parts and in the unfolding mixtures.[203]

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[202]Metallophyti is a work on fossil rocks written by Cesi. It is part of a larger work, De mediis naturis in universum, a work on things in transition. See Gabrieli, "Cesi," p. 367.

[203]Cf. Lucretius De rerum naturae 2. 433-86. Lucretius in his atomic theory attributes the qualities of things to the shape of their atoms.

APPENDIX III

AUTHORS CITED BY CESI

The following are authors cited by Cesi in the Apiarium. They are listed in chronological order so far as is possible. Dates of many of the ancient authors are of necessity approximate.

Homer (8th century B.C.)

Pindar (522-443 B.C.)

Herodotus (484-425 B.C.)

Euripides (480-400 B.C.)

Quintus Curtius Rufus (3rd century B.C.)

Vaecilia (3rd century B.C.)

Aristotle (384-322 B.C.)

Theophrastus (c. 372 - c. 288 B.C.)

Callimachus (fl. 250 B.C.)

Marcus Terentius Varro (116-27 B.C.)

Publius Vergilius Maro (70-19 B.C.)

Strabo the Geographer (c. 63 B.C. - c. 21 A.D.)

C. Julius Hyginus (c. 28 B.C. - c. 10 A.D.)

Aurelius Cornelius Celsus (fl. 14-37 A.D.)

Caius Plinius Secundus (23-79 A.D.)

Marcus Valerius Martialis (c. 38 - c. 102 A.D.)

Marcus Annaeus Lucanus (39-65 A.D.)

Publius Papinus Statius (45-96 A.D.)

Plutarch (46-120 A.D.)

Lucius Junius Moderatus Columella (1st century A.D.)

Pausanias (2nd century A.D.)

Claudius Galen (c. 130 - c. 200 A.D.)

Claudius Aelianus (170-230? A.D.)

Claudius Claudianus (4th century A.D.)

St. Ambrose (c. 340-397 A.D.)

Suidas (late 10th century A.D.)

Petrus Hispanus (1210?-1277 A.D.)

Albertus Magnus (1193?-1280)

Coelius Rhodiginus (Louis Ricchieri, 1450-1525)

Julius Caesar Scaliger (1484-1558)

Paracelsus (Theophrastus Bombastus von Hohenheim, 1493-1541)

Girolamo Cardano (1501-1576)

Francisco Lopez de Gomara (1510-1560)

Nicolas Monardi (1512?-1588)

Jacques Delechamps (1513-1588)

Valerius Cordus (1515-1544)

Goropius (Jean Becan, 1518-1572)

Ulisse Aldrovandi (1522-1605?)

Joannes Lerius (Jean de Lery, 1534-1611)

Fabio Colonna (1567-1650)

Francesco Stelluti (1577-1651)

Giusto Ricchio (1587-1627)

Nardo Antonio Recchi (16th century)

Gregoire de Bolivar (16th century)

Hans Staden (16th century)

Livinius Hulsius (Died 1606)

Pedro de Cieca de Leon (Born 1514-15)

Ign. Braccius (16th century)