Cleansing the Soul: Filarete and the Sewers of the Ospedale Maggiore in Milan

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Antonio Averlino (1400–69), called Filarete, designed the Ospedale Maggiore (or Great Hospital) in Milan with an ingenious sewer and ventilation system, which this article connects to ancient medical treatises on the human body's exhalation of air and evacuation of waste. Critical examination of the system in relation to Hippocratic and Galenic medical theory, Filarete's architectural thought, and the medico-spiritual function of early modern hospitals suggests that the architect conceived the building as a living and breathing corpus mysticum, whose internal organs cleansed the souls of its corrupted members.

INTRODUCTION

The Ospedale Maggiore in Milan is synonymous with the cruciform ward, a new architectural configuration of early modern hospitals by which patients were housed in four wings arranged in a Greek or Latin cross.[1] Offering a number of practical advantages over the medieval hall ward, the cruciform ward not only accommodated more beds, but also made it possible for hospital staff to monitor all patients from one central location and for all patients, looking in the opposite direction, to view the activities taking place at that location. Although two other cruciform hospitals were erected in Italy prior to the foundation of the Ospedale in 1456, this mammoth rectangular building just southeast of Milan Cathedral is credited with codifying the type and spurring its

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[1] Thompson and Goldin; Peroni; Henderson, 151–57.

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Figure 1. Alfred Guesdon. *View of Milan*, Ospedale Maggiore in lower right, from Hippolyte Etiennez. *L'Italie à vol d'oiseau*. Paris: 1849, pl. 27. Tinted lithograph. London, RIBA Collections.

adoption throughout Europe (fig. 1).[2] In one unified complex, the Ospedale boasted two cruciform wards, one for male and another for female patients; a spacious courtyard with a church; and extensive service facilities. After the male ward opened to the public in the mid-1470s, it won the admiration of the Venetian government, Antonio da Sangallo the Younger, Cesare Cesariano, and Giorgio Vasari.[3] By the late eighteenth century it had served as the template for so many hospitals across the Continent that the English prison reformer John Howard (1726–90) referred to the cruciform ward as "the usual form of hospitals in many Roman-Catholic countries."[4]

But according to the architect of the Ospedale, Antonio di Pietro Averlino (1400–69), who used the name Filarete (lover of virtue), the cruciform ward was not the building's most important feature.[5] Describing the hospital in his architectural treatise, now called the *Libro architettonico* (ca. 1466), the Florentine sculptor-architect and theorist instead emphasized his innovative design of the building's sewers. In Filarete's account, the patron of the Ospedale, the Duke of Milan Francesco Sforza (1401–66), was concerned that the wards

[2] Jetter; Foster; Keyvanian, 11–12, 384.

[3] Patetta, 281; Vasari, 2:456.

[4] Howard, 58.

[5] For Filarete, see Lazzaroni and Muñoz; Romanini; Tigler; Hub, 2009.

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Figure 2. Filarete. Ospedale Maggiore, damage to courtyard facades of male ward, July 1944. Photograph. London, Conway Library, The Courtauld Institute of Art. Published under the CC-BY-NC license.

would be permeated with the smell of excrement, a common problem in this setting that was thought to be deleterious to human health. As a solution, the architect devised an ingenious system of enclosed latrines, drains, subterranean canals, and terracotta pipes to whisk away patients' waste into a nearby river and exhaust its odor through the roof. Concealed in the building's masonry for centuries, this network of interior passages was virtually unknown until the hospital was bombed during the Second World War (fig. 2).[6] When the dust settled, several passages were found exposed in the rubble and brought to the attention of scholars.[7] However, perhaps because these utilities are hidden from view and difficult to access, the design, functioning, and sociohistorical significance of Filarete's invention remain largely unexplored.

A recent investigation of the Ospedale (now the University of Milan), which included a high-resolution laser survey guided by a close reading of the *Libro* as well as other primary textual and visual sources, now makes it possible

[6]The male ward, the only part of the Ospedale begun by Filarete and the focus of this article, survived the bombing intact, save for damage to two of its eight courtyard façades (see fig. 2) and the destruction of the aboveground portion of the far end of its western arm. See Grassi, especially 51.

[7]See Grassi.

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to elucidate this marvel of early modern architecture and engineering.[8] In the following pages and for the first time, the sewer and ventilation system is mapped, and its mechanical operations are explained and grounded in practices of waste removal long used in European hospitals and cities. Additionally, new textual evidence shows that Filarete's particular combination of these practices at the Ospedale stemmed from his general theory of architecture, which he expounded at the beginning of the *Libro* and held that buildings should imitate the human body. Central to Filarete's anthropomorphic architectural theory was his conviction that a building's interior passages should correspond to the anatomical form and physiological functioning of the body's pathways, thereby animating the structure with a soul and transforming it into "truly a living man."[9] As will be demonstrated by etymological and visual analyses, Filarete modeled the Ospedale's interior passages on the most up-to-date medical descriptions of the channels of the human respiratory and excretory systems, and claimed that they performed the same physiological functions. Pushing the literary boundaries of metaphor, the architect sought to create a living and breathing hospital-body that eliminated the putrefied corporeal substances of its patients, nursing them back to health.

At the same time, it will become clear that Filarete intended for this therapeutic organism to work within the spiritual context of late medieval and early modern hospitals. In these fundamentally religious institutions, the system of care was guided by the Christian beliefs that sin, which was embodied by excrement, was the cause of all disease, and that purging the soul of sin through Christ was therefore necessary for the recovery of the body. In addition to the sacraments, the curative power of Christ was transmitted in hospitals through the architectural vocabulary of the Christian church. Spiritually charged architectural motifs, such as the cruciform plan, reinforced the role of hospitals as sacred spaces of healing and earthly manifestations of the mystical body of Christ (*corpus mysticum*), or living Church formed by the union of Christ (its head) and the faithful (its members). Both Filarete and one of the Ospedale's earliest directors connected these themes to the cruciform architecture of the building, suggesting that the living hospital-body was imagined as a medico-spiritual figuration of the Church whose internal organs cleansed the souls of its corrupted members.

[8] The laser survey was undertaken by the author in collaboration with 3DScan Smart Surveying on 2 January and 8 June 2023. I am grateful to the members of the 3DScan team, especially Sergio Sabbatini, for their assistance, and to the administration of the University of Milan for permission to scan the monument.

[9] Averlino, 1965, 12 (Libro [henceforth Lib.] 1, fol. 6^{r}).

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THE OSPEDALE MAGGIORE IN FILARETE'S *LIBRO ARCHITETTONICO*

Filarete wrote the *Libro architettonico* in the form of a fictional dialogue between an architect and a prince (and at times his family), who were thinly disguised portraits of the author and his real-life patron, Duke Sforza.[10] Although generally wide-ranging, their conversation focused on the construction of an urban utopia with the flattering name of Sforzinda, which the architect builds for the prince along with its port city, Plusiapolis (rich city), over the course of twenty-four chapter-length books. In book 11, the prince asks the architect to produce a design for the ideal city's hospital, prompting Filarete to temporarily assume his true identity and propose the "hospital . . . I did in Milan."[11] Writing book 11 in roughly 1460–62, during which time the Ospedale was under construction, he proceeds to give the prince a long, detailed, and accurate technical description of the monument.[12]

Filarete begins his description by recalling that the prince of Milan, in this case Sforza himself, "thought [it best] to understand clearly before beginning that [the hospital] should be beautiful and that it should be capable of fulfilling the needs of the infirm, both men and women, and of children born out of wedlock."[13] Searching for the best model, the Milanese prince inquired if Filarete had seen "the hospitals of Florence and Siena," and if he remembered them well enough to sketch them.[14] The architect reports that he made a drawing of "the hospital in Florence," probably S. Maria Nuova, but that it "did not seem as suitable to [the prince] as he would have liked and he doubted if the others could be improved."[15]

With the famed hospitals of Tuscany thus dismissed, Filarete demonstrates why the Ospedale was ultimately chosen as the building most "capable of fulfilling the needs of the infirm." The first architectural element that he mentions is the sewers, which he singles out as the starting point of the whole design. From the beginning, Filarete recounts, "The lord and the citizens appointed to rule and govern this hospital . . . made a great point of the convenience and cleanliness of the sewers (*destri*)."[16] It was then that the architect was struck by an intriguing idea: "The moat of the city [i.e., the Naviglio River] went along the side of [the site] 400 braccia, and I thought I

[10] For the *Libro*, see Averlino, 1965; Averlino, 1972.

[11] Averlino, 1965, 137 (Lib. 11, fol. 79^{r}).

[12] For the dating of the work, see Spencer, 1956; Averlino, 1972, 1:xi–xiii.

[13] Averlino, 1965, 137 (Lib. 11, fol. 79^{r}).

[14] Averlino, 1965, 137 (Lib. 11, fol. 79^{r}). See also Peluso.

[15] Averlino, 1965, 137 (Lib. 11, fol. 79^{r}).

[16] Averlino, 1965, 137 (Lib. 11, fol. 79^{r}).

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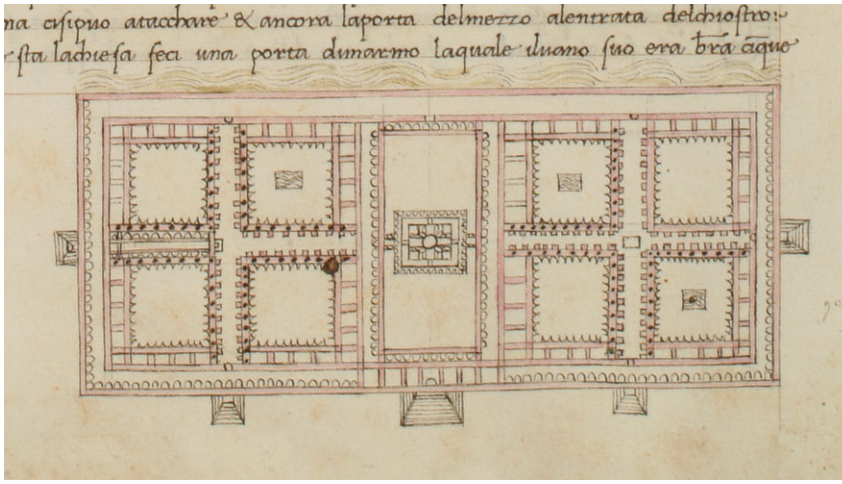

Figure 3. Filarete. Plan of Ospedale Maggiore, *Libro architettonico*, ca. 1460–66, detail, fol. 82ᵛ. With permission from the Ministero della cultura / Biblioteca Nazionale Centrale, Florence.

could use its water to wash and clean the sewers and any other waste (*bruttura*) that might be created there" (fig. 1).[17] To this end, he used the 400-braccia-long, eastern border of the site along the Naviglio for the long side of a rectangular ground plan, which he divided into two 160 x 160 braccia squares either side of a rectangle measuring 80 x 160 braccia (fig. 3). In each square he inscribed a cross, the one to the north containing the female ward and the one to the south the male, and in the central rectangle he placed a church, also in the form of a cross.

Turning to the male ward, the only part of the building under construction by that time, Filarete walks the prince through the main phases of the sewers' construction (fig. 4). The first task had been to create a vaulted storeroom directly underneath the cruciform ward (fig. 5). In the thick walls of the subterranean chamber, Filarete then carved out a vaulted corridor and placed inside it two canals, side by side and one lower than the other, so that both canals ran around the outer foundations of the entire cross (figs. 6, 7). Next, at the short, eastern end of the cross closest to the Naviglio, he diverted the river into the upper canal, causing water to circulate bidirectionally around both sides of the ward (fig. 8). Once the water reached the opposite, western end of the cross, it poured from both ends of the upper canal into a reservoir extending across that end of the ward, filling the reservoir to the level of the canal. Although the water in the reservoir rose above the two adjacent openings of the

[17] Averlino, 1965, 137 (Lib. 11, fol. 79ʳ).

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Figure 4. Filarete. Ospedale Maggiore, male ward (now part of the Biblioteca di Studi Giuridici e Umanistici of the University of Milan), alternating latrine doors and bedside cabinets along walls, 1456–76, Milan. Author's photo.

Figure 5. Filarete. Ospedale Maggiore, male ward, subterranean storeroom (now part of the Biblioteca di Studi Giuridici e Umanistici of the University of Milan), 1456–76, Milan. Author's photo.

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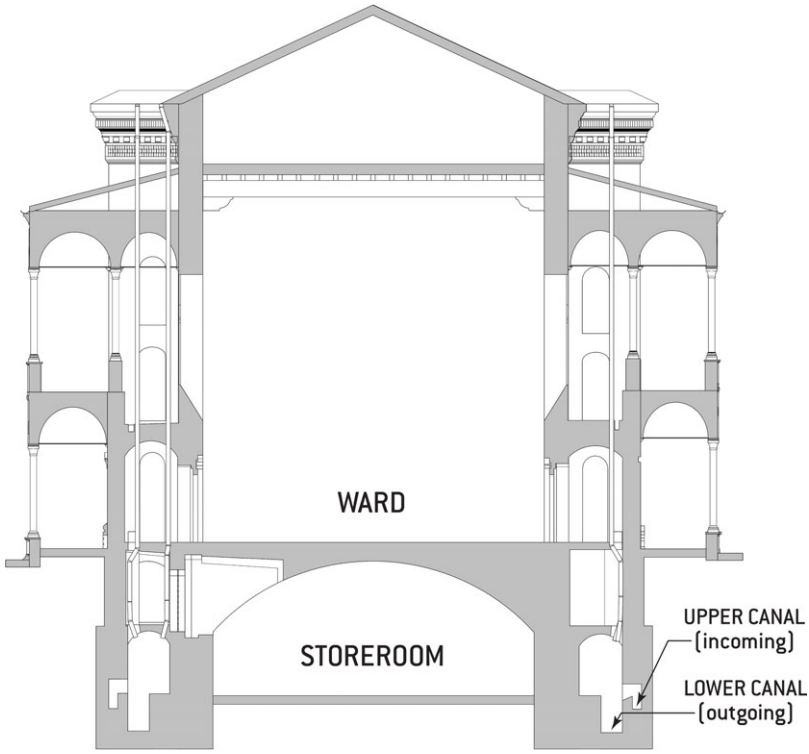

Figure 6. Section of Ospedale Maggiore, male ward. Author's reconstruction. See also architectureofthesoul.org.

lower canal, it was blocked from entering them by sluice gates. When the gates were raised, the water jetted into the lower canal "with a great rush," racing back around both sides of the ward in the opposite direction before returning to the river (fig. 9).[18]

At this point, the prince interrupts. Though pleased so far, he would like to know exactly "how these sewers are made useful for the sick and how they do not give off a bad odor."[19] Delighted for the opportunity to explain, Filarete addresses both concerns. Directly above the corridor containing the waterways, he hollowed out two additional, superimposed corridors, the highest one on the level of the ward (fig. 6). Inside the uppermost passageway, he installed latrines and opened doorways into the ward between every two beds, providing patients and staff with easy access to the facilities (figs. 10, 11). At the same time, he made sure to position the latrines in line with the lower canal and to cut holes

[18] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}).
[19] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}).

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Figure 7. Filarete. Ospedale Maggiore, male ward, subterranean sewer corridor, lower canal underneath metal grating at bottom, upper canal through arched openings at lower left, large openings of latrine drains and small openings of ventilation pipes alternating on vault above, 1456–76, Milan. Author's photo.

in the floors directly below them, "so that all the waste falls down into the canal where water is running and washing and carrying everything away" (figs. 6, 7, 12).[20]

[20] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}). Filarete also mentioned drains in the wall cabinets between each pair of beds, "where water could be thrown out," but these drains were not found by Grassi or this author. See figs. 4 and 10 above; Grassi, 134 (ill. 204); Averlino, 1965, 144 (Lib. 11, fol. 83^{r}).

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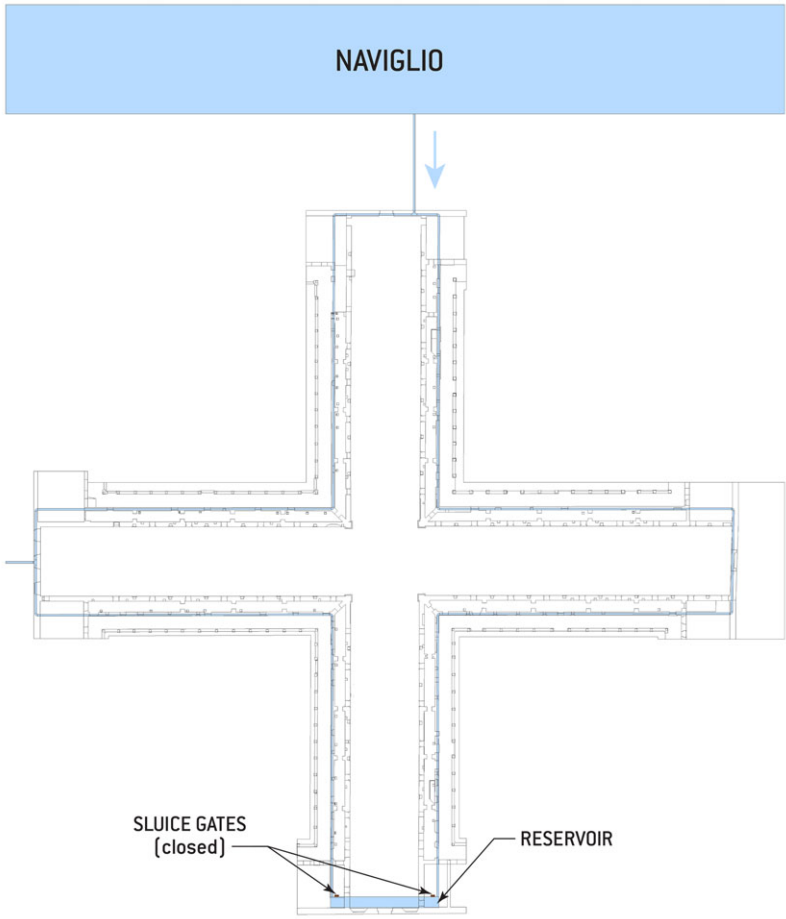

Figure 8. Ground plan of Ospedale Maggiore, male ward, incoming canal. Author's reconstruction. See also architectureofthesoul.org.

As for odor prevention, Filarete vowed that "no bad odor whatsoever can be caused," because the latrines and canals were "always covered and washed and cleaned by the water."[21] Offering further reassurance on this point, he unveiled yet another clever device. At an interval of every ten braccia, he inserted two "spiracles" (*spiracoli*), which he also called "passages" (*meati*), into the wall to ventilate the canal.[22] Built in the form of terracotta pipes, the ventilation tubes rose from the foundational corridor containing the canals, up buttresses in the

[21] Averlino, 1965, 138 (Lib. 11, fols. 79^{v}–80^{r}).
[22] Averlino, 1965, 138–39, 142 (Lib. 11, fols. 80^{r}, 82^{r}).

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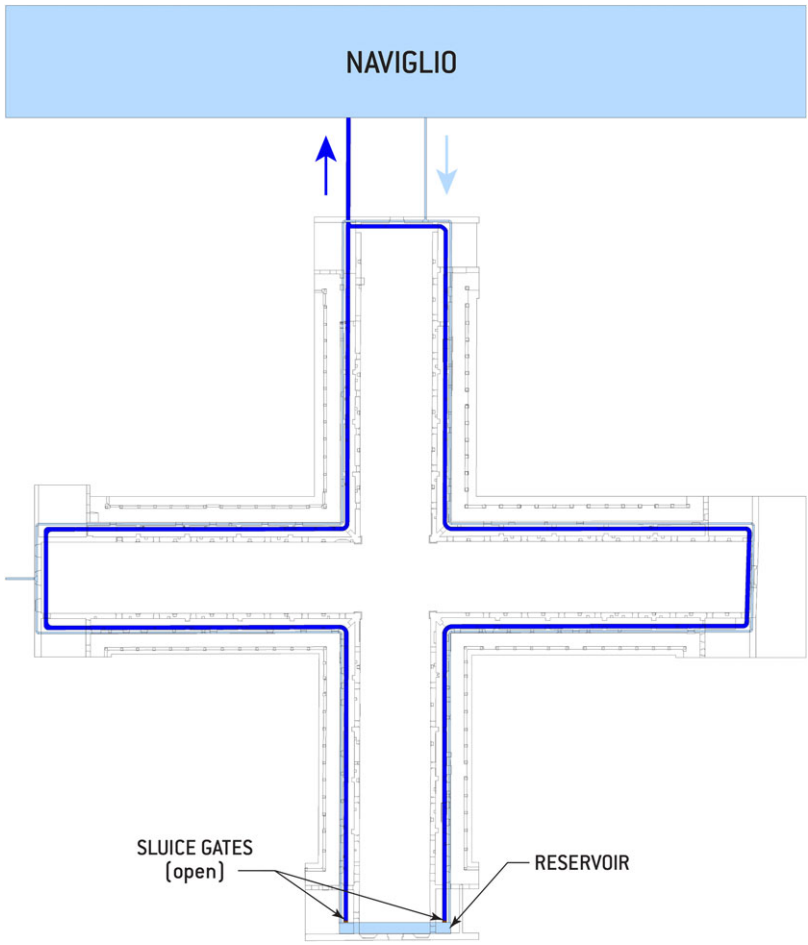

Figure 9. Ground plan of Ospedale Maggiore, male ward, incoming and outgoing canals. Author's reconstruction. See also architectureofthesoul.org.

walls, and out through the roof, "in case any bad odor should occur" (figs. 6, 7, 13, 14).[23] Filarete added that these shafts also combated odor by collecting rainwater. Hidden in the roofline of the building, gutters funneled water into the spiracles, sanitizing them and the lower canal so that "no unpleasant odor can come from the canals and from the roof" (fig. 15).[24] Thanks to these measures, he asserts for a fourth time, "no bad odor can ever be given off in the

[23] Averlino, 1965, 138 (Lib. 11, fol. 80[r]).
[24] Averlino, 1965, 139 (Lib. 11, fol. 80[r]).

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Figure 10. BIM model of Ospedale Maggiore, male ward, axonometric projection of interior. Author's reconstruction. See also architectureofthesoul.org.

sick wards."[25] Satisfied, the prince declares his understanding, permitting Filarete to move on to describing the rest of the building as well as other utilities powered by the canal, including a mill, laundry, sinks, and baths.

It is important to note that when Filarete was writing this account, he was being forced to change his design, which he never saw to completion. As construction continued from 1456, hospital officials and local masons criticized the building for being too elaborate, expensive, structurally unsound, and reminiscent of *all'antica* monuments in Florence and Rome, leading to numerous revisions.[26] Due to this conflict, Filarete fell out of favor at the Sforza court in the early 1460s, which urged him to change the dedication of the *Libro* from Sforza to Piero de' Medici (1416–69) and add a final, twenty-fifth chapter on Medici buildings. His role as "Inzignero" (engineer) of the Ospedale was increasingly diminished, and by the time he left the site in 1465 he had only supervised the construction of one arm of the male ward.[27]

That being said, a wealth of evidence shows that the sewer and ventilation system was begun and completed according to Filarete's intentions. Although

[25] Averlino, 1965, 139 (Lib. 11, fol. 80[r]).

[26] Welch, 145–66, especially 155; Hub, 2020, 48–58; Averlino, 1965, 139n5.

[27] Hub, 2020, 49; Welch, 145–66.

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Figure 11. Filarete. Ospedale Maggiore, male ward, latrine corridor (latrines no longer extant), 1456–76, Milan. Author's photo.

likely attempting to appease Duke Sforza, hospital officials acknowledged "Master Antonio of Florence" in 1460 as the creator of the "marvelous" Ospedale, who "demonstrated his great ingenuity and skill in building before the eyes of all through the fabric of this hospital as it will be completed and [who] clearly designed every single member of its parts and structure and all its works."[28] Moreover, after Filarete had overseen the construction of the first wing of the male ward, including its latrines, drains, canals, and ventilation pipes, local masons were instructed to "make the three [remaining arms] in the form of the one already completed," the only exceptions being "doors or windows or staircases."[29] Even as these arms rose under someone else's

[28] Welch, 154.
[29] Welch, 156.

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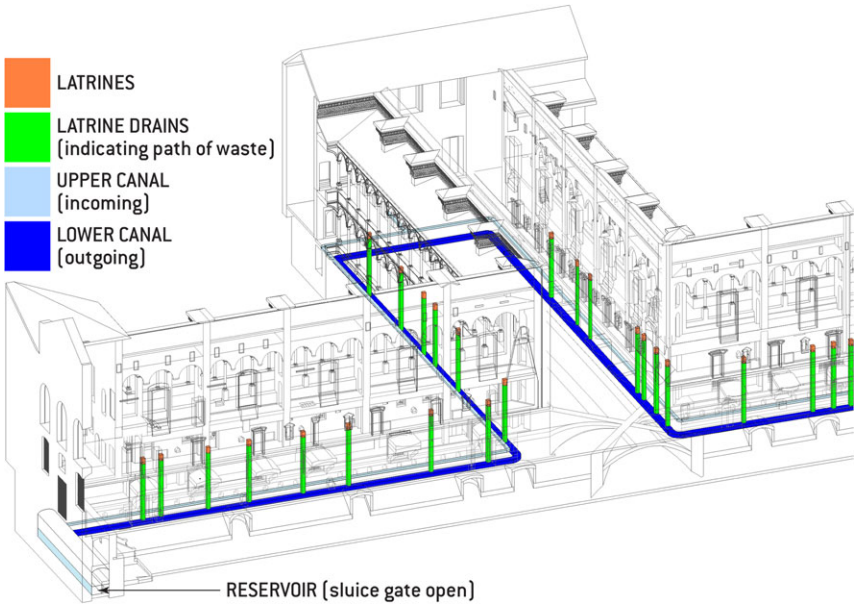

Figure 12. BIM model of Ospedale Maggiore, male ward, axonometric projection of interior. Author's reconstruction. See also architectureofthesoul.org.

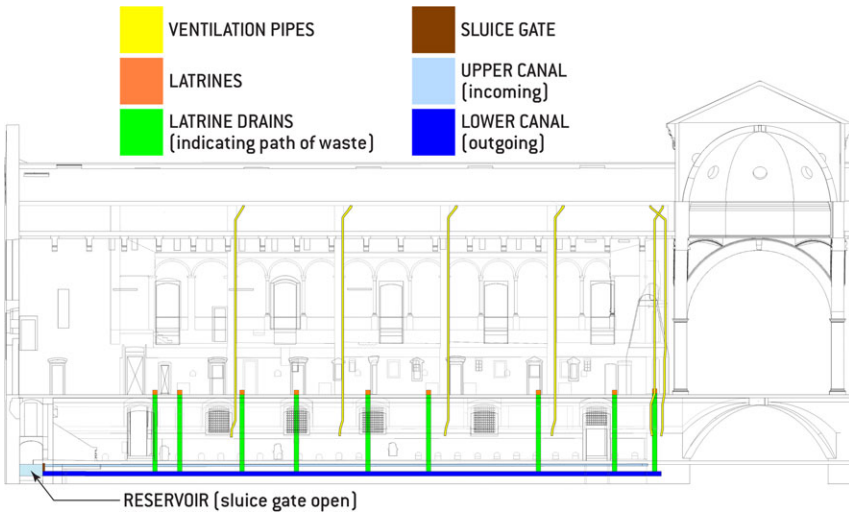

Figure 13. Elevation of Ospedale Maggiore, male ward, southwestern arm, interior. Author's reconstruction. See also architectureofthesoul.org.

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Figure 14. Filarete. Ospedale Maggiore, male ward, exposed terracotta ventilation pipe, 1456–76, Milan. Author's photo.

supervision, Filarete continued working on the sewer and ventilation system. As late as 1464, he received multiple payments for work on the ward's "stone canals."[30] Finally, both a seventeenth-century plan commemorating the extension of the sewers to the female ward (1624–94) and the recent laser survey of the building, whose point cloud data served as the basis for the reconstructions in figures 6, 8–10, 12, 13, and 15, confirm that the system was finished as described by Filarete in the *Libro* (fig. 16).[31]

[30] Lazzaroni and Muñoz, 200–01. For a contemporary connection between Filarete and the idea of allowing rainwater to filter down the ventilation pipes, see Averlino, 1965, 139n5.

[31] The only exception is the absence of the cabinet drains. See note 20.

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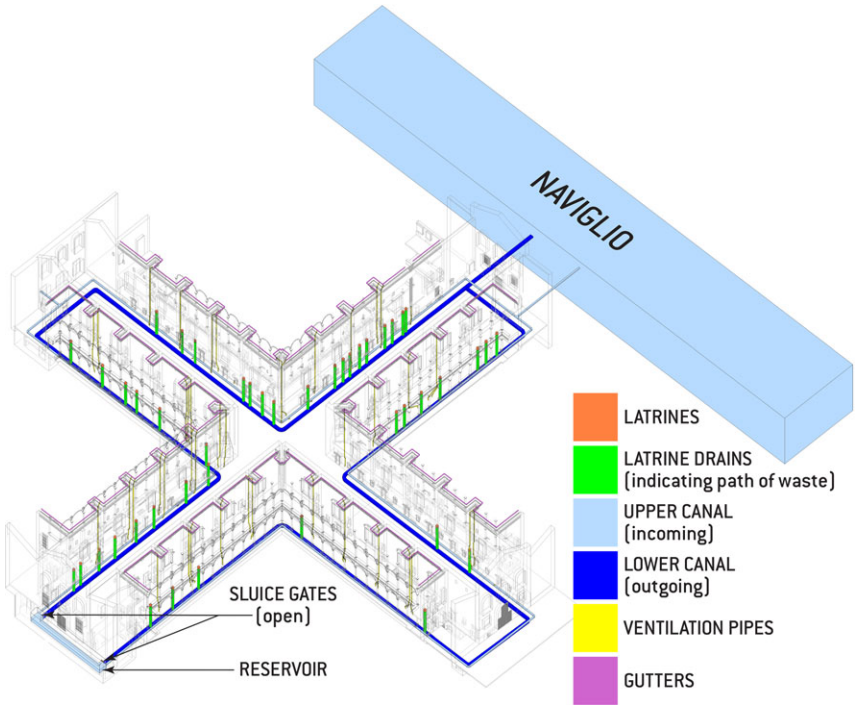

Figure 15. BIM model of Ospedale Maggiore, male ward, axonometric projection of interior. Author's reconstruction. See also architectureofthesoul.org.

MIASMA THEORY AND MALICIOUS EXCREMENT

In stressing the importance of keeping the sewers clean and preventing the "bad odor" of excrement from wafting into the Ospedale's wards, the prince was heeding contemporary miasma theory, which was rooted in the rational medicine of the Greek physicians Hippocrates (ca. 460–ca. 390 BCE) and Galen (130–200 CE). In this tradition, human health was determined by the four humors—blood, yellow bile, black bile, and phlegm—whose composition dictated each individual's complexion (or constitution) as well as their physical and mental well-being.[32] When these bodily substances were in balance, they sustained good health; when out of balance, they caused disease. Although everyone's state of humoral equilibrium was unique and almost impossible to maintain, it was sought through the regulation of variable aspects of the environment and human behavior. Based on Galen's rules of hygiene, these conditions were referred to as the "non-naturals" and were loosely grouped

[32] Siraisi, 107–09; Nutton, 139–205.

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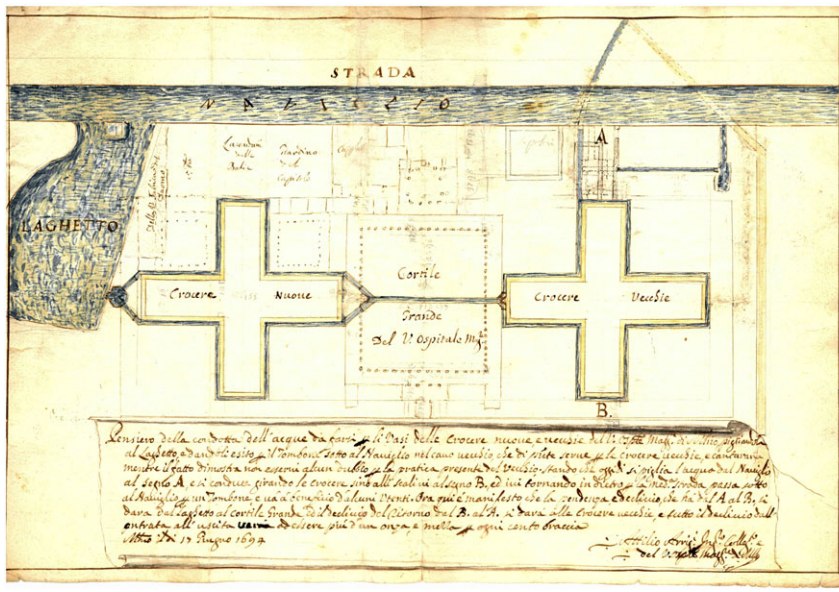

Figure 16. Plan commemorating extension of sewer system to the female ward (1624–94), with "A" indicating intake of system and "B" the location of the reservoir, 1694. Milan, Archivio dell'Ospedale Maggiore.

under the six categories of ambient air, exercise and rest, sleep and wakefulness, food and drink, evacuation and repletion, and the passions (or emotions).[33] The "non-naturals" worked hand in hand with the "naturals," including the humors, internal organs, and the elements, to prevent or produce "contra-naturals," or disease.

Of all the "non-naturals," ambient air, generally called *pneuma* in the Hippocratic and Galenic Corpuses, was believed to be especially important to human health. Because each humor was thought to possess a set of elemental qualities—blood being hot and moist; yellow bile, hot and dry; black bile, cold and dry; and phlegm, cold and moist—it followed that when individuals inhaled hot, cold, dry, or moist air, that air necessarily affected their humoral composition, whether for good or ill.[34] The predominantly environmental Hippocratic Corpus, a group of ancient Greek medical treatises attributed to Hippocrates in medieval and early modern Europe, focused particular attention on the harmful effects of the hot and moist southerly winds, cold and dry

[33] Galen, 1963; Sotres; García-Ballester.

[34] Coughlin, Leith, and Lewis; Lloyd.

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northerly winds, and transitions between seasons.[35] In addition, the Hippocratic treatises *On Breaths* and *On the Sacred Disease* (both fifth century BCE) delved into the dangers of miasma, or pathogenic elements carried in the air.[36] Distinguishing between sporadic and epidemic fevers, the author of *Breaths* reasoned that while the former must be brought on by poor regimen, the latter, called "pestilence" and later identified with plague, was caused by air "stained with morbific miasmas."[37] Similarly, *Sacred Disease* discussed the magico-religious belief that the disease in question, epilepsy, gripped "people who bear a stain," implying that miasma led to this condition as well.[38]

Focusing more on the internal structure and functioning of the body, the more securely attributed Galenic Corpus extended the Hippocratic theory on the role of miasma in the etiology of pestilence, making the pathological and physiological processes of the airborne contagion more explicit. In line with *Breaths*, Galen argued in *On Differences between Fevers* (ca. 174 CE) that epidemic fevers were caused by "pestilential seeds" of "putrefying miasmas" blown in from afar as well as by (and especially in combination with) hot air.[39] But further, Galen contended that people were more susceptible to pestilence if they breathed in "putrefied odors" emanating from swamps and lakes in the summertime, the rotting flesh of cadavers, and the breath of people whose humors had been contaminated.[40]

This ancient miasma theory on pestilential air and odor was of great interest to the civic authorities of late medieval Europe.[41] In the densely populated city-states of thirteenth- and fourteenth-century Italy, a combination of epidemics, famines, and wars encouraged a more medicalized approach to airborne disease prevention, which only accelerated in the wake of the Black Death (1347–51).[42] Advised by university-trained doctors, whose medical education was based on the teachings of Hippocrates, Galen, and their medieval commentators, newly established municipal health boards enacted sanitary legislation and worked with local functionaries to enforce prophylactic measures in the communal sphere.[43] Variously referred to as *viarii* (road masters), *comparii* (field masters), and *fango* (muck) officials, these workers spent much of

[35] See, for example, Hippocrates, 1923a.

[36] Hippocrates, 1868; Hippocrates, 1923b. See also Jouanna, 124–25.

[37] Hippocrates, 1923b, 232–35 (chapters 5, 6), as translated in Jouanna, 124–25.

[38] As translated in Jouanna, 122–24.

[39] As translated in Jouanna, 130–31.

[40] As translated in Jouanna, 130.

[41] Cipolla; Carmichael.

[42] Henderson, 25–28; Horden, 2006.

[43] Grendler, 314–52; Cipolla, 1–9; Geltner, 29, 34–67.

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their time clearing public rights of way of "stenches from which the air is corrupted and pestilential diseases arise."[44] By this time, moreover, most offensive stenches had come to be regarded as pernicious, including the odor of human excrement.[45] Identifying this smell as a major health hazard, authorities strictly regulated the draining of latrines and the emptying of chamber pots into street gutters and cesspits.[46] According to a statute from 1327, the citizens of Ravenna were forbidden to discard excrement in any public street, square, or gutter where "passersby might be harmed."[47] Later in the same century, anyone who owned a latrine in the Sicilian town of Aspra was ordered to "clean it so that it does not harm anyone's house or men or persons present on public roads and squares."[48] This increasingly medical approach to public health was also evident in hospitals. As early as the thirteenth century, specialized hospitals were established to treat particular afflictions and social groups.[49] Around the same time, physicians began asserting their professional status through guilds and charitable work, enabling hospitals to employ more doctors, surgeons, and apothecaries, and to contract out for specialists to treat certain organs, such as the eyes.[50]

The situation was analogous in Milan. Even though the city was fortunate to escape the Black Death, it was decimated by subsequent plagues and famines, which claimed roughly forty percent of its population in the second half of the fourteenth century.[51] By 1396 at the latest, six *officiales stratarum* (road officials) prohibited citizens from littering, creating blockages on canals, transporting uncovered cadavers, and hosting sick individuals.[52] In the fourteenth and early fifteenth centuries, a sustained interest in miasma theory and plague control was evident in the treatises of numerous ducal physicians.[53] Carrying the most weight for Duke Sforza were likely the recommendations of his own physician, Benedetto Reguardati (1398–1469). Working for the duke from around 1442, Reguardati wrote the *Libellus de Conservatione Sanitatis* (Book on the conservation of health, ca. 1435–38), a Galenic health and diet manual that opened with a section on the importance of clean air and water to keep

[44] Geltner, 48.
[45] Geltner, 42–44, 48–49, 54; Palmer, 66; Cipolla, 10–26.
[46] Geltner, 34–67; Bayless, 34; Pagliara.
[47] Geltner, 42.
[48] Geltner, 43.
[49] Henderson, 25–28.
[50] Park, 68.
[51] Albini, 22–29.
[52] Geltner, 58–59.
[53] Carmichael, 226.

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pestilence at bay.[54] When Sforza conquered Milan in 1450, at which time citizens were reeling from a virulent outbreak of plague, famine, and ongoing war, he had the physician assess the air quality of the city and report on plague controls as a member of the Secret Council.[55] In this capacity, Reguardati advised the Deputati sopra le Provvisioni dei Poveri, the health board recently established by the Ambrosian Republic (1447–50) to oversee the city's hospitals.[56] The construction of the Ospedale Maggiore brought to fruition the Deputati's plan to centralize Milanese healthcare under one "great hospital," with the new building serving as the administrative center of a network of nine charitable institutions in addition to specializing in the treatment of acute diseases.[57] At the Ospedale, four in-house doctors (one assigned to each arm of the cross), multiple surgeons, and barbers performed medical procedures and administered simple and compound medicines, while additional specialists were brought in to treat broken bones, dislocations, and gangrene.[58] Thus when "the lord and the citizens appointed to rule and govern this hospital," who very likely included Reguardati and the Deputati in addition to Sforza, stressed the need for sewers that would "not give off a bad odor," they were following an epidemiological approach consistent with the Ospedale's medical system of care. Informed by Hippocratic and Galenic miasma theory, they wanted to forestall the toxic smell of excrement from contributing to the airborne transmission of disease in the wards.

WASTE MANAGEMENT IN HOSPITALS, CITIES, AND SFORZINDA

From an architectural perspective, Filarete was also following well-known ancient and medieval practices. As seen at the mid-twelfth-century priory of Christ Church, Canterbury, many late medieval European monastic infirmaries and hospitals were designed with latrines that drained into subterranean canals and flowed into nearby waterways.[59] Some of these canals were even rinsed with rainwater collected by roof gutters.[60] Although the windows at the ends of hospital wards were often glazed, the ones along the flanks were typically used for air circulation.[61] In 1420, the account books of S. Maria Nuova in Florence

[54] Cotton, 1968, 78; Cotton, 1969, 181; Carmichael, 227–28.
[55] Carmichael, 227; Cotton, 1969, 181; Albini, 103–38.
[56] For the Deputati, see Leverotti; Welch, 130–36.
[57] Pecchiai, 130–97; Leverotti, 85–86; Welch, 136–37.
[58] Cosmacini, 172–73.
[59] Lillich; Thompson and Goldin, 15–20; Magnusson, especially 133–62.
[60] Thompson and Goldin, 19.
[61] Henderson, 159; Courtenay.

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Figure 17. Domenico di Bartolo. *Care of the Sick*, detail, ca. 1440–43. S. Maria della Scala, Pellegrinaio ward, Siena. © Alinari Archives / George Tatge / Art Resource, New York.

recorded purchases of "studs for the cloth-covered windows" and "rope for the windows of the new hospital."[62] Together with pulleys, the rope was used to open windows and shutters, as depicted in the background of Domenico di Bartolo's (1400–45) fresco in the Pellegrinaio ward of S. Maria della Scala in Siena (ca. 1440–43, fig. 17).[63] For the same reason, hospital wards were designed with open plans, high ceilings, and roofs *a cavaletti*, or pitched timber roofs with an external covering of tiles that allowed infected air and odor to escape.[64] Though not referring to hospitals per se, the humanist architect and theorist Leon Battista Alberti (1404–72) recommended in his architectural treatise, *De Re Aedificatoria* (ca. 1452), that when constructing "buildings of immense size, where the wall is to be very thick, the fabric of the wall should contain vents, spaced not too far apart, and extending from the foundations to the very top; these are to offer a free passage of escape to any vapors that might have built up and been trapped below ground."[65]

[62] Henderson, 160.
[63] Henderson, 160.
[64] Henderson, 157–59.
[65] Alberti, 1988, 68 (book 3, chapter 6).

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More broadly, these architectural features were part of a vast infrastructure of urban sanitation. In line with Hippocratic authors and Aristotle, Vitruvius advised founding cities on an elevated site with a temperate climate and streets oriented away from prevailing winds that could "injure," "corrupt," and be "noxious."[66] In describing the provision of clean water in Roman cities, he explained how aqueducts delivered water to a reservoir at the highest point of the city gates, from which fresh water was distributed through masonry canals, lead pipes, and terracotta tubing.[67] Equally instructive may have been Frontinus's *De acquaeductu urbis Romae* (ca. 98 CE), a mid-twelfth-century copy of which was brought to Rome in 1429 by the humanist book collector Poggio Bracciolini (1380–1459), where it was transcribed at least three times between 1447 and 1455.[68] The text brought the health benefits of Rome's aqueducts and famed sewer system, the Cloaca Maxima, to the attention of early modern readers, many of whom likely lived in a city whose ancient sewer system had been restored and connected to newly dug canals, street gutters, drains, and latrines.[69] So common were these practices that Alberti thought it unnecessary in *De Re* to "stress here how important drains are in maintaining the sanitation of the city, the cleaning of buildings, public and private alike, and toward preserving the wholesomeness and purity of the air."[70]

Filarete was surely aware of these practices.[71] He acknowledged Alberti's and Vitruvius's architectural treatises in book 1 of the *Libro*, and when designing the Ospedale he took documented trips to both Florence and Siena to inspect their hospitals firsthand.[72] As Filarete also must have known, Milan had its own still-functioning ancient sewer system, which by the mid-fifteenth century had grown to include artificial channels regulated by sluice gates and harnessed for powering mills.[73] One of the main arteries in this system was the Naviglio River bordering the Ospedale, originally created by Emperor Frederick I (1122–90) for defensive purposes following the sack of Milan in 1162 (hence why Filarete referred to it as a "moat").[74] As described in the *Libro*, moreover, the infrastructure of Sforzinda was an idealized version of the same Milanese and Vitruvian arrangement. Aqueducts channeled water to a reservoir outside

[66] Vitruvius, 26–31 (book 1, chapters 4, 6); Aristotle, 1905, 279–80 (book 7, 1330b).

[67] Vitruvius, 104–06 (book 8, chapter 6).

[68] Bruun, 45.

[69] Geltner, 34–67; Tomaselli; Baldasso, 119n38.

[70] Alberti, 1988, 113–14 (book 4, chapter 7).

[71] Baldasso; Karmon, 155–65.

[72] Peluso, 268.

[73] Magnusson and Squatriti, 224, 229–31, 235, 257, 263; Boucheron, 191–92; Averlino, 1965, 276n26.

[74] Magnusson and Squatriti, 229–31.

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the city, which branched off into a network of sewers as well as canals that provided water for drinking, transportation, and energy.[75] The streets leading away from the central piazza were pitched downward so that rainwater washed them clean all the way to the city gates.[76] In devising the sewer and ventilation system of the Ospedale, Filarete was therefore following well-established methods of urban waste management.

THE ANATOMY OF FILARETE'S SEWERS

What was unprecedented about Filarete's design, however, was the combination of these elements in one fully integrated and cohesive architectural system, which suggests that he had an additional frame of reference in mind. One such unifying paradigm is indicated by the terms that he employed for the Ospedale's ventilation pipes: *spiracoli* (spiracles), which he used first and three times in total; and *meati* (passages), which he used twice and as a synonym for *spiracoli* (figs. 6, 7, 13–15).[77] After using *meati* for the last time, he explained that what he meant by the term (and therefore also *spiracoli*) was "conduits" (*condotti*).[78] That Filarete felt the need to clarify the terms implies that he considered them to be somewhat unfamiliar to the readers of his vernacular text.

The first term, *spiracoli*, is the Tuscan Italian plural form of the Latin *spiraculum* or *spiramentum*, derived from the Greek *ἀναπνοή* meaning recovery of breath, respiration, pore, vent, or airhole.[79] Similarly, *meati* is the Tuscan Italian plural form of the Latin *meatus*, originating from the Greek *πόρος* for passage, means of passing, course, or movement.[80] Filarete could have learned both terms from a wide variety of ancient Greek and Roman authors, from Plato and Aristotle to Vitruvius and Pliny.[81]

However, the greatest concentration of these terms in ancient literature, by far, was in the Hippocratic and Galenic Corpuses. In these medical treatises, *ἀναπνοή* (*spiraculum*/*spiramentum*) referred mainly to breath and respiration, while *πόρος* (*meatus*) was the generic designation for all of the passages inside

[75] Averlino, 1965, 272–78 (Lib. 19–20, fols. 159^{r}–62^{v}).

[76] Averlino, 1965, 74–75 (Lib. 6, fol. 43^{v}).

[77] For *spiracoli*, see Averlino, 1965, 138–39 (Lib. 11, fol. 80^{r}). For *meati*, see Averlino, 1965, 138 (Lib. 11, fol. 80^{r}), 142 (Lib. 11, fol. 82^{r}).

[78] Averlino, 1965, 142 (Lib. 11, fol. 82^{r}).

[79] For *ἀναπνοή*, see Liddell and Scott. For *spiraculum*/*spiramentum*, see Lewis and Short. I thank Danielle Kellogg for her kind assistance with the Greek.

[80] For *πόρος*, see Liddell and Scott. For *meatus*, see Lewis and Short.

[81] Liddell and Scott; Lewis and Short.

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the body.[82] Of the two terms, *πόρος* was the most common and used most frequently by Galen. In particular, the term figured prominently in the physician's overall theory of human physiology, at the center of which was the close relationship between air and the soul, the latter understood according to its Platonic and Aristotelian definition as the divine principle of life inside the body.[83] As Galen explained in *The Doctrines of Hippocrates and Plato* (ca. 160 CE), he adopted a Platonic tripartite division of the soul, distinguishing between the appetitive part residing in the liver and in charge of hunger and desire; the spirited part located in the heart and responsible for emotions; and the rational part situated in the brain and governing cognition, sensation, and movement as well as the behavior of the two lower parts.[84] But, as explained in *On the Utility of Respiration*, *On the Use of the Pulse*, and *On the Use of the Parts of the Body* (all 165–75 CE), the soul needed the help of air passing through the body's *πόροι* to direct these operations.[85] After being taken in through the nose and mouth, inspired air journeyed to the brain by means of the arteries. Along the way, it was progressively refined into the more rarefied *pneuma psychikon* (animal spirit), the soul's "first instrument" and "vehicle," which was then sent out from the brain via the nerves.[86]

Furthermore, this medical literature includes the only known instance of *πόρος* (*meatus*) and *ἀναπνοή* (*spiraculum*/*spiramentum*) being used in the same way as in the *Libro*—that is, as synonyms for a series of conduits that exhaust air. Intriguingly, the overlap occurs in the two Hippocratic treatises discussed above in the context of miasma, *Breaths* and *Sacred Disease*. In *Sacred Disease*, the anonymous author set out to prove that the condition was brought on by the hot and humid southern wind. According to this argument, *pneuma* entered the body through the mouth and nose before proceeding to the brain, heart, lungs, and finally the veins, which delivered the air to the rest of the body. But when too much hot and moist *pneuma* entered the veins, it melted the *pneuma* already present, allowing cold phlegm to fill the void. If too much phlegm built up in the veins, then it caused blockages, which in turn obstructed the individual's internal air supply and gave rise to the symptoms of the sacred disease. In their capacity to inhale, circulate, and exhale air within the body, the

[82] For the occurrence of *ἀναπνοή* and *πόρος* in Greek literature, see the Logeion's Greek Vocabulary Tool (vocab.perseus.org). For the occurrence of *spiraculum*/*spiramentum* and *meatus* in Latin texts, see Lewis and Short.

[83] Plato, 1902, 327a–621d; Plato, 1907, 17a–92c; Aristotle, 1935, 8–9 (book 1, chapter 1, 402a).

[84] De Lacy, 2005, 367–71 (book 6, chapter 2, lines 1–12), 599–601 (book 9, chapter 9, lines 7–8); Hankinson.

[85] See, for example, Kühn, 5:608–09, 643.

[86] Kühn, 5:643, 11:731.

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veins functioned as spiracles: "By these veins we draw in much breath, since they are the spiracles (*ἀναπνοαὶ*) of our bodies inhaling air to themselves and distributing it to the rest of the body, and to the smaller veins, and they afterwards exhale it."[87]

In *Breaths*, *πόρος* (*meatus*) was also used to denote veins that drew in, circulated, and expelled air. As in *Sacred Disease*, this treatise held that *pneuma* entered the body through inhalation and migrated to the veins. By contrast, however, it assigned inhaled air a much larger role in the pathology of disease. If the quality or quantity of air in the veins was too little or too great, then it evaporated, compressed, congealed, or forced out the other substances in the veins, causing all diseases. Throughout the text, *πόροι* was used for *passages* and as a synonym for *veins*.[88]

In the Hippocratic and Galenic Corpuses, as well as in other medical writings, *πόρος* was therefore the genus for the body's numerous interior passages. These pathways served as the transportation network through which the soul, with the help of inhaled air, animated the body with life and governed its physiological functioning. As employed in *Sacred Disease*, an *ἀναπνοή* was a particular species of *πόρος*, in this case a vein in its capacity to inhale, distribute, and exhale air. The Hippocratic author of *Breaths* happened to use *πόρος* in the same exact way, demonstrating to later readers of *Breaths* and *Sacred Disease* that both terms could be used as synonyms.

Given that Filarete admitted to writing the *Libro* in the vernacular because he was "not too experienced in letters," it is difficult to ascertain exactly where he could have come across the medical usage of these terms.[89] One possible source was Alberti. The humanist architect employed *meatus* in *De Re* to signify all manner of passages, including the tracts of the human respiratory system, indicating that he knew the term's anatomical significance.[90] Moreover, *spiramenta* was his word for the vents that he recommended leaving open inside walls to release vapors through the roof.[91] In the proceeding paragraphs, he went on to describe walls as being composed of "bones," "muscles," "ligaments," and "skin," raising the possibility that he considered *spiramenta* to be part of the same architectural membrane.[92] That said, Alberti's use of *spiramenta* appears to have followed Vitruvius rather than Hippocrates. He employed the term twice in *De Re*, once for *vents* inside walls and again for *vents* between roof beams, and

[87] Hippocrates, 1868, 359–60.

[88] Hippocrates, 1923b, 236–47 (chapters 8, 10, 12).

[89] Averlino, 1965, 5 (Lib. 1, fol. 2[r]).

[90] Alberti, 1988, 331 (book 10, chapter 6); Núñez, 2:112.

[91] Alberti, 1966, 195; Núñez, 3:86.

[92] Alberti, 1988, 68–81 (book 3, chapters 6–12).

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both instances repeated Vitruvius's use of the term for the same two architectural elements.[93] In addition, Filarete's use of *spiracoli* and *meati* was markedly different from Alberti's use of *spiramenta* and *meatus*. Whereas Alberti utilized the terms separately and in different contexts, Filarete closely adhered to their Hippocratic treatment as synonyms for the same air-conveying conduits.

A more likely explanation for Filarete's thoroughly Hippocratic use of these terms emerges from an examination of the Latin translations of *Breaths* and *Sacred Disease* produced in early modern Italy. Although *Sacred Disease* was not translated into Latin until 1588, by Hieronymus Mercurialis (1530–1606), the first Latin translation of *Breaths* was made in 1444 by the humanist Francesco da Tolentino (1398–1481), known as Filelfo, Filarete's close friend at the court of Milan.[94] A leading translator of Greek texts, Filelfo spent the 1420s in Constantinople and later moved to Milan in search of employment, serving eight years under Duke Filippo Maria Visconti (1392–1447) before transferring allegiance to Sforza.[95] Upon returning to Venice from Constantinople in 1427, he wrote to Ambrogio Traversari (1386–1439) that he had brought back to Italy Hippocrates's *Breaths*, and in a letter to the physician Pietro Tommasi (ca. 1375/80–1458) in 1447 he stated that he had translated the text into Latin three years prior.[96] Following medieval Latin translations of Hippocratic and Galenic treatises, Filelfo translated *πόρος* as *meatus*.[97] What is more, even though the Hippocratic author of *Breaths* did not use *ἀναπνοή* (*spiraculum*/*spiramentum*), Filelfo did. Specifically, whenever a *πόρος* carried or released air, which occurs four times in *Breaths*, he translated it not as *meatus*, but as "spiramenta."[98] In these instances, air "rises out of" warm blood as it melts and percolates to the surface of the body as sweat, "just as steam rising from boiling water."[99] Filelfo's decision to distinguish between veins when they carried humors (*meatus*) and veins when they carried and exhausted air (*spiramenta*) betrays a sophisticated understanding of how *πόρος* and *ἀναπνοή* were employed in the ancient Greek medical lexicon. As in the Hippocratic and Galenic Corpuses, Filelfo used *meatus* as the genus and *spiramenta* the species. The distinction suggests that he had read *Sacred Disease*, which was the only other text to have used

[93] Alberti, 1988, 68–70 (book 3, chapter 6), 79–81 (book 3, chapter 12); Vitruvius, 61 (book 4, chapter 7), 90 (book 7, chapter 4).

[94] Laskaris, 1509–62; Rivier, 205.

[95] Welch, 146.

[96] Calderi, 217n2; 326n1.

[97] Nelson, 20–33 (chapters 10, 14).

[98] Nelson, 16–25 (chapters 8, 10).

[99] Nelson, 20–25 (chapter 10).

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ἀναπνοή (*spiraculum*/*spiramentum*) in this way and was known to have been circulating in Greek transcriptions in mid-fifteenth-century Italy.[100] More support for this hypothesis is found in a letter that Filelfo wrote in 1475 to Mattia Triviano (ca. 1407–77), the tutor of Gian Galeazzo Maria Sforza (1469–94), in which he cited *Breaths* as well as *Sacred Disease* in advising on the prince's health and diet.[101]

There can be little doubt that Filelfo was Filarete's main source for these terms. Their lasting friendship began in Florence in 1447, not long after Filelfo translated *Breaths* (1444) and shortly before Sforza announced his decision to build the Ospedale and Filarete arrived in Milan (both in 1451).[102] In the *Libro*, moreover, Filarete named Filelfo as his scholarly guide to ancient texts. The Hellenist appears in this guise as the interpreter of hieroglyphs and as the translator of the Golden Book, an ancient Greek text that the architect discovers and uses to design Plusiapolis.[103] According to Filarete, furthermore, Filelfo served in this very capacity at the Ospedale, as the author of a dedicatory Latin inscription planned for the building's entrance.[104] It is therefore not difficult to imagine that when Sforza, Reguardati, and the Deputati were impressing upon Filarete the importance of clean and odorless sewers, Filelfo gave his friend (and probably the others) a synopsis of *Breaths*, as he did later for Triviano. In addition to the synonymous use of *spiramenta* and *meatus*, his translation contained information highly relevant to this administration's epidemiological project, including: the fundamental role of air in the health of the body and soul; the onset of pestilential fevers due to morbific miasmas afloat in the air; and the body's ability to recycle that corrupted air through its veins.

Evidence thus suggests that Filarete drew a direct analogy between the veins of the body and the ventilation pipes of the Ospedale. Additionally, it should be pointed out that Filarete's *spiracoli* and *meati* also look like veins. Unlike Vitruvius's *spiramenta*, which the Roman architect described as voids left open in the wall,[105] Filarete's ventilation pipes are long, thin, meandering tubes that stem from the building's core and ramify through its structural members, at times surfacing just beneath the skin (fig. 18).

[100] Laskaris, 159–62.

[101] De Keyser, 4:1744 (PhE 42.29).

[102] On Filarete and Filelfo, see Lazzaroni and Muñoz, 111; Lang; Rovetta, especially 98–102; Beltramini.

[103] Averlino, 1965, 151–52; 180–296 (Lib. 12, fol. 87^{v}; Lib. 14–21, fols. 103^{r}–73^{r}). See Hub, 2011, 27.

[104] Averlino, 1965, 146 (Lib. 11, fol. 83^{v}).

[105] Vitruvius, 90–91 (book 7, chapter 4).

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Figure 18. Filarete. Ospedale Maggiore, male ward, terracotta ventilation pipe, 1456–76, Milan. Author's photo.

THE ARCHITECTURE-BODY METAPHOR IN THE *LIBRO*, AND THE LIVING BODY OF THE OSPEDALE

That Filarete envisioned the Ospedale's ventilation pipes as bodily veins makes perfect sense given his general theory of architecture, which he presented in the first two books of the *Libro* and based almost entirely on the metaphor between buildings and the human body.[106] In taking this approach, he was building on Vitruvius, "who also says that the building is derived from the human form," and Alberti, who in equating buildings with bodies in *De Re*, as noted above,

[106] Onians, 162–65; Tigler, 69–85.

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was himself expanding on Vitruvius's anthropomorphic principles.[107] From the outset, Filarete proclaimed: "As everyone knows, man was created by God; the body, the soul, the intellect, the mind, and everything was produced in perfection by him," so much so that man "decided to take the measures, members, proportions, and qualities of himself and adapt them to this method of building."[108] He then launched into a lengthy discussion of how the measures and members of architecture, including ornament, units of measure (e.g., the braccio), and the circle and square as mentioned by Vitruvius, all stemmed from the measures and members of the body.[109]

In addition, Filarete argued that in imitating the body, buildings came to life. The notion of living buildings had already been advanced by Alberti. In *De Re*, Alberti compared buildings to an *animans*, or animated organism, which included human beings as in Cicero's use of the term in *De natura deorum* (45 BCE).[110] Taking a more direct approach, Filarete plainly states that a "building is truly a living man."[111] He makes his case by drawing a number of parallels between architecture on one hand, and the body and soul as laid out in Galenic medical theory and Aristotelian natural philosophy on the other. The best known of these analogies is between buildings and the birth, growth, and decay of human beings, which Aristotle included among his fundamental "acts" of the ensouled organism.[112] A building, Filarete argues, was born from the collaboration of the patron and architect, with the architect fulfilling the roles of "both nurse and mother."[113] After seven to nine months of dreaming about, drawing, and planning the building based on "what seems most suitable and most beautiful to him according to the terms of the patron," the architect gives birth to it in the form of a wooden model.[114]

But before making the life cycle analogy, Filarete established a more Galenic basis for his argument. Directly in line with the marginal subtitle "How the Building Lives and Dies Like Man," he essentially followed Galen's general

[107] Averlino, 1965, 12 (Lib. 1, fol. 6^{r}); Alberti, 1988, 7–9 (book 1, chapter 2), 23–24 (book 1, chapter 9), 68–75 (book 3, chapters 6–9), 79–81 (book 3, chapter 12), 84–87 (book 3, chapter 14), 155–57 (book 6, chapter 2), 163–64 (book 6, chapter 5), 210–18 (book 7, chapter 5), 301–05 (book 9, chapter 5).

[108] Averlino, 1965, 6 (Lib. 1, fol. 2^{v}).

[109] Averlino, 1965, 6–12 (Lib. 1, fols. 2^{v}–5^{v}).

[110] Alberti, 1988, 158 (book 6, chapter 3); Alberti, 1966, 455. See Núñez, 1:142–43. For the Latin definitions of the term, see Lewis and Short. For the term in *De natura deorum*, see, for example, Cicero, 48–49 (book 1, chapter 18).

[111] Averlino, 1965, 12 (Lib. 1, fol. 6^{r}).

[112] Aristotle, 1935, 84–95 (book 2, chapter 4).

[113] Averlino, 1965, 16 (Lib. 2, fol. 7^{v}).

[114] Averlino, 1965, 16 (Lib. 2, fol. 7^{v}).

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theory of human physiology in reasoning that if a building's exterior and interior parts are modeled on the body and perform physiological functions, in other words, the operations of the soul, then it is genuinely alive. And what exterior and interior body parts does Filarete say are necessary for life to take root in a building? Not only members, but also *meati*:

> Now . . . I will show you how the building is formed and shaped from the members and form of man. You know that all buildings need members and passages (*meati*), that is, entrances and exits. They should all be formed and arranged according to their origins. The exterior and interior appearance of the building is arranged effectively in such a way that the members and passages (*meati*) are suitably located, just as the exterior and interior parts and members are correct for the body of man.[115]

Once these parts have been properly "measured, partitioned, and placed," the building can be enlivened with physiological operations.[116] In the broadest sense, Filarete explained how this worked by employing the alimentary metaphor of eating, the bodily process corresponding to the most basic, appetitive part of the soul in the liver. Using its members and *meati*, he argues, "the building must eat to live, exactly as it is with man."[117] Specifically, the building is fed by the architect, patron, and people who occupy it on a daily basis and give it continuous maintenance, which serves as its sustenance. Although all buildings (like all people) will eventually die, they can lead long and healthy lives if they are regularly nourished. When the building-body becomes ill by falling into disrepair, the architect should assume the role of "a doctor . . . who mends and cures it."[118] Without this constant upkeep, the building suffers the same fate as the Galenic body when deprived of food—it becomes corrupt, weak, and dies:

> I say to you that a building does just that, for it sickens when it does not eat, that is, when it is not maintained and begins to fall off little by little exactly as man [does] when he goes without food, and finally falls dead. . . . You need to maintain it continually and to guard it from corruption and too much fatigue, because, as man becomes thin and ill from too much fatigue, so [does] the building. Through corruption, the body of the building rots like that of a man.[119]

[115] Averlino, 1965, 12 (Lib. 1, fol. 6[r]).

[116] Averlino, 1965, 12 (Lib. 1, fol. 6[r]). The idea that a building lives by virtue of its functioning may have been gleaned from Alberti. See Payne, 81–84.

[117] Averlino, 1965, 12 (Lib. 1, fol. 6[r]).

[118] Averlino, 1965, 12 (Lib. 1, fol. 6[r]).

[119] Averlino, 1965, 12–13 (Lib. 1, fol. 6[r]).

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Deeper into the treatise, Filarete takes the metaphor further, linking additional exterior and interior parts of buildings to analogous bodily organs and processes:

> As the body of man is arranged with voids, entrances, and hollow places for its maintenance, so the building needs them too. The entrance of the body of man is the mouth and he sees through the eyes. The building too needs them, that is, a door and windows through which one sees the light. The other members conform to the same likeness: as man lives through eating, so the building should be maintained and regulated as you have already understood.[120]

For Filarete, then, when a material building recreated the conditions of the soul as defined in medical and philosophical discourses, it became a "truly" living organism, vivified by the same life force that animated human beings.[121] The essence of a building's life was its physiologically functioning members and passages (*meati*), arranged according to what was suitable to the design of the building and the desires of the patron. As long as these conditions were met, the building could live a long and healthy life on a regular diet of nutritional maintenance.

In the subsequent books of the *Libro*, Filarete demonstrated this anthropomorphic theory in the buildings of Sforzinda, and nowhere more extravagantly than in the Ospedale. When describing the ground plan of the building, he stated that he used the braccio to determine its measurements and the square its ground plan, implying that the body served as a theoretical touchstone for the building's design from the earliest phases.[122] In addition to referring to the Ospedale and its church as a "body" (*corpo*) multiple times, he alluded to the anatomical quality of the hospital's architectural parts.[123] Each of the far ends of the male ward was a "head" (*testa*);[124] the interior sides of the tribune of the hospital church "faces" (*faccie*);[125] the east end of the church a "head" (*testa*);[126] the openings of the latrines "mouths" (*bocche*);[127] and the intake of the upper canal a "mouth" (*bocca*).[128] Although such terminology was

[120] Averlino, 1965, 85 (Lib. 7, fol. 49^{r}).
[121] Averlino, 1965, 12 (Lib. 1, fol. 6^{r}).
[122] See also Grassi, 31–32.
[123] Averlino, 1965, 140, 142 (Lib. 11, fols. 80^{v}, 82^{r}).
[124] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}).
[125] Averlino, 1965, 142 (Lib. 11, fol. 82^{r}).
[126] Averlino, 1965, 142 (Lib. 11, fol. 82^{r}).
[127] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}).
[128] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}).

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common in contemporaneous architectural writing, the complexity of Filarete's architecture-body theory suggests that his nomenclature was more than casual.

Indeed, Filarete used the *spiracoli* and *meati* to show that the Ospedale's organs performed physiological operations, bringing the building to life. Immediately after introducing the ventilation pipes, he explained that their purpose was to "spira su" (breathe up, exhale) the fetid odor of the latrines.[129] With this remarkable statement, Filarete assigned the *spiracoli* and *meati* the anatomical function they shared exclusively in *Breaths* and *Sacred Disease*—breathing—not only confirming the Hippocratic origin of the terms but also giving the Ospedale the bodily process that regulated air, the "first instrument" and "vehicle" of the life-giving soul. Equally significant here is that Filarete was not referring to ambient air in general; rather, it was the bodily air of the patients that coursed through the Ospedale's veins. In this way, the hospital partially transcended metaphor and lent credence to the architect's claim that an otherwise inert, material building could be imbued with life.

Similarly, although Filarete did not explicitly say that the hospital-body excreted through its lower canals, it is difficult to believe that this correlation did not occur to him as well. In addition to exhaling real bodily air through its *spiracoli* and *meati*, the building passed real feces and urine through its lower canal. Filarete almost said as much when he stated that inside the hospital, "the mouths [of the latrines] are arranged so that all the waste falls down into the canal where this water is running and washing and carrying everything away."[130] Even his word "canal" (*canale*) here is suggestive, as physicians from Galen to Berengario da Carpi (1460–1530) used *canal* in reference to the body's excretory channels, as in the "urinary canal."[131] Serving as a catch-all term for bodily passages through which substances traveled, *πόρος*/*meatus* often referred in ancient and medieval literature to the channels, ducts, and openings of the excretory system. It was used in this context by Aristotle, Galen, Ibn Sina (Latinized as Avicenna, ca. 970–1037), and Mondino de Liuzzi (ca. 1270–1326) in his *Anathomia* (1317), which in mid-fifteenth-century Italy was still the standard university textbook for dissection lectures.[132] In the medieval encyclopedia tradition, *meatus* specifically denoted the anus. In his *Etymologies* (ca. 625), Isidore of Seville (ca. 560–636) explained that "The anus (*meatus*) is so-called because excrement passes (*meare*) through it, that is, it is

[129] Averlino, 1965, 138 (Lib. 11, fol. 80^{r}).

[130] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}).

[131] See, for example, da Carpi, fol. 20^{v}.

[132] Wickersheimer, 28; Aristotle, 1942, 38–39 (719b29), 444–45 (773a21); Galen, 1907–09, 1:251–52 (book 5, 343), 1:284–86 (book 5, 389–90), 1:291–92 (book 5, 398), 1:297–98 (book 5, 407); 2:2–3 (book 9, 686).

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discharged."[133] Moreover, although Filarete's first use of *meati* was in reference to the Ospedale's pneumatic tubes breathing out the stench of the lower canal, his second (and only other) use of the term was in reference to drainage pipes that ran down through the walls of the hospital church and supplied wells in its foundations. This wider usage of *meati* implies that Filarete, following Filelfo and the Hippocratic and Galenic Corpuses, considered the term to be the genus for all of the Ospedale's bodily passages and therefore more appropriate for physiological functions deeper in the bowels of the building, while reserving *spiracoli* specifically for passages that transported air.

The Ospedale also lived according to the logic of Filarete's alimentary metaphor, in which a building subsisted on continuous upkeep. The architect designed the lower canal "in such a way that if it becomes stopped up, it can be inspected and cleaned."[134] In this scenario it was not the architect acting as the doctor, nurse, and mother, but the actual medical staff of the Ospedale who cared for the hospital-body in addition to the human bodies in the wards. Although keeping the lower canal clean ensured the proper mechanical functioning of the sewers, clearing it "if it becomes stopped up" presented another connection with the body: one of the main arguments in *Breaths* and *Sacred Disease* was that the body's *spiracoli* and *meati* needed to be unobstructed to ensure the free-flowing and even distribution of air, water, and humors.

Finally, the *spiracoli* and *meati* fulfilled the desires of the patron. Sforza tasked Filarete with designing clean and inodorous sewers, and in keeping with the heightened medical attention to bodily health in this setting, the architect responded by bringing the latest medical knowledge to bear on his design. Likely in dialogue with Filelfo and building on Alberti, he learned about the anatomical members identified in the Hippocratic and Galenic Corpuses as being responsible for eliminating corrupted air and excrement from the body, and devised a corresponding, working architectural system of utilities to remove the same putrid substances from the bodies of the patients. In this way he could justifiably claim to have created a living and breathing architectural body. Additionally, this body incorporated the building and the people inside it into one integrated mechanism of reciprocal medical care. The patients evacuated their corrupted excrement and odor into the mouths of the latrines, while the hospital-body consumed the patients' waste and eliminated it through its excretory veins and passages. The hospital staff, meanwhile, attended to the bodies of the patients and building, nourishing the entire organism with life-sustaining care.

[133] Barney, Lewis, Beach, and Berghof, 238.

[134] Averlino, 1965, 138 (Lib. 11, fol. 79^{v}).

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HOSPITALS, CHURCHES, AND THE *CORPUS MYSTICUM*

For a fuller understanding of the relationship between Filarete's hospital-body and its occupants, it is necessary to delve deeper into the system of care that was implemented in the hospitals of late medieval and early modern Italy. Central to this system was the role of hospitals as fundamentally religious institutions whose ethos, architectural layout, and administrative structure were loosely modeled on monasteries, long-established centers of social relief.[135] In this predominantly spiritual setting, the practical work of the earthly physician (*medico fisico*) was fused with, reinforced by, and superseded by the curative power of Christ (*medico spirituale*).[136] At the core of this medico-spiritual approach was the Christian translation of Hippocratic and Galenic medical theory. Since Saint Augustine (ca. 340–430), the church had maintained that in paradise Adam and Eve possessed a perfect balance of humors, but that original sin destroyed that prelapsarian equilibrium by allowing disease, the virus of sin, to enter the world.[137] In patristic as well as later theological and popular religious literature, sin was therefore described as the cause of all disease, whether corrupting the body from within via evil "accidents of the soul" (*accidentia animae*) or making it more vulnerable to dangerous environmental agents, including miasma.[138]

Because the act of eating brought sin into the world, the excretory organs of the body were those most closely associated with evil, while the substance they produced, excrement, was believed to be the physical embodiment of sin.[139] As the location where excretion took place, the latrine was identified in late medieval and early modern Europe with the chthonic domain of the devil, where Satan could inflict pain, tempt people with sinful thoughts and behaviors, or alternatively be cast back "into the sewers of hell" (fig. 19).[140] For the same reason, images of hell often showed the wicked being devoured by the devil (or Hellmouth) and defecated into the custody of demons (fig. 20).

If original sin was the wellspring of all disease, then it followed that Christ, the savior brought into the world to absolve humankind of sin, could heal all disease. In the Gospels, Christ's healing miracles are described as manifestations of his power to absolve sins or reward the sick for their abiding faith. In patristic literature, biblical commentaries, and homilies on the same episodes, Jesus and

[135] Henderson, xxvi–xxix, 11–12, 28–33, 36–38, 49–80, 132–33, 135–40, 179, 221; Welch, 125–26; Rawcliffe, 1998.

[136] Henderson, xxix–xxx, 69; Horden, 2007, 141.

[137] Ziegler, 209.

[138] Sotres; García-Ballester, 105–15.

[139] Bayless, 98–163.

[140] Bayless, 133.

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Figure 19. John Harington. "A godly father sitting on a draught" (with devil backing in), from John Harington. *A New Discourse of a Stale Subject, Called the Metamorphosis of Ajax*. London: 1596, fol. 6ʳ. Washington, DC, Folger Shakespeare Library. Published under the Creative Commons Attribution-ShareAlike 4.0 International License.

his ministry were described in medical terms. From the writings of Augustine and John Cassian (360–435) to the Dominican friar Domenico Cavalca's (ca. 1270–1342) popular *Lo specchio della croce* (The mirror of the cross; also known as the *Medicina del cuore*, Medicine of the heart, ca. 1333), Christ assumed the role of *Christus Medicus*, the almighty physician and ultimate healer of

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Figure 20. Giovanni da Modena. *Inferno*, detail, 1410. Fresco. S. Petronio, Bologna. Scala / Art Resource, NY.

everything.[141] In emphasizing the centrality of the mass, the Fourth Lateran Council (1215) decreed that healing the soul was a precondition for the recovery of the body (Canon 22), and that communion and confession corrected humoral imbalances (Canon 21).[142]

Within this spiritual framework, the hospital director was normally a priest and regarded as the main "doctor,"[143] while additional priests administered a liturgical regimen of the sacraments (*medicina sacramentalis*) to cleanse patients' souls of sin.[144] As described in textual and visual sources, such as di Bartolo's *Care of the Sick*, patients took confession to purge their souls of impurities upon arrival, regularly throughout their stay, and before death (fig. 17).[145]

[141] Henderson, 113–17, 330, 335.

[142] Hamilton, 5, 7, 10; Horden, 2007, 141.

[143] Henderson, 36, 38, 58, 80, 186–221.

[144] Yoshikawa, 72–73.

[145] For the following discussion, see Henderson, 58, 163–68, 177, 253; Horden, 2007, 141–43.

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After arrival, they were taken "to greet the Body of Christ"—that is, receive the Eucharist, the embodiment of Christ's living presence and soul and first material form of medicine.[146] The patients' bodies were then deloused and their feet washed in a basin, recalling Christ at the Last Supper. Depending on the urgency of the condition, patients were dressed in robes based on monastic clothing and either taken to the infirmary or a bed in the ward. Before death, finally, they were given unction. This liturgical routine was reinforced by the regular celebration of mass in both the hospital church and wards.

The sacraments were part of a wide range of activities in which patients consciously used the operations of their souls, including the senses but also bodily functions like speech during prayer and confession, to take in the healing presence of Christ.[147] Particularly efficacious was viewing the body of Christ in the form of an image or the Eucharist, which, based on the theory of visual intromission most fully articulated by Ibn al-Haytham (Latinized as Alhazen, 965–ca. 1038), was believed to invite Christ directly into the soul.[148] Although the salvific value of the practice was debated by theologians, individuals who were unable to ingest the sacramental species during mass could receive the Eucharist by looking at it.[149] This was one of the reasons why altars in hospital wards were placed where all patients could see them, either at the end of hall wards or at the center of cruciform ones. As shown in studies of Matthias Grünewald's (1470–1528) Isenheim Altarpiece (1512–16) and in more recent analyses of the pictorial decoration of S. Maria Nuova, S. Maria della Scala, and S. Spirito in Rome, Crucifixion and Man of Sorrows scenes encouraged patients to identify somatically with Christ's physical suffering and death, and to be emotionally comforted that their own physical torment would bring spiritual salvation.[150] Often made the patron saint of hospitals, Mary also featured prominently in depictions of the Annunciation and Coronation, which emphasized the incarnation and the Virgin's bodily assumption and triumph over death.[151] Especially for hospital staff, these scenes also stressed the Virgin's roles as the caring mother of Jesus famous for her healing powers, an embodiment of spiritual purity, and a model of the compassionate nurse.[152]

As sacred spaces where people received the sacraments and interacted bodily with Christ and Mary, hospitals took on the spiritual associations of the

[146] Henderson, 163.
[147] Yoshikawa; Horden, 2007; Karmon, 140–76.
[148] Stearns, 91–105.
[149] Rubin, 147–55.
[150] Hayam; Orlandini; Presciutti.
[151] Henderson, 168.
[152] Henderson, 77, 115–17, 121, 130–33, 143–44, 173; Horden, 2007, 143.

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Christian church. Particularly important in this regard was the image of the mystical body of Christ (*corpus mysticum*), understood as the living body formed by the union of Christ (its head) and the faithful (its members) and nourished by the Eucharist.[153] As Saint Paul put it: "Do you not know that your bodies are members of Christ?" (1 Corinthians 6:15), and "now you are Christ's body" (1 Corinthians 12:27).[154] In this corporeal image, the faithful are "members of the household of God" (Ephesians 2:19), where Christ:

> gave some as apostles, others as prophets, others as evangelists, others as pastors and teachers, to equip the holy ones for the work of ministry, for building up the body of Christ, until we all attain to the unity of faith and knowledge of the Son of God, to mature manhood, to the extent of the full stature of Christ, so that we may no longer be infants . . . . Rather, living the truth in love, we should grow in every way into him who is the head, Christ, from whom the whole body, joined and held together by every supporting ligament, with the proper functioning of each part, brings about the body's growth and builds itself up in love. (Ephesians 4:11–16)

In late medieval consecration ceremonies, such as the one described by Abbot Suger (ca. 1081–1151) at St. Denis, the church building was cast as the house of the Lord (*domus Dei*, *domus Domini*; Genesis 28:17–22); a conduit between the temporal and spiritual realms; and the physical manifestation of the mystical body of Christ whose members are bound together in Eucharistic community.[155] The same ideas were elaborated in allegorical writings, especially Durandus of Mende's (ca. 1230–96) frequently copied *Rationale divinorum officiorum* (Rationale for the divine offices, ca. 1291–96), his treatise on liturgy and the spiritual significance of the church building.[156] Durandus argued that cruciform churches signified the body of the crucified Christ, the body of all believers, and their mystical union.[157] Reflecting the importance of this exegesis for the care of the sick, he combined the anatomy of the cruciform church building with the bond of charity. Not only was the chancel the head, the transept the arms and hands, and the sacrifice of the altar the vows of the heart, but also the lime, sand, and water in the cement that

[153] De Lubac.

[154] Biblical translations are taken from the New American Bible, revised edition, published by Oxford University Press in 2011.

[155] Meyer, 81–97; Smith and O'Connor, 255–68; Anderson, 23–52.

[156] Thibodeau, 11–25 (book 1, chapter 1, parts 1–51); Meyer, 81–97.

[157] Thibodeau, 14–17 (book 1, chapter 1, parts 8–17).

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held everything together was the care of widows, the elderly, infants, and the infirm.[158]

As the primary loci of Christian charity, late medieval hospitals across Europe were understood in the same theological terms. They were often referred to as and named "hotels of God" (hotel Dieu) and "houses of the Lord" (*domus Dei*, *domus Domini,* God's house, *ca' di Dio*, *godshuis*).[159] They were also regarded as embodiments of the *corpus mysticum*. As suggested by Thomas Aquinas (ca. 1225–74), who argued that the *corpus mysticum* could be afflicted with "noxious humors" because it "dwells in the midst of a corrupt people," hospital patients were seen as corrupted members of Christ's mystical body.[160] In this body, patients were rehabilitated by Christ in the sacraments and by the hospital staff through works of mercy, derived from Jesus's words in Matthew 25:34–40.[161] The weight of these beliefs in hospital wards is demonstrated by the *ad status* sermons of the French canon and chronicler Jacques de Vitry (d. 1240), who preached in hospitals across Europe and the Near East.[162] In one sermon, de Vitry reassured nurses that in helping the sick poor they were "refreshing Christ in his members every day, choosing to be abject in the house of the Lord (*domo domini*), that is, in a hospital."[163] "Spiritually," he continued, "it is said that you are the mother of Christ for whom you feed and nourish Christ in his members," thus alluding to the nurses' imitation of Mary in maintaining the mystical body of Christ in its head (Christ) and members (the church).[164] The same associations between nurses and saints, and Christ and hospital patients, were common in Italy. The statutes of S. Maria Nuova referred to nurses as "saintly" individuals moved by the Holy Spirit.[165] They were admonished to receive Christ's poor as if greeting "Christ himself," for they were "almost like Christ in their persons," recalling the popular image of Christ the pilgrim.[166] In Italian churches, charitable confraternities, and hospitals, the *corpus mysticum* was often employed as a pictorial convention to portray nurses and their acts of mercy as part of a larger civic or institutional embodiment of charity (fig. 21).[167]

[158] Thibodeau, 14–15 (book 1, chapter 1, part 10).
[159] Risse, 69–165.
[160] Bayless, 154–56.
[161] See also Psalms 41:1; Botana, 2; Courtenay, 86–87; Davis, 190–200.
[162] Davis, 198–200.
[163] Davis, 199.
[164] Davis, 199.
[165] Henderson, 36.
[166] Henderson, 58, 161–62, 198. See also Courtenay, 84, 86–87.
[167] Botana, 149–95.

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Figure 21. *Allegory of Mercy*, 1342–52. Fresco. Museo del Bigallo, Florence. HIP / Art Resource, New York.

The status of hospitals as houses of the Lord and embodiments of the *corpus mysticum* was further reinforced through the architectural imitation of churches, which in addition to the sacraments and related spiritual remedies immersed patients in the healing presence of Christ. The ends of medieval hall wards exhibited apses with centralized altars for the celebration of mass (fig. 22).[168] In Rome, Pope Sixtus IV (1414–84) drew an architectural connection between his

[168] Thompson and Goldin, 15–40; Courtenay, 77–106.

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Figure 22. Hospital of Notre Dame des Fontenilles, interior, 1293. Tonnerre. Author's photo.

hospital of S. Spirito in Sassia (1474–82), St. Peter's, and the Temple in Jerusalem (fig. 23).[169] The connection was made particularly close in the cruciform hospitals that appeared in Italy around the same time. At the Ospedale Grande in Mantua (begun 1451), one of the two cruciform hospitals in Italy that predated Filarete's Ospedale, the ward was physically combined with the church of S. Maria del Consortio, which was located in the crossing.[170] The same arrangement was observed at the cruciform Ospedale Maggiore in Parma (begun 1476) and Hospital Real de Todos-os-Santos in Lisbon (begun 1492), where churches occupied one arm of the cross ward, their apses serving as the crossing from which the three other arms extended.[171] Often merged with consecrated churches, then, the cruciform plan of these hospitals undoubtedly evoked the salvific image of the suffering body of Christ on the cross as discussed by Durandus and many others, which all patients could visually take into their souls from their beds.[172] The German architect Joseph Furttenbach (1591–1667), who lived in Milan for two years and called Filarete's Ospedale

[169] Keyvanian, 339–52; Onians, 195–200. See also Heinrichs.
[170] Franchini, 50.
[171] Franchini, 50; Abdon.
[172] Franchini, 35–37; Thompson and Goldin, 34; Henderson, 153.

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Figure 23. Corsia Sistina, interior, S. Spirito, Rome, from Pierre Saulnier. *De Capite Sacri Ordinis Sancti Spiritus Dissertation*. Lyons: 1649, unnumbered leaf. London, Wellcome Collection.

"the principal hospital of all Italy," described the intended experience.[173] Referring to his unrealized design for a Latin cross hospital, he argued that the building was to be envisaged as Christ on the cross, who:

[173] Thompson and Goldin, 37.

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> stretches out his merciful arms over the beds of the suffering, he who shares his merciful heart in the presentation of the Mass, the altar at the crossing being placed right at the heart, and in the place of the upper altar bends his holy head toward Christianity, the upper altar standing where his head would rest. Thus we may see in this hospital building a lovable figure and be reminded constantly of the suffering and death of our own Savior and the one who made us holy.[174]

Furttenbach thus conceived his cruciform hospital as an architectural manifestation of a therapeutic, mystical body of Christ (fig. 24). Inside the body, patients were to purify their souls by ingesting the Eucharist and looking up at the healing image of the savior in the cruciform shape of the ward around them. Spatiovisually, somatically, and emotionally, patients were enveloped by the redemptive power of Christ's suffering and death.

FILARETE'S MYSTICAL BODY

Alongside Hippocratic and Galenic medical theory, Filarete situated his anthropomorphic description of the Ospedale in the same spiritual context. In the first mention of the hospital in the *Libro*, on page one, he introduced the building as "the glorious hotel of the poor of God," immediately placing the monument in the tradition of the great houses of Christian charity throughout Europe.[175] Like Alberti in *De Re*, he then positioned his discussion of hospitals (specifically the Ospedale) immediately after the sections on churches and monasteries and used the building type to call attention to the beneficence of his patron. The description of the Ospedale began with the claim that the prince was concerned above all with the welfare of the sick, and ended with an account of the "solemn procession" led by "the archbishop and all the clergy" that marked the building's foundation.[176]

Moreover, Filarete made it clear that Christ and the Virgin presided over the Ospedale's system of care. He declared that "the hospital was to be built in the name of Christ and of the Virgin Annunciate," and discussed a variety of features that announced their healing presence.[177] At the front gate, he planned to erect a marble boundary stone displaying a sculpted "image of the Virgin Annunciate."[178] Although no record of the work survives, he illustrated it in the form of an Annunciation group perched atop a pedestal decorated with

[174] Thompson and Goldin, 37.
[175] Averlino, 1965, 3 (Lib. 1, fol. 1^{r}).
[176] Averlino, 1965, 144 (Lib. 11, fol. 83^{v}).
[177] Averlino, 1965, 144 (Lib. 11, fol. 83^{v}).
[178] Averlino, 1965, 146 (Lib. 11, fol. 83^{v}).

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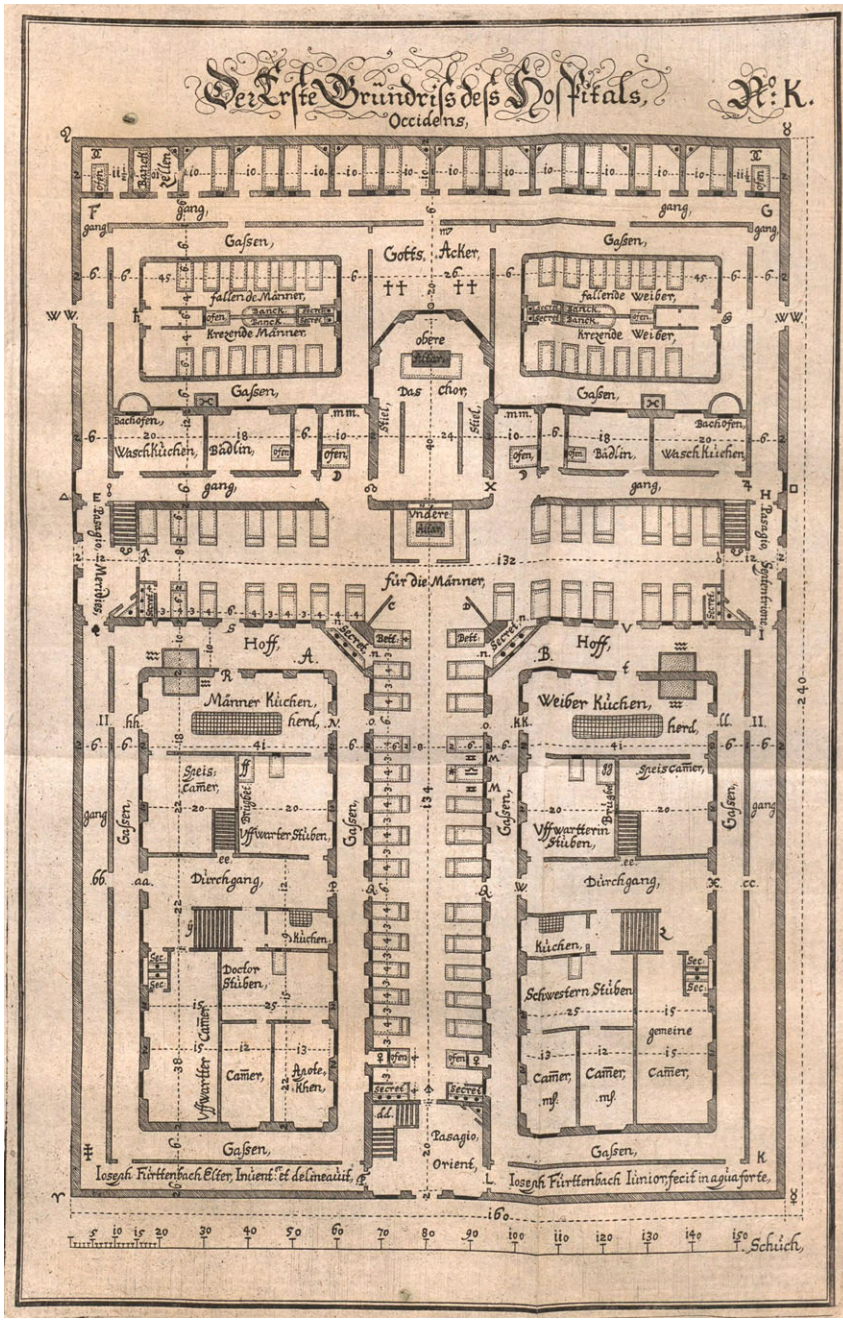

Figure 24. Joseph Furttenbach. Plan of Latin cross hospital, from Joseph Furttenbach. *Hospittals-Gebäw*. Augsburg: 1655, 12. Munich, Bayerische Staatsbibliothek.

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personifications of the four seasons (fig. 25). Similarly, he envisioned a sculpture of the same subject at the main entrance of the hospital. Drawn directly below the boundary stone, this work showed the archangel Gabriel and Virgin Annunciate flanking the stairs of the main doorway (fig. 25). Consistent with these representations, Filarete noted that "Pope Pius granted a pardon from sin and suffering" at the central altar in the crypt of the hospital church on the Day of Annunciation, 25 March 1460.[179]

Furthermore, in the section of the *Libro* on churches, Filarete connected the cruciform plan to Christ on the cross. Answering the prince's question as to "why the greater part of churches are made in [the form of a] cross," Filarete explained: "Since the coming of Christ, this form has been used through reverence to Him, because he was placed on a cross."[180] Over the course of the treatise, Greek cross churches emerge as Filarete's preferred type, as seen in the Cathedral of Sforzinda.[181] At the Ospedale, he not only included a Greek cross church in the central "cloister," but also called attention to its spiritual affinity with the cross wards (fig. 3).[182] In addition to noting that the wings of the church and wards were aligned, he indicated that the altar in the crypt of the church, where "Mass is said every Monday for the souls of the dead," was "exactly in the middle like the one in the cross where the beds are," "where Mass is celebrated every morning."[183] In placing the altar in the middle of the cross ward, Filarete also knew he was facilitating the visual healing of patients. "All the sick people here can see [the mass]," he pointed out, "because the altar is exactly in the middle of the cross."[184]

Filarete's association of the cruciform wards with Christ and the true cross is all but confirmed by one of the Ospedale's earliest directors, Prior Giovanni Giacomo Gilino (1490–1508). Upon completing his tenure, Gilino wrote an exhaustive report to the Deputati on virtually every aspect of the institution, which included fifty-four brief chapters on its history, administration, system of care, and architecture, all fronted with an image of the hospital surmounted by the Annunciation.[185] In the chapter on architecture, he stated that the male ward was "divided in the sign of the healing cross," proclaiming his belief that the cruciform ward signified the cross on which Christ was crucified and healed

[179] Averlino, 1965, 141 (Lib. 11, fol. 81^{v}).
[180] Averlino, 1965, 83 (Lib. 7, fol. 48^{r}). See also Franchini, 35–37.
[181] Averlino, 1965, 74 (Lib. 11, fol. 43^{r}).
[182] Averlino, 1965, 140 (Lib. 11, fol. 80^{v}).
[183] Averlino, 1965, 140–41 (Lib. 11, fols. 80^{v}–81^{v}).
[184] Averlino, 1965, 140 (Lib. 11, fol. 81^{r}).
[185] Cosmacini.

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Figure 25. Filarete. Boundary stone and entrance stair of Ospedale Maggiore, *Libro architettonico*, ca. 1460–66, detail, fol. 83v. With permission from the Ministero della cultura/ Biblioteca Nazionale Centrale, Florence.

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those in view of it.[186] According to Gilino, moreover, the Ospedale was part of a *corpus mysticum*. Discussing the Ospedale's function as the administrative center of a new network of Milanese hospitals, he observed that there were:

> many members, which are the nine hospitals, with one head, which is the Ospedale Maggiore, in which all of the Deputati must be like good fathers of the family by imitating nature, in which living things, in helping and sustaining their diverse members, have only one opening for food and from there distribute nutrition to all its members by way of digestion; in this form the Ospedale Maggiore prepares the universal needs for all of the poor in these places.[187]

Echoing Filarete's anthropomorphic conception of the Ospedale, Gilino saw the hospital as the Christ-like head of a living organism incorporating Milan's major hospitals, the mouth through which healing nourishment was distributed to its members by means of spiritual digestion. In subsequent chapters, he seemed to connect this spiritual image to other features of the building, similarly bringing to mind Filarete's ideas. The male ward was built "with subterranean canals and aqueducts in the sides of the wall to cleanse (*ad purgatione*) the sewers," which were continually maintained by an architect and engineer.[188] In addition to earthly medicines given by doctors, all patients were attended by two devout priests who never abandoned them and administered the sacraments "until their last breath."[189]

Given that Filarete grounded his description of the Ospedale in this spiritual tradition as well as in medical theory, it fits that both discourses played into his design of the building. The spiritual association between hospitals, churches, and the *corpus mysticum* was already widespread in Europe by the thirteenth century, and the evocation of Christ's suffering body was very likely one of the main reasons why the cruciform ward was employed in Italian hospitals prior to the Ospedale and subsequently adopted across Europe. Beyond establishing a compelling model of the type, Filarete built on this religious foundation with his own imaginative combination of urban waste management and medicalized architectural theory, the emphasis of his lengthy description of the Ospedale in the *Libro*. Fulfilling Sforza's, Reguardati's, and the Deputati's epidemiological request for odorless sewers, he offered a Hippocratic and Galenic interpretation of the long-standing reputation of

[186] Cosmacini, 167, 169. See also Franchini, 35.
[187] Cosmacini, 169.
[188] Cosmacini, 169, 174.
[189] Cosmacini, 175.

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hospitals as church-like hotels of God. The result was the construction of an architectural being that made a physical and emotional connection with its viewers. Imitating the body and soul, Filarete infused the structure with life, creating a "truly" living and breathing, physiologically functioning organism of religio-medical healing that worked in tandem with the bodies and souls inside it.[190] The saintly staff maintained the health of the Christic hospital-body by cleaning and caring for its members, both the patients and the building itself. Concomitantly, the patients forged a bond with Christ by gazing at the healing cross around them and evacuating their evil excrement and its hellish stench into the mouths of the latrines. In conjunction with the sacraments, sacred imagery, and the cruciform plan, the hospital-body eliminated the patients' sinful waste through its vascular *spiracoli* and *meati*, cleansing the souls of its corrupted members. Offering a medical translation of long-established spiritual and architectural traditions, Filarete breathed new life into the architecture of early modern Italy.

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[190] Averlino, 1965, 12 (Lib. 1, fol. 6ᵛ).

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