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Microscopic Musings: Athanasius Kircher and the Roman Plague of 1656–57

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Athanasius Kircher, *Scrutinium physico-medicum contagiosae luis, qui pestis dicatur* (Typis Maseardi: Romae, 1658).

Francis A. Countway Library of Medicine, Rare Books, RC171 .K63 c.1.

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What does the blood of plague-infected bodies look like under a microscope? Since Alexandre Yersin's and Kitasato Shibasaburō's simultaneous discovery of the plague bacillus in Hong Kong in 1894, we have a very specific answer to this question because we already know what to look for: a rod-shaped anaerobic microorganism known as *Yersinia pestis*. Photographs show us what this virulent bacillus looks like in blood and tissue samples examined in the laboratory with high-powered instruments. The bacteriological understanding of plague made the late 19th-century microscope an instrument of revelation.¹ It showed us a microbe invisible to the naked eye. This important discovery makes it hard for us to imagine looking through a microscope and not seeing *Yersinia pestis*. The sciences of microbiology, bacteriology, and virology and the emergence of germ theory all inform our modern understanding of plague, just as

antibiotics transformed a once untreatable disease with a high mortality rate into a relatively rare but serious occurrence that we have a good chance of surviving. The microscope, however, was not invented by modern scientists in white laboratory coats but emerged in the 17th century when plague was a recurrent epidemic disease with no known cure. What did the first generation of experimenters to use this new and imperfect instrument think it might do for them? How did it shape their understanding of plague as an early modern contagion?

In 1653, the French physician and chemist Pierre Borel (ca. 1620–71) became the first person to describe blood under the microscope. “Animals in the shape of dolphins or whales swim in human blood as if in a red ocean.”² In the next few years, he observed more bodily fluids under the microscope. “In anatomy many things can be observed with the microscope, namely, the white corpuscles in serum and chyle which are not found in urine, the valves of the pores, vessels and veins, etc.”³

Borel published 100 observations with his microscope in 1656. He investigated tiny animals in the human nose and a variety of ailments—the intensely itchy red skin of scabies, gonorrhea’s discharge, and the pustules (*variolae*) symptomatic of highly contagious and often fatal diseases that produced skin eruptions. He continued to examine blood under the microscope. “Furthermore, it is reported as a certainty that worms have been found in the blood of feverish patients.” Borel concluded that the microscope was potentially useful “in observing the signs of sickness.”⁴ By identifying otherwise invisible symptoms, physicians could diagnosis more quickly. Borel never specifically mentioned plague, but his curiosity about pustules and fevers suggests an interest in understanding some of its classic symptoms with the aid of a microscope.

Galileo initially envisioned the microscope as a reverse telescope with a convex and concave lens. In 1610, the Scottish medical student and mathematician John Wedderburn described Galileo examining the parts of tiny animals “with a small perspective glass” (*ex perspicillo*) in Padua. Galileo subsequently described the potential uses of “a telescope adapted to see the closest objects” in *The Assayer* (1623).⁵ Around 1620, the Dutch inventor Cornelis Drebbel decided to create his version of a compound microscope with two convex lenses, polishing them finely using a glass-grinding machine of his own invention. When Galileo came to Rome in April 1624, there were two examples of the Dutch microscope in Cardinal Scipione Cobelluzzi’s possession and one wasn’t working. Galileo examined it carefully and incorporated what he learned into a redesign of his own microscope. In May 1624, Galileo was already boasting of “an eyeglass that multiplies these minute things perhaps 50,000 times, in such a way that a fly appears as big as a hen.”⁶

Less than a year later, the German physician and naturalist Johan Faber, who observed a fly with Galileo to his great astonishment, decided to call it a “microscope.”⁷ Like Galileo, Faber was a member of the Accademia de’ Lincei, the Roman scientific academy founded by Federico Cesi in 1603. Eager to demonstrate what this new instrument could do, in 1625

the Linceans published some microscopic illustrations of the bee. Faber described the new “microscope” (*microscopium*) in print in 1628, describing Galileo’s version but especially praising the one “made with great skill and craft by two Germans who brought it to my house and presented it to me.”⁸ Their microscope was inspired by Kepler’s improvements on the telescope and initially showed images in reverse. Drebbel was working with the Kuffler brothers, Dutch artisans from Faber’s native Cologne. Giles and Johannes Sibertus (a Padua MD) presented the microscope to Faber after their brother Jacob died of plague in Rome in November 1622.⁹ This is why he considered it a German invention.

For the next few years, Linceans between Rome and Naples discussed their improvements on the original instrument and tested its applications. Galileo’s interest quickly faded; he was not a naturalist by inclination and probably recognized the limits of his ability to compete with talented microscopists. After seeing one of the Kuffler brothers demonstrate their microscope in Naples in June 1625, the Lincean naturalist Fabio Colonna collaborated with the astronomer Francesca Fontana to create an even better compound microscope than the Dutch version. A year later, they had an instrument that resolved chromatic aberration “without the eye suffering any glare like that of the Cologne craftsmen” but it didn’t magnify much. They experimented with a much smaller version that “magnifies objects significantly” by showing them in reverse.¹⁰ Versions of these microscopes arrived in Rome along with new drawings of bees, full of detailed anatomical observations that no one could yet see in 1625. The Lincean Francesco Stelluti published three drawings of the bee seen from three different positions, with many individual parts carefully labeled, in his 1630 translation of the Roman poet and satirist Persius. He described making his observations with Colonna and Fontana in Naples, and subsequently engraving Fontana’s drawings in Rome.¹¹

Thus by 1630, the year of a major plague outbreak in many parts of Italy, the microscope was an instrument that promised many new discoveries. Even Galileo’s longtime adversary, the Jesuit astronomer Christoph Scheiner, praised “that remarkable instrument the microscope” for making visible things “which escape the acuteness of the eye because of their extreme smallness.”¹² Cesi predicted that the microscope would yield further discoveries with time, knowledge, and skill. “There are still other much smaller things yet, which escape and elude even the sharpest of instruments constructed by us.”¹³ What his generation began, others would complete. In 1646, Fontana boldly claimed to have invented the compound microscope in 1618, citing his 1625 observations as proof of his priority. No one was persuaded that the glory belonged to him alone. Fontana observed different insects, grains of sand, and dust, but the medical, let alone epidemiological uses of the microscope were not yet of interest.¹⁴

The idea of studying plague under the microscope emerged in Rome in the mid-17th century when the German Jesuit polymath, Athanasius Kircher (1602–80)—a reader of Fontana, Scheiner, and the Lincean publications using the microscope—decided to put this instrument to the test during an epidemic.¹⁵ Countway Medical Library’s two copies of the

original edition of Kircher's *Scrutinium physico-medicum contagiosae luis, qui pestis dicatur* (Physico-Medical Examination of the Contagious Pestilence Called the Plague, Rome, 1658), one owned by Würzburg physician and medical historian Johann Baptist Scharold (1802–82), the other by Harvard embryologist and medical professor Frederic Thomas Lewis (1875–1951), who helped create the Ernst-Lewis Collection of Microscopes, reminds us how 19th and 20th-century physicians collected historical materials that they perceived to be foundational to a modern understanding of science and medicine.¹⁶ The reality of Kircher's plague book is far more complicated and therefore much more interesting. Kircher was no baroque bacteriologist, but he certainly was the first person to wonder what the blood of plague victims looked like, examine it under a microscope, and publish the results.

Plague in the Eternal City

At the beginning of 1658, Athanasius Kircher brought to conclusion a treatise that he completed while the experience of the Roman plague of 1656–57 was still fresh in everyone's memory. Kircher's *Examination of Plague* (fig. 1) was one of many publications to emerge from an epidemic which killed approximately 9500 inhabitants of the Eternal City, about 8% of the overall population.¹⁷ Divided into three parts, it described the origins, causes, and effects; the nature of plague and the course of this disease; and prophylactics, preventive measures, and the potential for a cure. It was both a local chronicle of an epidemic and a global history of plague. Kircher concluded his treatise with a chronology of noteworthy plagues since the Flood, demonstrating his interest in history and antiquity.

The *Examination of Plague* represents Kircher's only foray into a medical subject of pressing interest during a century in which major outbreaks of plague devastated many cities throughout western Europe, Britain, and the Ottoman empire.¹⁸ Dedicated to Alexander VII (Fabio Chigi, 1655–67) who became pope the year before plague returned to Rome, Kircher's *Examination of Plague* was the first plague treatise to base its conclusions on the use of a microscope.¹⁹ The majority of his analysis did not rest on this fact. Kircher synthesized a great deal of information from earlier accounts of plague, disease, and contagion, conversations with physicians and surgeons, and his own research on the unseen causes of natural phenomena, natural and diabolic magic, alchemy and transmutation, and astral influences. As a result, the *Examination of Plague* is a curious and contradictory work, full of observations and insights, attempting to do something new yet deeply invested in traditional ways of understanding the mysterious pathways of a devastating disease.

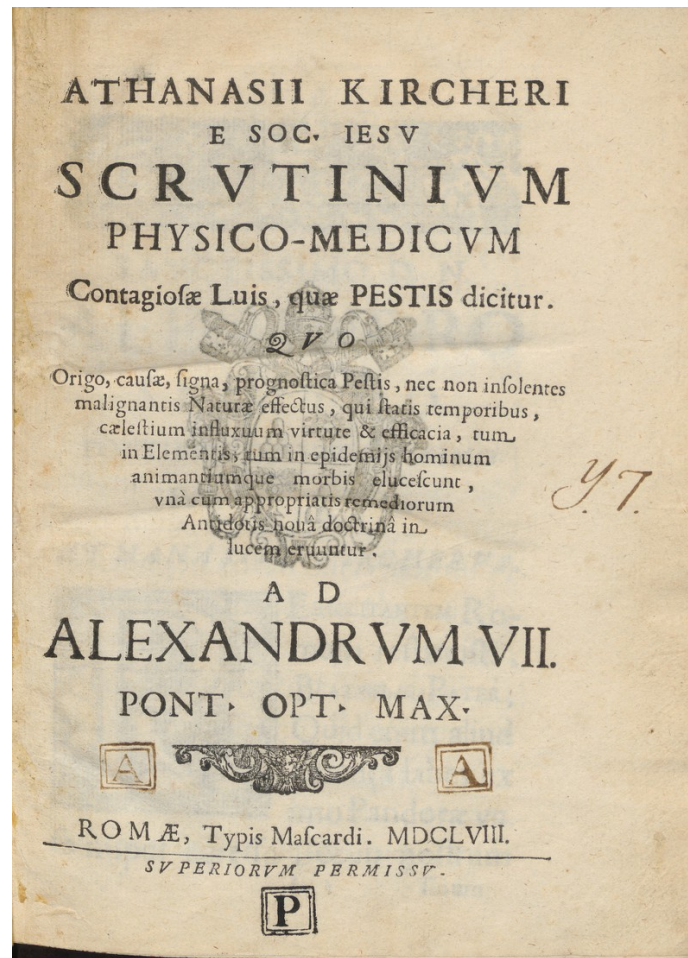


Figure 1. Title page, Athanasius Kircher's *Examination of Plague*, written at the end of the 1656–57 Roman epidemic. Countway Library, Harvard University.

Roman publishing was a very intimate world. Vitale Mascardi, the Roman publisher who produced the *Examination of Plague*, was nephew and heir of Giacomo Mascardi, who printed Cesi's, Faber's, and Stelluti's broadsheets and books in which they described their microscopic research.²⁰ Vitale's shop was on the Corso, near the church of Santa Maria in Via Lata and a stone's throw from the Roman College, the main educational institution of the Society of Jesus. Kircher taught mathematics and Oriental languages at the Roman College in the early years after his arrival in Rome in 1634 until his celebrity led his superiors to release him from formal instruction to devote more time to his research and numerous publications; he inaugurated the Roman College Museum in 1651, full of natural and ethnographic curiosities and many intriguing instruments and machines. Mascardi had already produced Kircher's *Oedipus Aegyptiacus* (Egyptian Oedipus, 1652–55), the third edition of his *Magnes sive de arte magnetica* (Lodestone or the Magnetic Art, 1654), and other Roman plague treatises. He was a publisher of convenience though not the only Roman publisher Kircher used; in 1661, Kircher decided to publish in Amsterdam with

Johannes Janssonius to reach a more international market, but his plague book was initially a very Roman project.²¹

In May 1656, plague arrived in Rome from the south where an epidemic was devastating the Kingdom of Naples. Kircher described the Neapolitan outbreak as the “most dreadful and unheralded plague in all the centuries,” writing that it claimed “about 300,000” lives.²² Current estimates suggest that it was closer to 200,000, approximately half of Naples’s inhabitants.²³ Rome was on full alert. The “pestilential Hydra” came through the many different arteries connecting these two adjacent states: the ports of Nettuno and Civitavecchia, the Roman Campagna, the customhouse at Ripa, the poor neighborhoods along the Tiber, and the Roman hospitals.²⁴ The pope was determined not to have Rome suffer the fate of Naples. On May 21, the Health Commission headed by Monsignor Girolamo Gastaldi closed eight of the city’s twelve gates, ordered chains stretched across the Tiber to prevent ships from entering, and suspended trade with Naples.²⁵ They created a *cordon sanitaire*, temporarily closing the city off from the rest of the world.

To further contain the spread of contagion within the city, on June 23, 1656, a dramatic decision was made to quarantine Trastevere, the working-class neighbor of artisans and immigrants along the Tiber. In less than a day, the Congregation of Health sealed all the gates, alleys, and windows and built a wall isolating this neighborhood from the rest of Rome. Trastevere’s approximately 6,000 inhabitants were now shut in and Cardinal Francesco Barberini was put in charge of this district. The Roman College was also put under quarantine that day since students had begun to show symptoms and two coadjutors (assistants assigned to the students) died.²⁶ On July 18, the Roman ghetto was also placed under quarantine. Numerous other public health measures were enacted—Gastaldi retrospectively published 260 regulations related to this outbreak.²⁷ The entire Isola Tibertina, the island at the southern bend of the Tiber near Trastevere, became a public health zone, temporarily housing the *lazaretto* (plague hospital) of San Bartolomeo and using its other buildings to accommodate those suspected of plague or recovering from it. It was not the only pesthouse—throughout the city and just beyond the walls, churches, monasteries, hospitals, and prisons were repurposed to meet the needs of a city in crisis (see fig. 2). At the height of the epidemic, an open tent near the hospital of Santo Spirito, just a stone’s throw from St Peter’s, accommodated plague victims. Roman printers, artists, and engravers rushed to depict the city’s transformation making the 1656–57 outbreak one of the most well-documented plague epidemics.²⁸

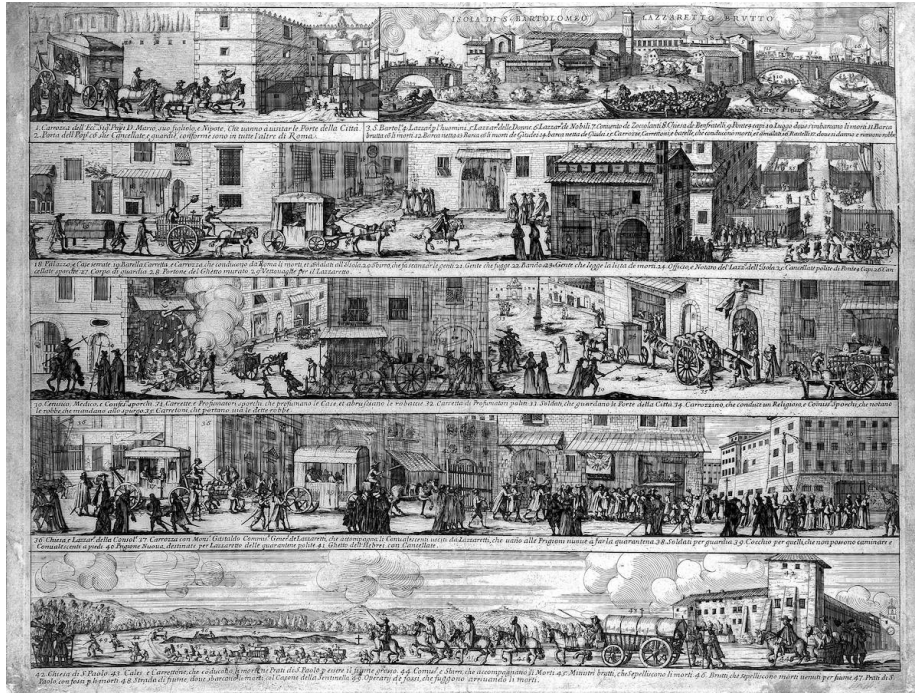


Figure 2. Rome Under Quarantine, 1656–57. Giovanni Giacomo de Rossi, Episodes in the Plague of Rome, 1656 (Rome, 1657), Wellcome Collection/CC BY 4.0.

Many Roman aristocrats fled the city to more salubrious locations such as the Castelli Romani, the fertile volcanic hill towns south of the city. Queen Christina of Sweden, who arrived in Rome to great fanfare in December 1655 after her abdication of her throne and conversion from Lutheranism to Roman Catholicism, had Kircher show her the curiosities of the Roman College Museum, then hastily decamped for Paris. Others were not so fortunate. Plague “struck down important people and reduced places to solitude,” observed the Roman virtuoso Cassiano dal Pozzo in October 1656; he would die in his home on Via dei Chiavari at the end of the epidemic.²⁹ Both Poussin and Bernini lost relatives; even Donna Olimpia Pamphili, the formidable sister-in-law of the previous pope Innocent X, died at her country estate near Viterbo in September 1657. The pope remained in Rome but took all due precautions. Alexander VII retreated to the Quirinale with his inner circle of advisors, artists, and architects, occasionally descending from the palace to bless the city and its inhabitants, in a papal plague suit and hat treated with French prophylactic powder just in case God alone did not keep him free from contagion. Kircher credited the pope’s “piety, prudence, and incredible care and solicitude” as the reason why the Eternal City did not suffer the fate of Naples.³⁰ Alexander VII became the Hercules who slayed the hydra of disease, liberating Rome from plague in August 1657 and subsequently transforming the Eternal City into a glittering cultural capital.³¹

Curiosity and Faith Under Quarantine

Locked inside the Roman College, Kircher contemplated the “grim silence of the city.”³² He found himself unable to carry on business as usual while “a ferocious plague ruled the entire city.”³³ The visitors who normally took up so much of his time, eager to see the Roman College Museum, had gone away. Kircher’s numerous projects and publications, which earned him great fame as an author capable of unlocking nature’s secrets and solving ancient mysteries of civilizations past, no longer seemed urgent. The steady flow of letters arriving from the four corners of the world, full of erudite questions demanding learned responses and news of his latest books, slowed to a trickle.

On July 20, 1657, responding to a correspondent who had sent a letter in February, Kircher explained how impossible it was to receive communications during quarantine with “every road to the city barricaded” and all commerce suspended.³⁴ People also worried that letters were contagious. In his *Examination of Plague*, Kircher wrote that mail “contained plague in its innermost fiber for a long time.”³⁵ Soaking it in vinegar or fumigating with smoke might quell contagion but he recalled the chemical physician Jan Baptista van Helmont’s warning that touching infected letters with your fingers posed a great risk. It was best not to open the mail, even if it managed to circumvent quarantine.

When plague arrived, Kircher had just completed the *Itinerarium ecstaticum* (Ecstatic Voyage). Mascardi printed it early in quarantine, with an effusive dedication to Queen Christina dated June 1, 1656.³⁶ Kircher was writing his *Mundus subterraneus* (Subterranean World, 1664–65), an ambitious account of the nature and workings of the geocosm. Uncertain when it would be completed, Kircher had Mascardi publish a preview—the *Iter extaticum II qui & mundi subterranei prodromus dicitur* (Second Ecstatic Voyage that is Called Forerunner to the Subterranean World, 1657). Once this was done, he stepped back to reflect on how quickly and dramatically his world had changed because of plague. By 1657, Kircher found himself in an unusually contemplative mode, practicing Ignatian spiritual exercises during an epidemic: “isolated from a fair number of my usual learned subjects, I passed into the deepest recess of solitude in which now, a little while ago, I conceived in my mind the topic of the origin of plague, indeed, I will try to explain it with active and useful effort.”³⁷ The idea of researching and writing a plague treatise, as a response to this moment, began to take shape.

God may have illuminated the path forward, but conversations with Roman physicians and surgeons as well as Kircher’s own intellectual interests guided the next steps. From the relative safety of the Roman College, Kircher observed the challenges medical practitioners faced and their perplexity in understanding the causes of plague. If medicine alone did not provide answers, could a man of faith and science offer something more? Kircher’s reputation for deciphering the indecipherable made him a natural consultant during an epidemic in which no one had certain answers. “Everyone sought out my

judgment, however feeble, of the true cause of the plague,” he declared.³⁸ His response was to mobilize different aspects of his research to explain why plague was such a highly contagious and seemingly inscrutable disease, making its unseen pathways visible. The natural more than the supernatural interested him. Thus, in 1657, Kircher temporarily became a disease detective, using all the tools he could muster to decipher plague.³⁹

At the height of the epidemic, Kircher was largely a bystander. He was not among the clerics tending the sick poor. The Society of Jesus began as an urban ministry in Rome, with Loyola recommending that novices test their vocation in the city’s hospitals, but the growth of its educational mission led the late 16th-century Jesuit leadership to encourage sending most Jesuits and their students out of the city, leaving only a few behind to safeguard the buildings in a self-imposed quarantine. Flight was permissible if you were a Jesuit. Even the 1605 beatification of Luigi Gonzaga, who died in his quarters at the Roman College in 1591 after tending plague victims during the 1590–91 outbreak and whose remains were venerated (leading to his canonization in 1726 and modern role as the patron saint of AIDS victims and caregivers), did not inspire the Jesuits to see caring for the sick as their primary mission.⁴⁰ They had been reluctant to let Gonzaga risk his life and prohibited him from returning to the pesthouse where the danger was greatest. Little wonder that Camillo de Lellis, who studied at the Roman College, ultimately founded the Ministers of the Sick (more commonly known as the Camillans), approved by Gregory XV in 1591, to ensure that there was a religious order devoted exclusively to the sick poor. He too was canonized, in 1746.⁴¹

Since neither became a saint in Kircher’s lifetime, he could not advise readers to ask for their merciful intercession. Nonetheless, his chronology of plague outbreaks included an entry for 1591: “The plague of Rome that emerged from a famine killed 60,000 people.”⁴² Kircher recommended prayers to Mary and well-known plague saints, Sebastian, Roche, and Rosalia. Saint Rosalia’s bones were carried in procession through the streets of Palermo during the 1624 outbreak and her healing miracles were recently invoked during COVID-19.⁴³ During the Roman epidemic, Cardinal Francesco Barberini commissioned a high altarpiece of Saint Roche for the Ripa district. In 1656, Prince Maffeo Barberini asked Carlo Maratti to create a painting of *Saint Rosalia interceding for victims of the plague in Palestrina*, which the artist completed in 1668.⁴⁴ Kircher demonstrated an awareness of the local importance of Saint Rosalia as her thaumaturgic powers spread beyond Sicily to the Eternal City.

Kircher also encouraged people to pray to the recently canonized Jesuit saints, Ignatius of Loyola and Francis Xavier, and to Saint Carlo Borromeo. During the 1575–76 plague epidemic in Milan, Borromeo had been critical of Jesuit priorities yet he famously gave Gonzaga first communion and surely inspired him to test his faith by tending to plague victims.⁴⁵ The Society actively promoted Borromeo’s cult but also defended their acts of charity during the 1656–57 plague by publishing a detailed account of all the Jesuits in the Neapolitan and Roman provinces who died assisting others.⁴⁶ It was not a long list for

Rome but nonetheless an opportunity to make the case that some Jesuits left the Roman College and the Casa Professa (the Jesuit residence next to the church of Il Gesù) to offer communion to the sick. Kircher surely knew all this when he encouraged readers to turn to other unnamed holy mediators. Countway Library's copy of his *Examination of Plague* reminds us of its religious uses as well. An inscription inside the front cover copies out the beginning of a prayer to Saint Ildefonso from the Roman Missal in a 17th-century hand (fig. 3). In 1657, some Roman Jesuits included this saint in their prayers.⁴⁷

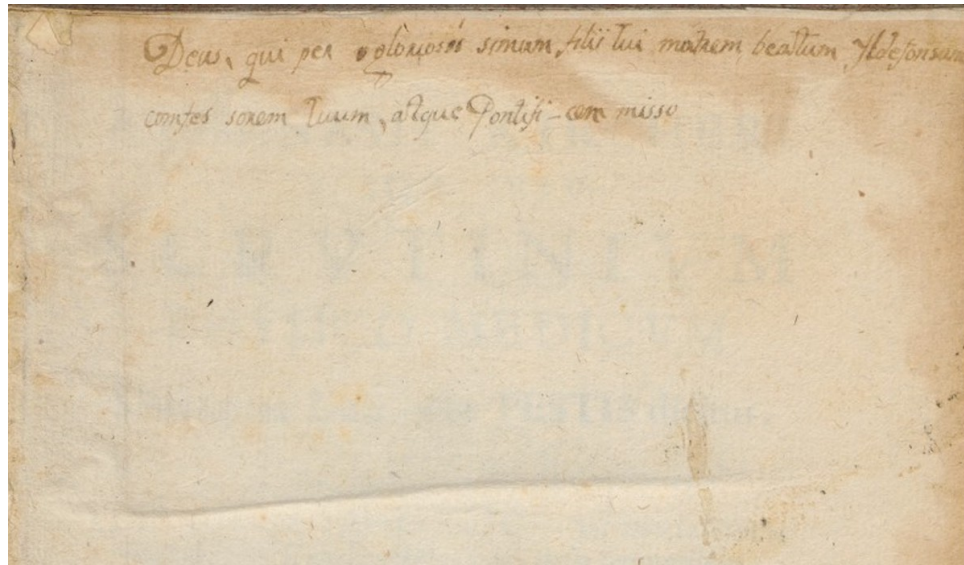


Figure 3. Prayer to Saint Ildefonso inside the cover of Kircher's *Examination of Plague*: "God, who by the most glorious mother of your son, adorned the blessed Ildefonso, your confessor and Pontiff, with a gift ...". Countway Library, Harvard University.

The Microscope in an Epidemic

The promise of science more than the certainty of faith intrigued Kircher as he contemplated plague. His plague treatise brought together many different strands of his research, starting with the role of the instrument that assisted his plague research. In his *Ars magna lucis et umbrae* (Great Art of Light and Shadow, 1646), Kircher described using a simple microscope—a gift from Cardinal Giovanni Carlo de' Medici—to magnify fleas, mites, and hair. He cited his fellow German Jesuit Scheiner and Fontana, who was closely affiliated with the Neapolitan Jesuits. Kircher included an image of his flea-glass (fig. 4), calling it a *Smicrocopium* so that he, too, could be credited with naming the instrument.

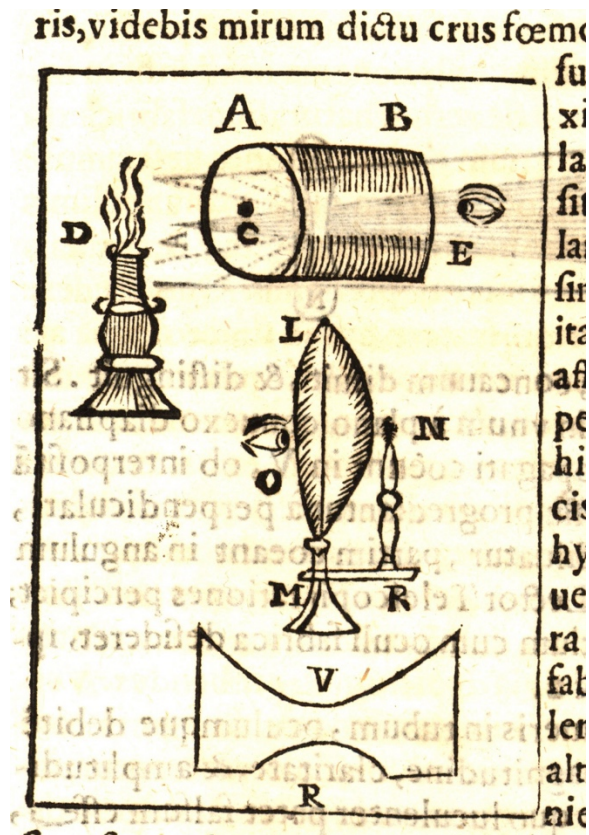


Figure 4. Kircher's simple microscope. Athanasius Kircher, *Ars magna lucis et umbrae* (Rome, 1646). Courtesy Special Collections, Stanford University Library.

Kircher's brief remarks on what to observe under the microscope offered nothing new in comparison with the observations done in the 1620s, save for one crucial comment. "I omit here many wonders ... in the verminous blood of the fever-ridden, and countless other things forever unknown to physicians and not penetrated by a single physician, that can now be known."⁴⁸

The Roman medical community surely inspired this idea. Kircher was already thinking about the medical uses of the microscope *before* Borel published his observations, which is why Borel cited Kircher's use of the microscope in his own observations and replicated some of his experiments.⁴⁹ In the decade before plague returned, Kircher was anticipating the future possibilities of the microscope as a diagnostic instrument.

In 1657, as plague assaulted Rome, Kircher's disciple Gaspar Schott published his own account of Kircher's early microscopic investigations from the Jesuit College at Würzburg. Describing the microscope as one of the greatest inventions of their century, Schott, who spent 1652–55 in Rome, recalled repeating these experiments with Kircher at the Roman College. "He saw these things not just once with the microscope, and showed others—fleas penetrated by other extremely small fleas that, one supposes, annoy them with their bite

and perhaps free them with their noxious blood, just as they do to us.”⁵⁰ Thus, by the time Kircher used the microscope to investigate plague, he prepared his readers to see it as a miraculous instrument capable of showing things inside and on the surface of the body that no one had previously seen.

Where did Kircher get his microscopes? Schott offered a plausible source when he wrote: “Eustachio Divini makes a most excellent microscope of this kind in Rome, now cited frequently by me above.”⁵¹ Divini established a workshop near Piazza Navona around 1646 and became Rome’s foremost instrument-maker. He was renowned for his association with the Roman Galileans and probably trained his younger rival, Giuseppe Campani, who arrived in Rome in the early 1650s; Campani and his elder brother Matteo enjoyed an international reputation for their knowledge of optics and precision lenses but did not make microscopes until about 1660.⁵² Both competed for Alexander VII’s patronage. One of them created an undated handwritten sheet of instructions for the pope on how to use the microscope with carefully labelled illustrations to demonstrate how to adjust the lenses for different magnifications. The highest resolution “will serve for objects imperceptible to the eye.”⁵³ It is tempting to envision the pope sharing Kircher’s curiosity about plague under the microscope.

The microscope that Kircher used in 1657 may have more closely resembled the ones depicted by another Jesuit, Filippo Buonanni, in his catalogue of the *Musaeum Kircherianum* (1709). Buonanni restored the Roman College collection after becoming its second curator in 1698 (fig. 5). Whether a screw barrel design, or a series of nested tubes, Kircher’s plague microscope was certainly compound. Kircher claimed it could magnify 1,000x—a virtual impossibility but since Divini declared only a few years later that his microscopes enlarged the smallest things “many thousands of times,” he was not the only scholar prone to exaggeration!⁵⁴ Historians of this instrument feel that it was closer to 32x.⁵⁵ Certainly large enough to see *something* but what exactly? The only thing we know for certain is that he did not see the *Yersinia pestis* bacillus, which awaited the laboratory revolution in medicine and higher resolution microscopes at the end of the 19th century.⁵⁶

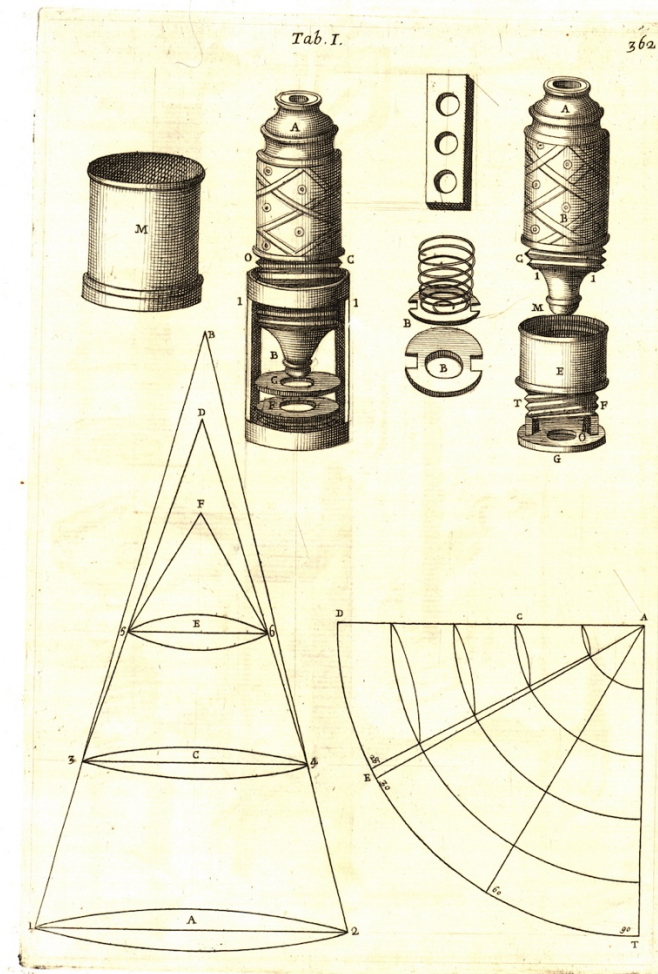


Figure 5. Compound Microscopes in the Kircherian Museum. Filippo Buonanni, *Musaeum Kircherianum sive Musaeum a P. Athanasio Kirchero in Collegio Romano Societatis Jesu* (Rome, 1709). Courtesy of Special Collections, Stanford University Library.

Kircher confidently presented six “conclusive experiments” (*experimenta consecutaria*) performed with a microscope. He attributed his success in seeing the invisible not only to the precision of the instrument but his skill in using it. “However, do not suppose that the microscope must be common, but carefully made by an accurate and skillful hand; mine is the kind that represents objects a thousand times greater than they are in themselves.”⁵⁷ Five experiments involved no direct observations of pestilential matter but offered experimental proof of the spontaneous generation of insects and small worms invisible to the naked eye, just as ancient authors such as Aristotle and Pliny had written; the sixth raised the possibility of the human body as a site of spontaneous generation. “Truly, a dead body foul with decay is a breeding ground for worms.”⁵⁸ The presence of microscopic organisms became the proof that corruption of matter occurred, allowing researchers to pinpoint the sources of contagion.

In order to put plague under the microscope, Kircher needed access to the effluvia from plague-infected bodies. “I confess that I am not a physician,” he reminded his readers.⁵⁹ The answer was to collaborate with a physician, Giulio Piacenti, who was indeed on the streets and in the hospitals trying to care for patients. Piacenti’s name appears on an October 1656 list of physicians in Rome, stating that he was posted “past the Chiavica del Bufalo,” in other words, near one of the city’s main sewers.⁶⁰ Describing “the dissection of a bubo swarming with countless miniscule worms breeding,” Kircher praised Piacenti’s skill as a physician and presented him as a witness who could corroborate these observations.⁶¹ Piacenti is also the likely source of the “putrid blood” Kircher observed with his microscope about an hour after bloodletting, declaring it to be equally crowded with worms. He underscored the importance of seeing things “before and after death.”⁶² Thus, it does seem that Kircher eventually exited the Roman College as the epidemic waned, primarily to collect samples for his experimental observations. Whether he was wearing his own version of the baroque hazmat suit that this epidemic made famous with its engraving of the Roman plague doctor (fig. 6)⁶³ is anybody’s guess.



Figure 6. “Doctor Beak of Rome” or the Roman Plague Doctor, 1656. [Public domain via Wikimedia Commons.](#)

Kircher's explanation of plague drew upon a Christian theology of sin and penitence, Hippocratic understanding of disease and environment, Galen's account of poisons and their antidotes, and Paracelsian chemical medicine, which discarded the humoral notion that the cure must be the antithesis of the disease, instead emphasizing the role of sympathies rather than antipathies.⁶⁴ Kircher reminded his readers that he had fully explored the unseen forces of attraction at a distance in nature in his work on magnetism; he referred to his earlier explanations of tarantism, the Apulian dance reputed to cure the tarantula's bite.⁶⁵ Citing his *Ecstatic Journey* to remind readers of his recent (if controversial) work on astronomy, Kircher reiterated the classic distinction between immediate physical causes and remote causes such as divine providence and the heavens. The poisons, pollutions, and exhalations of the earth and its ability to spontaneously generate living things made excellent use of his research towards the *Subterranean World*. He also used his microscope to examine spontaneously generated creatures and the corruption of matter in this publication. Ultimately, Kircher sought to demonstrate why a multifaceted approach to an awful and unknowable disease might eventually yield interesting answers.

Kircher did not believe that the imagination could conjure up plague, though he warned about the power of fear to render people susceptible to disease. He disabused his readers from thinking that magic (or really much of anything) might offer a cure, citing his extensive knowledge of Egyptian amulets in his *Egyptian Oedipus*. Kircher reproduced a "superstitious amulet" that he roundly condemned and provided readers with a virtuoso demonstration of his skill at deciphering a pestilential cryptogram (fig. 7).⁶⁶ He was skeptical of promethean efforts to control the supernatural and eager to debunk their false premises.⁶⁷

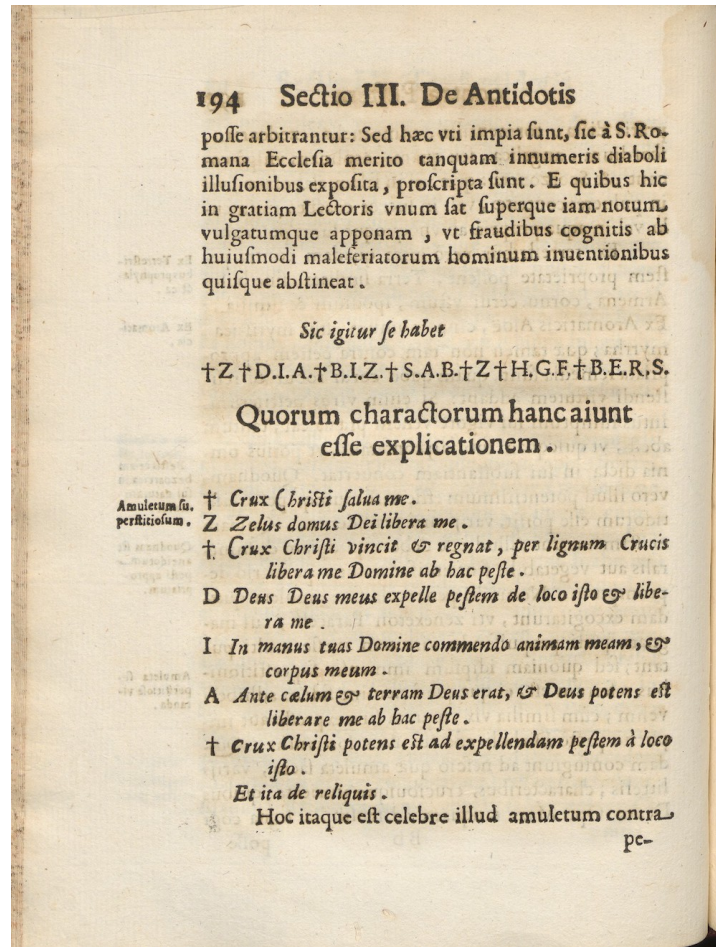


Figure 7. Kircher deciphers a plague amulet. Countway Library, Harvard University.

Instead, Kircher warmly endorsed the toad amulets worn by physicians and priests in the lazaretto as the best preventive because the rough skin of the toad resembled that of plague victims, making it a sympathetic cure.⁶⁸ This was natural, not diabolic, magic. On July 22, 1656, the young priest Gregorio Barbarigo, assigned to monitor public health in Trastevere, had a conversation with Kircher about where to procure toad pills.⁶⁹ Kircher gave him the name of a Venetian physician also known for his viper's powder, suggesting that Roman supplies of the most desirable prophylactics were running low. The physician and surgeon working with Barbarigo to police public health died the next week, so his request was a matter of real urgency.⁷⁰ Kircher was indeed a good source of information about plague medicines due to his broad network of acquaintances. Their exchange reminds us that Kircher was not under strict quarantine; he was having conversations with a young priest, who rose high to become a cardinal and bishop of Padua (and ultimately a saint in 1960, though not for doing his job during the Roman plague). Only one letter survives in Barbarigo's hand in Kircher's correspondence, written long after their encounter in the plague-ridden city, yet this was certainly a shared memory.⁷¹

Most importantly, Kircher offered his own contributions to the idea of contagion, a subject pioneered especially by the Renaissance physician Girolamo Fracastoro, whose work he curiously did not cite.⁷² Kircher was an enthusiastic reader of Lucretius' ancient philosophy of materialism and its Renaissance revival. The "seeds of plague" (*pestis semina*) were like tiny specks of dust, poisonous atoms or imperceptible corpuscles subtly entering the body through a variety of different sources that harbored the potential to activate disease under the right conditions. Heat and decay were essential to this process. Borrowing Fracastoro's word *fomites*, Kircher found himself searching for the tinder that ignited disease, transforming dormant substance into "living effluvia."⁷³ This is what he hoped to magnify to the point of visibility. He compared the effect to a serpent snaking its way through the body, spreading its poison. "Plague is, in general, a living thing," Kircher ominously proclaimed, emphasizing the way in which the sick and the dead often infected the healthy.⁷⁴ Rather like the voracious Demogorgon of *Stranger Things*, plague was "a slow, viscous malignant rot with a stench" that lived underground awaiting its opportunity to infiltrate the surface and ensnare a succession of human prey.⁷⁵ The best prophylactics absorbed and neutralized pestilential corruption, from the lowly garlic, vinegar, aromatic herbs and flowers, to elaborate recipes for making rose water, mineral and citrus oils, and especially toad pills.

Jesuit Censors and Medical Knowledge

Kircher's plague treatise was not without its critics. In May 1657, Jesuit censors initially refused to approve his book, citing his lack of medical credentials. In the preceding century, Saint Ignatius excluded medicine from the curriculum of the Jesuit colleges outlined in his *Constitutions*, as a subject peripheral to the central mission of the Society of Jesus.⁷⁶ Jesuits produced some vernacular plague treatises in 1577, but they were overwhelmingly concerned with spiritual measures to combat disease rather than plague science.⁷⁷ Two of the three censors, François le Roy and François Duneau, were unequivocal in their jointly-authored condemnation of Kircher's *Examination of Plague*. Despite his use of the microscope, they found few new insights "since the most part of the things contained in it are common and obvious enough."⁷⁸ They did not feel he was qualified to write on this subject. The third censor, Celidonio Arbizio, was more lenient. He approved the parts of the book dealing with natural philosophy, with some corrections, since they fell within Kircher's areas of expertise. Arbizio felt that if the medical portions "were examined and approved by some eminent physician," he would not object to their publication.⁷⁹

The Superior General Goswin Nickel encouraged Kircher to follow this advice. In summer 1657, Kircher collected effusive testimonials from three leading Roman physicians, Giovanni Benedetto Sinibaldi, Paolo Zacchia, and Girolamo Baldi, who were presumably less busy tending patients as the epidemic subsided. They appeared right after Kircher's preface to the reader, along with a reference to his consultation with a fourth physician, the English Catholic James Alban Gibbes, who was professor of rhetoric at La Sapienza.

Baldi's and Zacchia's testimonials still exist in manuscript in Rome, as a reminder of Kircher's eagerness to have his plague treatise published.⁸⁰ On July 23, 1657, all three censors approved the final version of Kircher's book; the Superior General Goswin Nickel authorized its publication on November 1, 1657.⁸¹

During the epidemic, Kircher managed to discuss the genesis of his plague treatise and the role of the microscope in understanding the nature of disease with the Dresden physician and alchemist August Hauptmann. In February 1657, Hauptmann sent a lengthy account of pathology research undertaken with other German colleagues. He shared a pamphlet he published in 1650 in which he used a microscope to explore whether all fevers were caused by tiny worms in the blood, in support of his hypothesis that living organisms within the body caused the death of the body itself.⁸² He recommended the Christian convert Pedro de Castro's recent book on malignant fevers to Kircher. Hauptmann expressed great enthusiasm for the medical potential of the microscope and included his own drawing of an itch mite, the parasitic organism that causes scabies (fig. 8).⁸³ This was the letter held up during the Roman quarantine and presumably fumigated with vinegar and smoke before delivery.

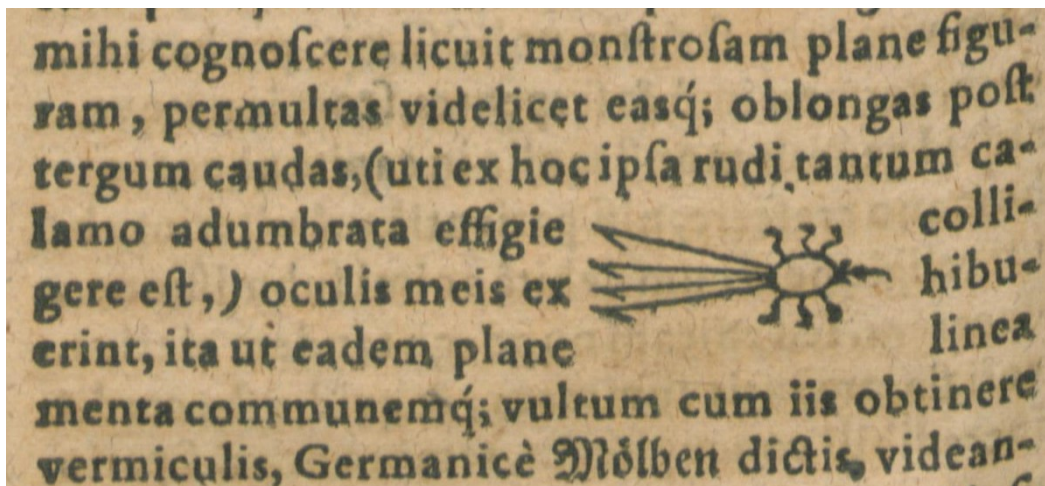


Figure 8. August Hauptmann's drawing of an itch-mite, sent to Kircher on February 28, 1657. Martin-Luther Universität Halle-Wittenberg, Universitäts- und Landesbibliothek Sachsen-Anhalt.

When Kircher was finally able to respond in July 1657, Hauptmann got a full preview of Kircher's work in progress, then just days from receiving the Jesuit censors' final approval for publication. He encouraged Kircher to complete his plague book and quickly published Kircher's response with his own letter, inserting them in his book on German mineral waters.⁸⁴ Hauptmann's effusive praise for the *Examination of Plague* when he received a copy in fall 1658 reminds us that not everyone was as skeptical of his efforts as the two critical Jesuit censors. Of course, Hauptmann was surely pleased to see his own work cited in Kircher's book!⁸⁵ There were indeed physicians beyond Rome wondering if Kircher

would make an important discovery. Kircher was enthralled with the potential of experimental philosophy. “It reveals new theaters of unknown truth in the present age,” he told Hauptmann with his characteristic enthusiasm.⁸⁶ He considered the microscope a tool of light to diminish the long shadow of human ignorance.

With the end of quarantine, Kircher fully resumed his correspondence. The *Examination of Plague* soon became part of his conversations with other scholars. The Bohemian physician Marcus Marci read it while traveling from Prague to Frankfurt in summer 1658. In Puebla, the Jesuit François Guillot (writing under his Spanish name Francisco Ximenes) was so thrilled to receive Kircher’s “book on plague” in 1661 that he sent a box of Mexican chocolate and chile peppers to Rome. The German medical community was by far the most enthusiastic, the English and French physicians more apt to be critical. Professors wrote that they were teaching Kircher’s *Examination of Plague* in Jena and replicating his observations with their own microscopes.⁸⁷ The Leipzig medical professor Christian Lange, who worked closely with Hauptmann, republished Kircher’s book in 1659 with a preface recommending it to his students. Two reprints appeared in Leipzig in 1671 and 1674, followed by a German translation by Lange’s son, Christian Johann in 1680.⁸⁸

In May 1664, the French physician, diplomat, and experimenter Balthasar de Monconys visited Kircher in Rome. He was very interested in scientific instruments, artisanal secrets, and medical recipes, writing extensively about them during his many years of traveling throughout western Europe and the Levant. Kircher was putting the finishing touches on his *Subterranean World* and generously shared his research with this curious and well-informed visitor from Lyon. Monconys learned how to generate flies in an hour by sprinkling powder of dried flies into rainwater. The mysteries of spontaneous generation figured prominently in their discussions; naturally this led to a conversation about Kircher’s recent plague research. “He told me that it has been tested that plague buboes were full of worms which the air is full of in the time of plague, but the majority are so small that one hardly sees them with the microscope, by means of which one sees the least small.”⁸⁹ Six years after the publication of his book, Kircher’s explanation of the boundary between the visible and the invisible shows him hedging his bets. He had a theory of contagion and corruption, and he had his microscopic observations. Putting the two together, however, still left some gaps in explanation.

During the 1660s Kircher was working primarily with his Amsterdam publisher Janssonius, expanding the audiences for his books. In 1669, Rotterdam publisher Abraham van Waesberge, a relative of Janssonius’ son-in-law, Johannes Janssonius van Waesberge, who ran the press with other family members after 1664, produced a Dutch translation of the *Examination of Plague*. It is the only edition of this book to have an illustrated title page presenting Kircher as a great interpreter of the Roman plague (fig. 9). When Gastaldi final compiled his monumental account of the Roman plague in 1684, he cited Kircher’s work approvingly.⁹⁰ The final Latin edition was printed in Augburg in 1740. By then the rest of the world had long forgotten Kircher’s plague treatise.



Figure 9. Kircher as Roman plague expert, 1669. Athanasius Kircher, *Naturelijke en geneeskonstige navorsching der peste* (Rotterdam, 1669). New York Academy of Medicine Library.

Microscopic Discoveries

What had Kircher seen under his microscope? Pus cells, possibly red blood cells or something else? This became a burning question—not in the 17th century but by the early 20th century when physicians began to search for the origins of germ theory and rediscovered the *Examination of Plague*.⁹¹ Exasperated by Kircher's excessively erudite and rhetorical style of writing, British physician and medical historian Charles Singer, who briefly worked as a pathologist in the Royal Army Medical Corps during World War One, nonetheless concluded the following about Kircher: "In his work on the Plague, however, he shows genuine insight, and gains a clear though distorted view of organisms of minute size acting as the vehicles of contagion."⁹²

Microscopic organisms only became more important, especially after the publication of Robert Hooke's *Micrographia* (1665).⁹³ In May 1684, the *Philosophical Transactions* published Antoni van Leeuwenhoek's observations of spittle, dental plaque, nose hairs, and cuticles under the microscope that he sent in a letter addressed to the Royal Society of London on September 17, 1683. For several years, the Dutch microscopist had been trying to see "if there be any Animals dispersed in our Body."⁹⁴ Diffusing his samples in rainwater, he saw numerous tiny creatures in motion that had previously been invisible even to this patient and astute observer, drawing bacteria for the first time (fig. 10). Leeuwenhoek also observed porous skin, leading him to consider "how a Louse, Flea, or other insect may thrust his sting or snout into the skin."⁹⁵ He did not yet connect these two observations to the transmission of disease.

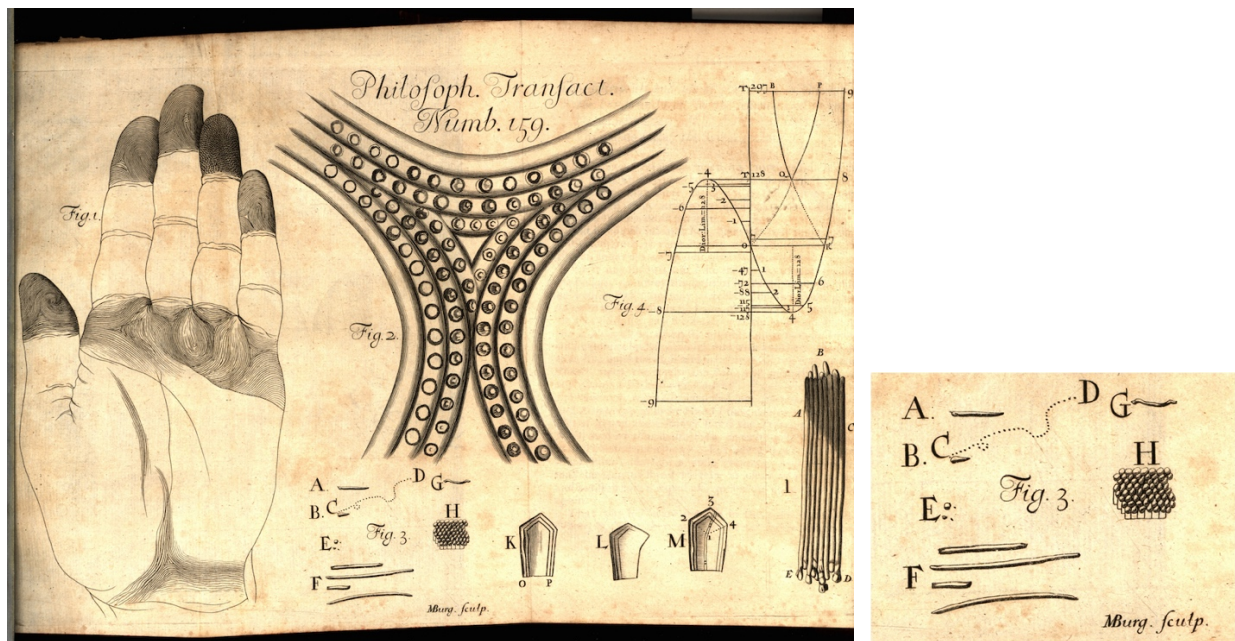


Figure 10a. Leeuwenhoek's drawings of bacteria from the human body. Figure 10b. Detail of bacteria. "An abstract of a Letter from Mr. Anthony Leeuwenhoeck at Delft...", Special Collections, Stanford University Library.

In Florence, the Medici court physician Francesco Redi, who famously debunked Kircher's ideas of spontaneous generation in his *Esperienze intorno alla generazione degli insetti* (Experiments on the Generation of Insects, 1668), was exploring the role of parasites in various illnesses. He published around a hundred observations of parasites in humans and animals in his *Osservazioni intorno agli animali viventi che si trovano negli animali viventi* (Observations on Living Animals Found within Living Animals, 1684), the same year that Leeuwenhoek's drawing appeared in print.⁹⁶ Redi was among the first physicians to begin to consider how to treat parasitic diseases and the microscope played a crucial role in these developments. Other researchers continued to observe blood. Marcello Malpighi, Jan

Swammerdam and his friend Leeuwenhoek described red blood cells during the late 1660s and 1670s. Leeuwenhoek finally illustrated them in 1695.⁹⁷

News of these microscopic discoveries arrived unevenly in different parts of the world. When Johann Zahn, canon of the Premonstratensian monastery of Oberzell near Würzburg, published his *Oculis artificialis teledioptricus sive Telescopium* (The Long-Distance Artificial Eye or Telescope, 1685), he had not yet absorbed Leeuwenhoek's numerous innovations. Kircher remained his primary authority on the nature and use of the microscope based on reading the *Great Art of Light and Shadow*, *Examination of Plague*, and *Subterranean World*; Zahn also cited Hauptmann's observations of gangrene in syphilitic patients.⁹⁸ By the time Zahn published his enlarged second edition in 1702, he gave priority to Leeuwenhoek's numerous important observations. Yet he still considered Jesuit microscopy important enough to include images of the Roman College Museum microscopes in a new appendix.⁹⁹

Inspired in no small part by Leeuwenhoek's discoveries with his handheld microscope, the Roman instrument-maker Giuseppe Campani presented a new compound microscope to the Accademia fisico-matematica, a Roman experimental academy founded in 1675. In the July 1686 issue of the *Acta eruditorum*, a Leipzig journal with an international readership, Campani advertised the medical uses of his microscope in a letter addressed to the Vatican librarian, Emanuel Schelstratenus (fig. 11).¹⁰⁰



Caption: Figure 11. Giuseppe Campani's compound microscopes designed for medical diagnosis. Special Collections, Stanford University Library.

Here we see someone explicitly using a small compound microscope to observe a lesion in a patient's leg illuminated by an assistant. A third observer holds a microscope in midair while an enlarged version sits upright on its stand. Campani encouraged physicians to think of the microscope as a truly versatile instrument. He cited the benefits of using a microscope to inspect "wounds and gashes" in the living body as well as the "the very smallest parts" of every limb and organ.¹⁰¹ One suspects that the papal physician Luca Riva used a Campani microscope to do his autopsy of Innocent XII on September 28, 1700.¹⁰² The 85-year-old pope did not die of plague, but the postmortem suggested that colon cancer probably contributed to his demise. Kircher certainly would have approved of this new use of the microscope.

Notes

Thanks to Hannah Marcus and the anonymous reviewer for their suggestions for this final version and the students in my Age of Plague class in fall 2020 for inspiring discussions while I wrote this essay. I also want to thank Jeff Streed at The Episcopal School (Alexandria, VA) for introducing me to Wayne Holman's remarkable collection of Kircheriana and the joys of translating Kircher with high school Latin students, including the *Scrutinium*, which was a project of his former student Yeji Kim. One section of my own excerpted translation has benefited from consulting hers.

¹ Andrew Cunningham, "Transforming Plague: The Laboratory and the Identity of Infectious Disease," in *The Laboratory Revolution in Medicine*, ed. Cunningham and Perry Williams (Cambridge: Cambridge University Press, 1992), 209–44.

² Pierre Borel, *Historiarum et observationum medico-physicarum Centuria IV* (Paris, 1657 ed.; 1653), 198; see Didier Foucault, *Pierre Borel médecin et savant castrais du XVII^e siècle: textes choisis*, trans. Jean Golfín and Foucault, *Cahiers d'histoire du Centre d'étude d'histoire de la médecine de Toulouse*, 7 (Toulouse: Pierre-C. Lile, 1999).

³ Borel, *Observationum microscopicarum centuria* (The Hague, 1656), 36. This book was published with *De vero telescopii inventore, cum breve omnium conspiciendorum historia* (The Hague, 1655), separately paginated.

⁴ Borel, *Observationum microscopicarum centuria*, 8, 16–17, 20–21, 29, 36 (quotation on 8, 38).

⁵ John Wedderburn, *Quatuor problematum quae Martinus Horky contra Nuntium sidereum de quatuor planetis novis disputanda proposuit. Confutatio* (Padua, 1610), 7; Galileo Galilei, *Il saggiaiore* (Rome, 1623), 105. See Gilberto Govi, "Il microscopio composto inventato da Galileo," *Atti della Reale Accademia di scienze fisiche e matematiche*, ser. 2, vol. 2 (1888): 1–3; and David Freedberg, *The Eye of the Lynx: Galileo, His Friends, and the Beginnings of Modern Natural History* (Chicago: University of Chicago Press, 2002), 153.

⁶ Govi, "Il microscopio," 3 (Girolamo Aleandro the Younger to Nicolas-Claude Fabri de Peiresc, Rome, May 24, 1642). Govi concludes that this was approximately 36x magnification.

⁷ Giuseppe Gabrieli, ed., *Il Carteggio linceo* (Rome: Accademia Nazionale dei Lincei, 1989), vol. 2, 1038 (Faber to Cesi, Rome, April 13, 1625).

⁸ Johan Faber, *Animalia Mexicana descriptionibus, scholiisque] exposita* (Rome, 1628), 473–74, 532 (quotation on 473). I have used the translation in Freedberg, *The Eye of the Lynx*, 183.

⁹ Govi, "Il microscopio," 21; Mauro Gargano, "Della Porta, Colonna and Fontana: The Role of Neapolitan Scientists in the Beginning of the Telescope Era," *Journal of Astronomical History and Heritage* 22, no. 1 (2019): 55.

¹⁰ Biblioteca Corsiniana, Rome, Archivio Linceo, Ms. 12, c. 71r (Colonna to Cesi, Naples, September 29, 1626); as quoted in Gargano, "Della Porta, Colonna and Fontana," 56.

- ¹¹ Francesco Stelluti, *Persio tradotto* (Rome, 1630), 47, 51–54 (illustration on 52).
- ¹² Christoph Scheiner, *Rosa Ursina sive sol ex admiranda facularum & macularum suarum phenomeno varius* (Bracciano, 1626–30), 130r; also discussed in Charles Singer, “Notes on the Early History of Microscopy,” *Proceedings of the Royal Society of Medicine* 7 (May 1, 1914): 263–64.
- ¹³ Cesi, *Apiarium* (Rome, 1625), as translated in Freedberg, *The Eye of the Lynx*, 180.
- ¹⁴ Francesco Fontana, *Novae coelestium terrestriumque rerum observationes* (Naples, 1646), 145–51.
- ¹⁵ For an introduction to Kircher, a good starting point is John Glassie, *A Man of Misconceptions: The Life of an Eccentric in an Age of Change* (New York: Riverhead Books, 2012), 158–69; and John Edward Fletcher, *A Study of the Life and Works of Athanasius Kircher, “Germanus Incredibilis”*, ed. Elizabeth Fletcher (Leiden: Brill, 2011). For an accessible account of Kircher’s *Scrutinium pestis*, see John Glassie, “‘Invisible Little Worms’: Athanasius Kircher’s Study of the Plague,” *Public Domain Review* (April 22, 2020), <https://publicdomainreview.org/essay/athanasius-kircher-study-of-the-plague>.
- ¹⁶ Countway has digitized RC 171.K63 c.1 (*Ex libris Frederic T. Lewis*); RC 171.K63 c.2 contains J. B. Scharold’s autograph. On the Ernst-Lewis Collection of Microscopes, see <http://waywiser.fas.harvard.edu/people/9207/ernstlewis-collection-of-microscopes>.
- ¹⁷ Eugenio Sonnino, “Cronache della peste a Roma. Notizie dal ghetto e lettere di Girolamo Gastaldi,” in *La peste a Roma (1656–1657)*, ed. Irene Fosi [special issue of *Roma moderna e contemporanea* 14, nos. 1–3 (2006)]: 35.
- ¹⁸ On plague in this era, see Carlo Cipolla, *Fighting the Plague in Seventeenth-Century Italy* (Madison: University of Wisconsin Press, 1971); Paul Slack, *The Impact of Plague in Tudor and Stuart England* (London: Routledge & Kegan Paul, 1985); and Nükhet Varlık, *Plague and Empire in the Early Modern Mediterranean World: The Ottoman Experience, 1347–1600* (Cambridge: Cambridge University Press, 2015).
- ¹⁹ The principal studies of the *Scrutinium* as a medical and scientific work are Harry Beal Torrey, “Athanasius Kircher and the Progress of Medicine,” *Osiris* 5 (1938): 246–75; Charles Edward Amory Winslow, *The Conquest of Epidemic Disease: A Chapter in the History of Ideas* (Madison: University of Wisconsin Press, 1980; 1943), 145–52; Luigi Belloni, “Athanasius Kircher: Seine Mikroskopie, die Animalcula und die Pestwürmer,” *Medizinhistorische Journal* 20/1–2 (1985): 58–65; Gerhard F. Strasser, “Science and Pseudo-Science: Athanasius Kircher’s *Mundus Subterraneus* and His *Scrutinium ... Pestis*,” in *Knowledge, Science, and Literature in Early Modern Germany*, ed. Gerhild Scholz Williams and Stephan K. Schinder (Chapel Hill: University of North Carolina Press, 1996), 219–40; Strasser, “Athanasius Kirchers Pestschrift von 1658 und seine Einstellung zur Lungenpest,” *Pneumologie* 59, no. 3 (2005): 213–17; Maria Conforti, “Peste a stampa. Trattati, relazioni e cronache a Roma nel 1656,” in Fosi, ed., *La peste a Roma*, 140–44; and Fletcher, *Study*, 105–28.
- ²⁰ Cesi’s *Apiarium* (1625), Faber’s *Animalia Mexicana* (1628) and Stelluti’s *Persio tradotto* (1630) were published “Ex Typographeio Iacobi Mascardi,” “Apud Iacobum Mascardum” and “Appresso Giac.^{mo} Mascardi.” Stelluti’s *Melissographia* (1625) was engraved by Mathias Greuter with no publisher indicated but it may well have been produced by Mascardi.
- ²¹ On the Mascardi family and their press, see Saverio Franchi, with Orietta Sartori, *Le impressioni sceniche. Dizionario bio-bibliografico degli editori e stampatori romani e laziali di testi drammatici e libretti per musica dal 1599 al 1800* (Rome: Edizioni di storia e letteratura, 1994–2002), 1:519–39, 2: 29. For Kircher’s relationship with Janssonius, see Daniel Stolzenberg, “The Holy Office in the Republic of Letters: Roman Censorship, Dutch Atlases, and the European Information Order, circa 1660,” *Isis* 110 (2019): 1–23, esp. 18–19.
- ²² Athanasius Kircher, *Scrutinium physico-medicum contagiosae luis, qui pestis dicatur* (Rome, 1658), n. p. (Proemium ad lectorem).
- ²³ Silvana D’Alessio, “On the Neapolitan Plague of 1656: Expedients and Remedies,” in *Disaster Narratives in Early Modern Naples: Politics, Communication and Culture*, ed. Domenico Cecere, Chiara De Caprio, Lorenza Gianfrancesco and Pasquale Palmieri, trans. Enrica Maria Ferrara (Rome: Viella, 2018), 187–204.
- ²⁴ Kircher, *Scrutinium pestis*, sig. ++2v. For more on this plague, see Fosi, ed., *La peste a Roma*; Eugenio Sonnino and Rosa Traina, “La peste del 1656–57 a Roma: organizzazione sanitaria e mortalità,” in *Demografia storica delle città italiane: Relazioni e comunicazioni presentate al Convegno tenuto ad Assisi nei giorni 27–29 ottobre 1980* (Bologna: CISP, 1982), 433–452; Alessandra Belardelli, “Il governo della peste: l’esperienza romana di 1656,” *Sanità scienza e storia* 1 (1987): 51–79; Giulia Calvi, “‘Dall’altrui comunicazione’: Comportamenti sociali in tempo di peste (Napoli, Roma, Genova 1656–57),” in *Popolazione, società e ambiente:*

temi di demografica storica italiana (secc XVII-XIX) (Bologna: CLUEB, 1990), 561–79; Guenter B. Risse, *Mending Bodies, Saving Souls: A History of Hospitals* (Oxford: Oxford University Press, 1999), 190–229; Rose Marie San Juan, *Rome: A City Out of Print* (Minneapolis: University of Minnesota Press, 2001), 219–54.

²⁵ San Juan, *Rome*, 228; Risse, *Mending Bodies, Saving Souls*, 191–92.

²⁶ Philippe Alagambe, with Jean Nadas, *Heroes et victime charitatis Societate Iesu seu catalogus eorum qui e Societate Iesu charitati animam devolverunt; ad id expositi, & immortui peste infectorum obsequio ex charitate, obedientiaque suscepto* (Rome, 1658), 548–49.

²⁷ Girolamo Gastaldi, *Tractatus de avertenda et profliganda peste politico-legalis* (Bologna, 1684); David Gentilcore, “Purging Filth: Plague and Responses to it in Rome, 1656–57,” in *Rome, Pollution and Propriety: Dirt, Disease and Hygiene in the Eternal City from Antiquity to Modernity*, ed. Mark Bradley, with Kenneth Stow (Cambridge: Cambridge University Press, 2012), 153–68.

²⁸ Ellen B. Wells, “Prints Commemorating the Rome, 1656 Plague Epidemic,” *Annali dell’Istituto e Museo di Storia della Scienza* 10 (1985): 15–21; San Juan, “The Contamination of the Modern City: Marketing Print in Rome during the Plague of 1656–57,” in Fosi, ed., *La peste a Roma*, 205–25.

²⁹ This section is based on Sheila Barker, “Art, Architecture, and the Roman Plague of 1656–57,” in Fosi, ed., *La peste a Roma*, 243–44 (quotation from Cassiano on 244).

³⁰ Kircher, *Scrutinium pestis*, n. p. (Proemium ad lectorem).

³¹ Richard Krautheimer, *The Rome of Alexander VII, 1655–1667* (Princeton: Princeton University Press, 1987).

³² Kircher, *Scrutinium pestis*, n. p. (Proemium ad lectorem). For a contextual understanding of this moment in Kircher’s life and work, see Fabio Troncarelli, “La paura dell’idra. Kircher e la peste di Roma,” in *Enciclopedia in Roma barocca: Athanasius Kircher e il Museo del Collegio Romano tra Wunderkammer e museo scientifico*, ed. Maristella Casciato, Maria Grazia Ianniello, and Maria Vitale (Venice: Marsilio, 1986), 139–50; Martha Baldwin, “Reverie in Time of Plague,” in *Athanasius Kircher: The Last Man Who Knew Everything*, ed. Paula Findlen (New York: Routledge, 2004), 63–77.

³³ August Hauptmann, *Unhrlater Wolckensteinescher Warmer Badt- un Wasser-Schatz* (Leipzig, 1657), 248 (Kircher to Hauptmann, Rome, July 20, 1657).

³⁴ Hauptmann, *Warmer Badt- un Wasser-Schatz*, 247 (Kircher to Hauptmann, Rome, July 20, 1657).

³⁵ Kircher, *Scrutinium pestis*, 154. For a later example of how to disinfect mail, see Giorgio Migliavacca, “La disinfezione delle lettere e le fedi di Sanità in Lombardia durante la peste del 1720,” *Il Nuovo Corriere filatelico* n. 42 (August 1982): 208–209. Thanks to Rachel Midura for this reference.

³⁶ Kircher, *Itinerarium extaticum* (Rome, 1656), sig. +3v (Ex Collegio Rom. Kal. Iunii 1656); Paula Findlen, “Un’incontro con Kircher a Roma,” in Eugenio Lo Sardo, ed., *Athanasius Kircher, S.J. Il Museo del mondo* (Rome: Edizioni De Luca, 2001), 39–48.

³⁷ Kircher, *Scrutinium pestis*, n. p. (Proemium ad lectorem).

³⁸ Kircher, *Scrutinium pestis*, n. p. (Proemium ad lectorem).

³⁹ I borrow this apt phrase from Jennifer Kahn, “The Disease Detective,” *New York Times* (June 3, 2021), <https://www.nytimes.com/2021/06/03/magazine/metagenomic-sequencing.html>. See also Berton Roueché, *The Medical Detectives* (New York: Time Books, 1980).

⁴⁰ A. Lynn Martin, *Plague? Jesuit Accounts of Epidemic Disease in the 16th Century* (Kirkville: Sixteenth Century Journal Publishers, 1996), 119–21; Virgil Cepari, S.J., *Life of S. Aloysius Gonzaga*, ed. and trans. Francis Goldi, S.J. (New York: Benziger Brothers, 1891). On the early Jesuit urban ministry, see Thomas M. Lucas, S.J., *Landmarking: City, Church and Jesuit Urban Strategy* (Chicago: Loyola Press, 1997), 85–105.

⁴¹ John Patrick Donnelly, S.J., “Camillus de Lellis (1540–1614), Patron Saint of Hospitals,” *The Linacre Quarterly* 78 (2011): 45–48.

⁴² Kircher, *Scrutinium pestis*, 251.

⁴³ Lorenzo Tondo, “Palermo Pins Hopes on Patron Saint to Rid Italy of Coronavirus,” *Guardian* (March 13, 2020), <https://www.theguardian.com/world/2020/mar/13/palermo-pins-hopes-patron-saint-rosalia-rid-italy-coronavirus>.

⁴⁴ Barker, “Art, Architecture and the Roman Plague,” 254; Giovanni Battista Fidanza, “Carlo Maratti and the Barberini Family: Two Paintings for Churches in Palestrina,” *Burlington Magazine* 159 (2017): 610–16.

⁴⁵ Kircher, *Scrutinium pestis*, 224. On Borromeo’s views of the Jesuits, see Martin, *Plague*, 175–85.

⁴⁶ Alagambe and Nadas, *Heroes et victime charitatis Societate Iesu*, 511–47 (Neapolitan province), 547–57 (Roman province).

- ⁴⁷ Alagambe and Nadas, *Heroes et victime charitatis Societate Iesu*, 557.
- ⁴⁸ Kircher, *Ars magna lucis et umbrae* (Rome, 1646), 834. See Torrey, "Athanasius Kircher," 253; and Strasser, "Science and Pseudo-Science," 229–31.
- ⁴⁹ Borel, *Observationum microscopicarum centuria*, 8, 13, 16–18; see Fletcher, *Study*, 111n32.
- ⁵⁰ Kaspar Schott, *Magia universalis naturalis et artis* (Würzburg, 1657) 1:538; also discussed in A. B. Luckhardt, "Description of Some Early Microscopes and Their Use in the Study of Infectious Disease," *Bulletin of the Society of Medical History of Chicago* 2, no. 1 (1917): 109.
- ⁵¹ Schott, *Magia universalis* 1:535.
- ⁵² Silvio A. Bedini, "Seventeenth Century Italian Compound Microscopes," *Physis* 5, no. 4 (1963): 383–422; Matteo Campani de' Alimenis, Pietro Tommaso Campani, and Giuseppe Campani, *Opera varia. Horologica @ Microscopia 1660–1705*, ed. Anatolio Egidi (Spoleto: Nuova Eliografica, n.d. [2012?]), 442.
- ⁵³ As quoted in Bedini, "Italian Compound Microscopes," 395.
- ⁵⁴ Eustachio Divini, *Lettera di Eustachio Divini all'Ill.mo Sig. Conte Carl'Antonio Manzini* (Rome, 1663), as quoted in Bedini, "Italian Compound Telescopes," 387.
- ⁵⁵ Garrison, "Athanasius Kircher," 858.
- ⁵⁶ Cunningham, "Transforming Plague."
- ⁵⁷ Kircher, *Scrutinium pestis*, 43.
- ⁵⁸ Kircher, *Scrutinium pestis*, 47.
- ⁵⁹ Kircher, *Scrutinium*, n.p. (Proemium ad lectorem).
- ⁶⁰ *Nota delli medici che si sono rassegnati all'Offitio di Mons. Illustriss. Governatore in virtù del Bando dalli 6 sino per tutto li 10 Ottobre 1656* (Rome, 1656), n.p. Piacenti appears in Maria Conforti, "Visible Signs, Invisible Processes: Explaining Poison in the Late Seventeenth Century," in *Pathology in Practice: Diseases and Dissections in Early Modern Europe*, ed. Silvia De Renzi, Marco Bresadola, and Maria Conforti (London: Routledge, 2017), 116–34. For a broader overview of the medical and philosophical understanding of disease during this outbreak, see Gennaro Cassiani, "Medici, magistrati e filosofi contro i miasmi della peste Ricerche in margine ad alcuni documenti sulla epidemia di Roma del 1656–57," *Ricerche di storia sociale e religiosa* 46 (1994): 187–215.
- ⁶¹ Kircher, *Scrutinium*, 142.
- ⁶² Hauptmann, *Warmer Badt- un Wasser-Schatz*, 249 (Kircher to Hauptmann, Rome, July 20, 1657).
- ⁶³ "Doctor Beak of Rome" or the Roman Plague Doctor, 1656. Paul Fürst, Dr Schnabel von Rom (1656), copperplate engraving, reproduced in Eugen Holländer, *Die Karikatur und Satire in der Medizin: Medico-Kunsthistorische Studie von Professor Dr. Eugen Holländer*, 2nd ed. (Stuttgart: Ferdinand Enke, 1921), 171 fig. 79. Public domain via Wikimedia Commons, [https://commons.wikimedia.org/wiki/File:Paul_F%C3%BCrst,_Der_Doctor_Schnabel_von_Rom_\(Holl%C3%A4nder_version\).png](https://commons.wikimedia.org/wiki/File:Paul_F%C3%BCrst,_Der_Doctor_Schnabel_von_Rom_(Holl%C3%A4nder_version).png).
- ⁶⁴ On Roman Paracelsianism, see Antonio Clericuzio, "Chemical Medicines in Rome: Pietro Castelli and the Vitriol Debate (1616–1626)," in *Conflicting Duties: Science, Medicine and Religion in Rome, 1550–1750*, ed. Maria Pia Donato and Jill Kraye (London: Warburg Institute, 2009), 181–302.
- ⁶⁵ Kircher, *Scrutinium pestis*, 22.
- ⁶⁶ Kircher, *Scrutinium pestis*, 194; see Daniel Stolzenberg, *Egyptian Oedipus: Athanasius Kircher and the Secrets of Antiquity* (Chicago: University of Chicago Press, 2013).
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- ⁶⁹ Bartolo Bertolaso, "La peste romana del 1656–1657 dalle lettere inedite di S. Gregorio Barbarigo," *Fonti e ricerche di storia ecclesiastica padovana* 2 (1969): 246.
- ⁷⁰ Bertolaso, "La peste romana," 230.
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- ⁷² Vivian Nutton, "The Reception of Fracastoro's Theory: The Seed That Fell Among the Thorns?" *Osiris* 6 (1990): 196–234.

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- ⁷⁴ As translated in Winslow, *Conquest*, 148.
- ⁷⁵ Kircher, *Scrutinium pestis*, 22.
- ⁷⁶ Ignatius of Loyola, *Constitutions* § 452; see Jos V. M. Welie, “Ignatius of Loyola on Medical Education,” *Early Science and Medicine* 8 (2003): 25–43, esp. 31.
- ⁷⁷ Paolo Bisciola, *Relatione verissima del progresso della peste di Milano* (Ancona, 1577) and Antonio Possevino, *Cause e rimedii della peste, et d’altre infermità* (Florence, 1577); see Martin, *Plague*, 24, 89–90.
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- ⁸⁰ Kircher, *Scrutinium pestis*, sig. ++2rv; Archive of the Pontificia Università Gregoriana (hereafter APUG), Rome 564, c. 31r (Zacchia, n.d.) and ms. 568, fol. 159r (Bardi, June 5, 1657). Bardi’s published testimonial is date July 9, suggesting a minor revision from the original.
- ⁸¹ ARSI, FG 663, c. 133r, in Stolzenberg, “Oedipus Censored,” 50; APUG 559, f. 60r (Goswin Nickel, Rome, November 1, 1657), also published in Kircher, *Scrutinium pestis*, sig. ++4v.
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- ⁸⁴ APUG 557, fols. 13r–15v (Hauptmann, Dresden, February 20, 1657); see also fols. 17r–18v (Dresden, December 15, 1657); Fletcher, “Medical Men and Medicine in the Correspondence of Athanasius Kircher (1602–80),” *Janus* 56 (1969): 264. The original drawing of the itch mite is on f. 14v and subsequently published in Hauptmann, *Warmer Badt- un Wasser-Schatz*, 200 (N.B. the printed letter is dated February 28, 247–51, with a printed version of Hauptman’s letter on 190–205).
- ⁸⁵ APUG 557, fol. 11r (August Hauptmann, Dresden, November 30, 1658); Kircher, *Scrutinium pestis*, 57.
- ⁸⁶ Hauptmann, *Warmer Badt- un Wasser-Schatz*, 251 (Kircher to Hauptmann, Rome, July 20, 1657).
- ⁸⁷ Fletcher, “Medical Men.”
- ⁸⁸ Fletcher, *Study*, 117; Strasser, “Athanasius Kirchers Pestschrift.”
- ⁸⁹ Balthasar de Monconys, *Journal des voyages de Monsieur de Monconys* (Lyon, 1666) 2:445.
- ⁹⁰ Gastaldi, *Tractatus*, 668, 755, 788.
- ⁹¹ Torrey, “Athanasius Kircher,” 255–56. For examples of this kind of retrospective interest, see Garrison, “Athanasius Kircher”; Singer, *Development*; Luckhardt, “Description of Some Early Microscopes”; and Ralph D. Major, “Athanasius Kircher,” *Annals of Medical History* ser. 3, no. 1(1939): 105–29.
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- ⁹⁴ Antoni van Leeuwenhoek, “An abstract of a Letter from Mr. Anthony Leeuwenhoeck at Delft, Dated September 17, 1683. Containing Some Microscopical Observations about Animals in the Scurf of the Teeth, the Substance Call’d Worms in the Nose, the Cuticula Consisting of Scales,” *Philosophical Transactions of the Royal Society* 14, n. 159 (May 20, 1684): 568.
- ⁹⁵ Leeuwenhoek, “An abstract of a Letter,” 573.
- ⁹⁶ For a brief introduction, see Antonio Ioli, Jean-Claude Petithory and Jean Théodoridès, “Francesco Redi et la naissance de la parasitologie expérimentale,” *Histoire des sciences médicales* 31/1 (1997): 61–66.

⁹⁷ Leeuwenhoek, *Arcana naturae detecta* (Delft, 1695).

⁹⁸ Johann Zahn, *Oculus artificialis teledioptricus sive telescopium* (Würzburg, 1685), 101.

⁹⁹ Zahn, "Appendix Dioptrico-Microscopica," in his *Oculus artificialis*, 2nd ed. (Nuremberg, 1702; 1685), 789.

¹⁰⁰ Giuseppe Campani, "Descriptio novi microsocopii," *Acta eruditorum* (July 1684): 372, 439; see W. E. Knowles Middleton, "Science in Rome, 1675–1700, and the Accademia Fisicomatematica of Giovanni Giustino Ciampini," *British Journal for the History of Science* 8/2 (1975): 138–54; and Steven I. Hajdu, "A Note from History: The First Use of the Microscope in Medicine," *Annals of Clinical & Laboratory Science* 32/3 (2002): 309–10.

¹⁰¹ Campani, "Descriptio novi microsocopii," 439.

¹⁰² Michele Augusto Riva, Luca Borghi and Fabio Pagni, "The First Recorded Use of the Microscope in Medicine: Pope Innocent XII's Autopsy Report," *The Lancet* 388 (August 6, 2016): 559.