

SECTION D, SOCIAL SCIENCES

The Apiarium: An Early Example of Microscopic Study

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Federico Cesi, Duke of Acquasparta and author of the *Apiarium*, was born on March 13, 1585, in Rome. He grew up with a strong love of learning, and an early letter written to his friend Francesco Stelluti reveals him as a sensitive, withdrawn and somewhat melancholy young man. While still in his teens Cesi became friends with three young men who were to be his companions in a most important undertaking. One was Stelluti, a mathematician from Fabriano; another was Anastasio de Filiis of Terni, who was skilled in the arts of mechanics; the third was Johannes Eck, a physician from Daventer in Holland who attracted Cesi's attention by his reputation for learning and who became a member of his household as his companion.¹

Cesi's ambition in life was to establish a group patterned after a monastic order, the members of which would devote themselves to secular rather than religious learning. He and his three friends began to put this idea into practice in 1630 when they formally constituted themselves as the *Accademia dei Lincei*.² Because of the nature of their interests and their publications, the group has been called the first modern scientific society. New members were recruited in various cities of Europe. Giovanni Battista della Porta joined in 1610 in Naples. In 1611 Galileo Galilei, the most illustrious member, joined the organization. The members remained scattered in their respective cities. The unifying force for the group was Cesi himself, who carried on a copious correspondence with the members and encouraged their scientific studies. He supported the society not only with his interest but also with his money. He financed all the early publications of the Lincei, notably Galileo's book on sunspots in 1613 and his *Il Saggiatore* in 1623.³

Cesi was an ardent admirer of Galileo, and the two men remained lifelong friends. Galileo gave Cesi a microscope. He sent the instrument to Cesi with a letter dated September 24, 1624, in which he described it as an *occhilino* for observing small objects. It had a tube whose length could be adjusted and a movable plate on which the object to be viewed could be positioned.⁴ Cesi and other members of the Lincei evidently took great interest in this new invention. Johann Faber, a member of the Lincei, coined the name microscope in a letter which he wrote to Cesi on April 13, 1625.⁵

In 1625 Cesi began one chapter of an encyclopedia of natural history that he planned to write. This chapter, in Latin, was entitled *Apiarium* and is the only part of this proposed work that he ever published.⁶ The work was dedicated to Maffeo Barberini, who ruled as Pope Urban VIII from 1623 to 1644. The Barberinis were an important and powerful family in Rome, and their crest displayed three bees. Cesi's ulterior motive in the production of the *Apiarium* was obvious in the choice of subject matter, bees. The work was intended to please the Pope and to solicit his support for the Lincei, for which Cesi was rapidly finding himself unable to continue as patron. In 1618 upon the death of his father Cesi had been called to Acquasparta to take over the management of his family's affairs. The estate had been squandered by the elder duke, and the financial burden of publications was probably too great a drain on Cesi's depleted fortune.⁷ Also, the time away from his friends at Rome, which his family responsibility entailed, led Cesi to consider finding a new patron for the Lincei. The Barberini family was of special interest to Cesi because the Pope's nephew, Francesco Barberini, was a member of the group.

The Catholic Church's suspicion of Galileo may have been another reason for Cesi's wish to gain the attention of the Pope. As early as 1616 the Church had prohibited the teaching of the Copernican system, which Galileo had espoused, and in 1618 Father Grassi attacked Galileo for his views. Cesi and most of the Lincei were strong in Galileo's defense, and Cesi wrote a series of letters to Cardinal Robert Bellarmine in which he expounded his own views of the nature of the heavens and eloquently defended the compatibility of Scripture and natural science.⁴

In 1623 Galileo wrote his *Il Saggiatore* in reply to the criticism that had been levied against him by Grassi. In the same year Maffeo Barberini was crowned Urban VIII. The Lincei then made a bid to gain the favor of the Pope on behalf of Galileo. The *Apiarium* was probably part of this campaign.

There are two extant copies of the *Apiarium* in the world today. One belongs to the University of Oklahoma's DeGolyer Collection in the History of Science and Technology. The complete *Apiarium* is made up of two large sheets, one of text and one a plate of drawings of three bees showing lateral and dorsal views. At the bottom of the page of drawings is the statement *Franciscus Stellutus Fabriis microscopio observabat*. The body of the text within the margins measures 39½ by 25 inches. At the top of the text page are drawings of pairs of medallions which seem to represent the obverse and reverse of ancient Roman and Greek coins. (In the text Cesi mentions coins adorned with bees.) At the top center of the page, between the medallions, is the crest of the Barberini family with three bees, surmounted by the papal crown and keys. Below this is the title of the work which in translation reads: *The Bee Hive from the Frontispiece of the Natural Theatre of Prince Federico Cesi Lincei prince of San Angeli and San Poli. Marchese of Monticelli. A Roman noble, offspring of Giacomo Cesi, 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.*

The text of the *Apiarium* is divided into paragraphs composing sections which correspond to chapters. One section is a chapter on the habits of bees, their hive building, government and family life. Another section deals with the physiology of the insect, a description of its mouth parts and legs and the divisions of its body, the kinds of substances it gathers from flowers, and the effect of heat on the honey it produces. One section is a chapter on the mode of reproduction of bees, and another is a list of various kinds and species of bees as reported by ancient and contemporary authors. Five paragraphs across the bottom of the page comprise a chapter on wax, its uses and its production.

In the text Cesi describes the eyes of the bee as beautiful golden dice boxes, arranged in a kind of net work, separated by hairy columns which form little lines. He notes that the same kind of hairy columns are present on the ends of the wings, but there they are small and less thick. He describes the parts of the mouth as instruments for honey-making and says that they are enclosed in curved sheaths in four cavities that are like very large and strong jaws. The four outer parts of the mouth form a sheath around the longer tongue in the middle, just as a flower, when in the bud, is enclosed by its outer leaves. Two of these parts have rigid tips and can be moved apart in a scissor-like motion. Cesi describes the hairy ridges on the four outer parts of the mouth, which are used to scrape the nectar from the tongue, and notes that they are worn down in the middle from use. He also mentions the jointed legs of the bee, the three digits which appear at the end of the legs and even the nails of these digits. The drawings show in detail what is described in the body of the text.

Cesi's description of the bee occupies one fairly long paragraph of

the work, and it is not extremely rigorous. It shows far less attention to detail than a description written by Francesco Stelluti in 1630.⁹ The references to dice boxes and the comparison of the mouth of the bee to the bud of a flower are characteristic of the general tone of the work. It is a curious combination of fact and fancy liberally drawn from at least 48 ancient authors and contemporaries of Cesi. His favorite sources seem to be the Roman poet Virgil and the encyclopedist Pliny, neither of whom could be called a writer of scientific merit. Cesi repeats the tale, drawn from Aristotle, that bees carry pebbles in their feet as ballast when they fly in high winds. He refers to the leader of the hive as the king bee, not the queen. He includes mythological accounts of the origins of bees and says they can be generated from the bodies of dead bullocks. Cesi's discussion of the reproduction of bees within the hive comes largely from Aristotle.

The knowledge contained in the *Apiarium* is a summary of what had been known and conjectured about bees from ancient times. There is only one section, besides the passage of description, in which Cesi contributed anything to the knowledge about bees in the seventeenth century, and that is in his discussion of the various kinds of bees named by different authors from Aristotle to Aldrovandi. In this section he summarizes the references to bees made by various sixteenth-century explorers of the New World.

In the *Apiarium* Cesi reveals himself as a humanist rather than a scientist. He shows wide acquaintance with Greek and Roman writers, with ancient languages, with ancient coins, and with the Peripatetic concepts of heat. This acquaintance is the result of Cesi's keen interest in philology, archaeology, and natural science. The *Apiarium* is an example of the encyclopedic nature of Cesi's knowledge.

Cesi's purpose in writing the work probably influenced its final form. It was intended not as a scientific treatise but as a panegyric on bees with which he wished to flatter the Pope and win him to the side of Galileo and to the support of the Lincei. 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 which were indirectly attributed to the Pope when attributed to the animals that decorated his crest. Cesi's use of the microscope to observe bees was natural, since the instrument had been given to him by Galileo in the preceding year and was the kind of novelty which would appeal to the Lincei.

The *Apiarium* stands as the first published example of the early use of the microscope.¹⁰ The instrument was still a novelty and observations were made out of curiosity. The *Apiarium* did not make any startling contribution to what was then known about bees except that it described in a cursory manner their physical makeup. Stelluti's description of bees (1630) is written in much the same manner as Cesi's description, i.e., inserted as a matter of curiosity in a work oriented toward the classics. The *Apiarium* is important to the history of microscopy, however, because it is the first instance of the use of the microscope as an instrument of inquisitive observation.

NOTES AND LITERATURE CITED

⁹Giuseppe Gabrieli, "Federico Cesi Lincei," *Nuova antologia*, CCLXXII, serie VII (July-August, 1930), pp. 352-56.

¹⁰D. Baldassare Odescalchi, *Memorie istoriche critiche della Accademia dei 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. 13.

¹Gabrieli, pp. 359-60.

²Charles Singer, "The earliest figures of microscopic objects," *Endeavour*, XII (October, 1953), p. 198.

³Royal 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 Bibliographies of Original Authorities*, ed. Alfred A. Disney (London: Royal Microscopical Society, 1928), p. 88.

⁴Federico Cesi, *Apitarium ex Frontispiciis Naturalis Theatri principis Federici Caesii Lyncei S. Angeli et S. Poli princ. I. march. M. Caelli II. G. C. baron. Roman. depromptum, quo universa melificum familia ab suis prae-generibus derivata in suas species ac differentias distributa in physicum conspectum addicitur* (Rome: Ex typographio Iacobi Mascardi, 1625).

⁵Gabrieli, p. 361.

⁶R. Morghen, "The Academy of the Lincei and Galileo Galilei," *Cahiers d'histoire mondiale*, VII, pt. 2 (1963), pp. 376-77.

⁷Persius Flaccus, *Persio tradotto in verso sciolto e dichiarato de Francesco Stelluti, acad. Linceo da Fabriano all'ill^{mo} et r^{mo} Sig^o il sig. Cardinale Barberino* (Rome: Appresso Giacom^o Mascardi, 1630), p. 47.

⁸Singer, p. 197.
