

Chapter 4

Under Philadelphia, Infrastructural Gigantic

Below the streets of Philadelphia and normally invisible to those above lies a maze of utility lines, trolley tracks, sewers, privies and buried foundation walls unseparated by archaeological strata. In its working depths, Philadelphia's underground realm, like all cities, collects past and present in a simultaneous history that recalls Sigmund Freud's city of the psyche, a compressed Rome in which memory and myth are impossibly merged.

Underground utility systems make simultaneous what in nature is dispersed, collecting almost elemental substances from sources far away into an unnatural proximity below the street: water, electricity, and natural gas.¹ Their industrial history also is compressed below the pavement in networks of tunnels, pipes, and wires that are built continuously so old and new elements coexist. Philadelphia's Department of Highways maintained maps of the underground but stopped revising in 1989 so entire systems such as cable TV are now unknowable to the public. A telephone number, prefaced with the request, "Call before you dig," locates underground utilities through a computerized network, but maps are held by private utility companies as proprietary knowledge. Each utility maintains its own network and has its own manholes in the street for access, so Second Street at Headhouse Square, for example, is pockmarked with manhole covers (24 at one intersection) and often disrupted by utility work. The increasing complexity of infrastructure further obscures the urban underground so that it is not completely knowable even to workers. Lines under Headhouse link with invisible networks throughout the city and beyond, giving lie to discrete buildings within discrete property lines above. Infrastructure has progressively remade urban geography to separate citizens from the physical ground below while uniting them through utility lines, making geographic proximity less significant than network links. At the same time, infrastructural systems increasingly define the urban landscape both above and below the ground. The rules of measure that govern architecture are largely irrelevant to infrastructure, for each system has its own dimensions of distance in terms of speed such as gallons per minute (water), amperes (current), cubic feet per minute (natural gas), and bps, bytes per second.

The current mix of underground utilities and historical debris has accrued slowly since Philadelphia's founding. Architects and engineers charged with designing the city's infrastructure and novelists who explored its character have modified the ground underfoot and interpreted it with allusions to classical metaphor and to the body. Their cumulative work persists in the mix of conduits, ruins, and collective memory, into which contemporary architects must dig when they build.

The subterranean environment has always been a mythically dark, corporeal place. The earth has long been described as the source of all life and resting place in death, secure shelter and clandestine hiding place. Archaeologists dissect the earth as coroners dissect the body, sifting through the past. "It is underground that old men scratch for knowledge, gold and death."² Both womb and tomb, the earth is the body of



Figure 1. Map of historical streams compared to existing streams in Philadelphia (Philadelphia Water Department).

Gaia and the kingdom of Pluto, for digging is integral to civilization. Cutting the earth with plow or coulter to cultivate crops precedes urban culture and digging, for building, for water, for waste disposal, and for burial defines the extent of settled life. The gods of the underworld are gods of work and of wealth. Vulcan draws iron from the heat of his forge to shape weapons or tools, and “Pluto” means “plenty.” Foundation comes from Latin, *fundus*, meaning the base or bottom, from which we get “fund,” so founding and funding are intimately tied. The modern city also finds its roots underground. Early coal mining required an almost military organization of labor to excavate fuel from dangerous depths. Mining companies developed railroads for transporting earth and coal, as well as elevators, ducted air systems, and artificial lights, which were forerunners of modern building systems.³

In Philadelphia, the paradox of an underground that is at once nurturing and fearful emerged in the uneasy proximity of urban wells and privy pits, two holes dug in the ground, one a vital source and the other a vile dump. An eighteenth-century Philadelphia law governed the depth of both wells and privies to insure that water would be drawn from a deeper strata than waste deposited, the two separated by a fortuitous layer of clay.⁴ When the ground proved an imperfect barrier, wells and privies were replaced by networks of supply, then drainage pipes that carried water from afar and conveyed waste to the rivers to be carried away. For Philadelphia as for many cities, the introduction of piped water signaled an urban maturity that required a shift in metaphor, redefining the city as an anatomical body sustained by a circulatory system.⁵ A baroque tradition in city planning holds that a healthy city, like the vigorous body of a young man, had a system of viaducts that carried water, people, and goods.⁶

The body metaphor proved durable, though the tone shifted with age. Writing in the 1980s, novelist John Wideman described Philadelphia’s subway system as alimentary rather than circulatory. He described riding the train under Broad Street as an intestinal journey through the stinking guts of a giant who groans with the passage of the train. In Wideman’s narrative, Philadelphia’s body is not that of a beautiful youth but a behemoth,

drunk and sprawled on his back, the “rough contours of his body smothering the rolling landscape, the rivers and woods, hills and valleys, bumps and gullies.”⁷ Like an aging Gulliver strapped down by the lines of its infrastructure, the city presses the natural landscape down to merge with it underground. In the course of the nineteenth century, most of Philadelphia’s streams were enclosed in culverts, which became the main lines of its sewer system (Figure 1). Streambeds were often covered with a layer of fill deep enough to level the topography above so property could be platted in a regular grid and attached by capillaries to a drainage system embedded in the contours of the pre-existing landscape.⁸ The progress of enclosing streams marked the progress of development as the city stretched out across increasing amounts of territory, pressing down to absorb its natural watershed into an engineered system.⁹

The form of Philadelphia as a whole and Headhouse Square in particular parallels the development of subterranean infrastructure, stroke for stroke. Innovations and compromises in engineering the underground systems governed the locale of buildings above and influenced the contours of development. Each major change below ground was also reflected in a change in the metaphors with which the city’s architects, novelists and playwrights described the underground.¹⁰

The Body of the City

The health of a human body and that of an urban body have long been linked by analogy as they have been linked by infrastructure. In a treatise on endemic diseases, “The Book on Airs, Waters and Places,” Hippocrates advised medical doctors to know of the places where their patients live, the seasons and orientation of their cities and the habits of the people.¹¹ His words were echoed in the Constitution of the Philadelphia Academy of Medicine established in 1799 under the press of repeated yellow fever epidemics. “To collect materials for a general history of the diseases of our country, to mark those diseases and their modifications, accompanying the several seasons of the year, the different situations of places, the various occupations of men, and their modes of life.”¹² The health of citizens was contingent on the city’s physical situation. The condition of their bodies mirrored that of the water and soil of their locale.

In the eighteenth century, the health of Philadelphians intimately reflected that of their locale for they drew water from either private wells in their yards or public wells along the street, and deposited waste nearby. A contaminated well could affect all adjacent households.¹³ The health (and wealth) of neighborhoods was also defined by their proximity to tidal creeks off the Delaware River, which interrupted the regular grid of Penn’s plan with miasmic marshes. Mosquito-borne yellow fever and many gastric illnesses were attributed to bad air rising from rotting material in swamps.

For example, Dock Creek, an inlet just north of Headhouse Square, interrupted Second Street, cutting it off from the center of the city. Dock Creek had been an early harbor and the city’s first tavern stood on its banks, yet even by 1699 the slough could not flush the waste being dumped into it. Several tanneries had opened at the top of the inlet, adding offal that turned the creek into an open sewer. The city seemed powerless to remove the tanners and by the mid-eighteenth century, the reputation of the area as an unhealthy place created a formidable barrier between the central market on High Street and the residential areas south of Walnut Street.

In the 1740s after an outbreak of palatine fever and diphtheria, citizens petitioned the Common Council of Philadelphia to fill in the foul marsh at Dock Creek. In response, the city filled in the upper portions of the inlet, the first of several projects to enclose Dock Creek (Figure 2).¹⁴ City mayor Edward Shippen, who heard the complaints from citizens, was also an entrepreneur. He convinced the city council to widen Second Street in 1745 so he and Joseph Wharton could build a new market at Headhouse Square. Apparently, he recognized the relative isolation of the neighborhood south of the creek as both a civic and a business opportunity. Shippen and Wharton also specified that the street be wider than High Street to relieve congestion and allow airflow, a precaution that grew out of the same fear that still air close to the ground might harbor pestilence.

Philadelphia's Water Supply

By the 1790s, most of Dock Creek had been enclosed in a sewer under a new Dock Street, yet periodic epidemics of typhoid fever and diphtheria did not abate and were joined by summers of yellow fever. Under a full-blown health crisis, city authorities finally bent to the popular belief that the city could be cured only by abandoning groundwater from wells and piping in abundant pure river water to drink, cleanse the streets, and purify the air with fountains. A Watering Committee appointed by the Common Council of Philadelphia cited the will of Benjamin Franklin, which recommended clean river water be brought into town.¹⁵ The committee was charged with building the city's first infrastructure, which implicitly required a shift in the definition of the urban body. First, the committee had to convince citizens that they could trust public water enough to close cisterns and wells on their own property. Secondly, bringing water from outside makes the city feel vulnerable, for it must depend on a single supply line that crosses the city boundary to extend out into the countryside. Theorist Ivan Illich notes that the points where aqueducts entered the ancient city of Rome were considered 'indiscrete' places that broke the urban boundary and required specific attention. The danger and heroism of entry were recognized architecturally by public fountains, each of which celebrated the particular quality of the waters they offered.¹⁶

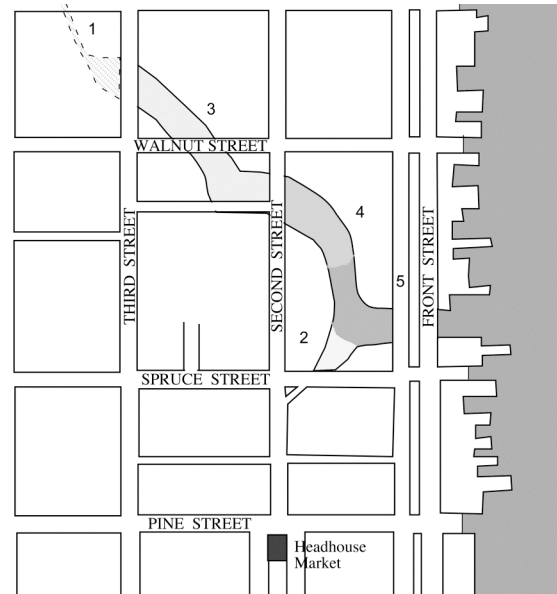


Fig. 2 Sequential Closing of Dock Creek (Cotter)

- 1. Head of the Swamp, presumably filled during block development**
- 2. Closed by 1757**
- 3. Closed 1763-69**
- 4. Closed 1784**
- 5. Closed 1818-21**
- 6. Closed after 1821**



Figure 3. Central Pumping Station designed by Benjamin Latrobe in 1800, engraving by A. B. Walters after John James Barralet, 1860 (Library Company of Philadelphia)

In Philadelphia, the press of a particularly severe epidemic in 1798 moved the Watering Committee to enlist engineer Benjamin Henry Latrobe to design and build a water system.¹⁷ Latrobe proposed to deliver water using a series of steam-powered pumps, considered a new and risky technology. He convinced the committee that the system could supply an ‘inexhaustible quantity’ of clean water for drinking, street cleaning, and fighting fires,” promising to assuage both disease and fire, the two potentially devastating threats to urban life.¹⁸

By 1800, Latrobe had built massive wood-fired steam pumps to lift water from the Schuylkill River to a holding basin from which it flowed through wooden pipes under Chestnut Street to Center Square. There, a second pump lifted the water into a small cistern under the dome of a classical building elevated sufficiently that gravity could carry water to hydrants in most of Philadelphia’s main streets.¹⁹

Latrobe’s design of the water system engaged the city metaphorically as well as physically to reassure the public and reinforce the promise of health. He summoned the metaphor of the city as a body compounded with the traditionally dichotomous metaphors of the underground to give the system mythic resonance. In design, Latrobe suppressed and almost hid the place where Schuylkill water entered the city, choosing not to mark it architecturally, thus downplaying the collective risk. Rather, he celebrated the main pumping station in Philadelphia’s Center Square, the geographic center of the city as laid out by William Penn. Latrobe’s design made reference to the tradition of the center as the city’s *mundus* or hell’s mouth that opened to the underworld, images that would have been familiar to an educated populace (Figure 3). He enclosed the steam engine and cisterns in a small classical temple surrounded by gardens and a fountain graced by a

sculpted figure of the nymph of the Schuylkill. Within the idiom of the garden miniature, the temple traced the vertical axis between the bodily underworld and sky by crowning the square base with a circular drum and dome. As if from Hades, smoke rose from the top of the dome into the sky to make clean water surge forth from the navel of the city, offering deliverance from disease and fire.

At the moment when the ground below Philadelphia no longer offered sustenance, Latrobe's heroic machines reified the ancient metaphor of the generative earth while pointedly misrepresenting the real source of the water. The fire-driven, iron pumps were cast as sublime and quasi-natural mechanisms, as if forged by Vulcan, stoking fire to draw water at the city's *mundus*, where tradition located an opening to the underworld. In Penn's plan, Latrobe recognized a symbolic structure descended from Roman urban structure that linked the body of the city to the body of the earth, then used it to bless Philadelphia's water supply.²⁰

Latrobe's water system performed as promised although the steam engines proved temperamental and expensive. Clean water from the relatively un-populated Schuylkill watershed greatly reduced water-borne disease. Reliable piped water also mitigated yellow fever by reducing the need for rainwater cisterns and shallow wells that had been breeding grounds for mosquitoes. Philadelphia suffered its last major outbreak in 1821. Water hydrants along the streets also made fire fighting significantly more effective, giving rise to a number of engine companies throughout the city.²¹

The new water supply and growth of the city changed the status of volunteer fire brigades from genteel dinner clubs, which met in rented halls, to city-funded organizations. As the source of water changed from private wells to public utility, fire fighting was also redefined from private companies that served only subscribers to a public service. For example in 1805, shortly after Latrobe's water system was completed, the city built the brick Headhouse at the head of Second Street market as a firehouse to serve the district.

By 1812, Philadelphia's Watering Committee sought ways to mitigate the costs of fuel and the increasing interruptions caused by engine problems. Engineer Frederick Graff, who had run Latrobe's system since 1805, implemented several changes that modified Philadelphia's waterworks both physically and symbolically.

Graff moved the intake a mile upstream to a point above the reach of tides and had a large reservoir dug on top of Morris Hill (currently Fairmount Hill, the site of the Philadelphia Art Museum) from which water flowed down into the city pipes. To lift the water from river to reservoir, he built massive wood burning, high-pressure, steam engines housed in a federal style house similar to other houses along the river, as if to conceal it. By 1821, Graff had abandoned steam power in favor of a milldam and waterwheel to drive pumps to lift water. This time, rather than cloak the mechanism, he celebrated it architecturally with series of graceful Greek temples adjacent to the original house, which instantly became one of the most attractive features of the city, an acropolis on the Schuylkill (Figure 4). Graff's classical buildings cast a new set of allusions that relocated the symbolic source of water definitively away from the city's *mundus* to its edge. Graff no longer summoned the kingdom of Pluto to support his machines or to testify to the purity of the water, rather he cast the waterworks within a picturesque image of temples in a natural garden, or in this case, a verdant riverbank. His acropolis celebrated the threshold, where water was transformed from a wild, natural substance to a

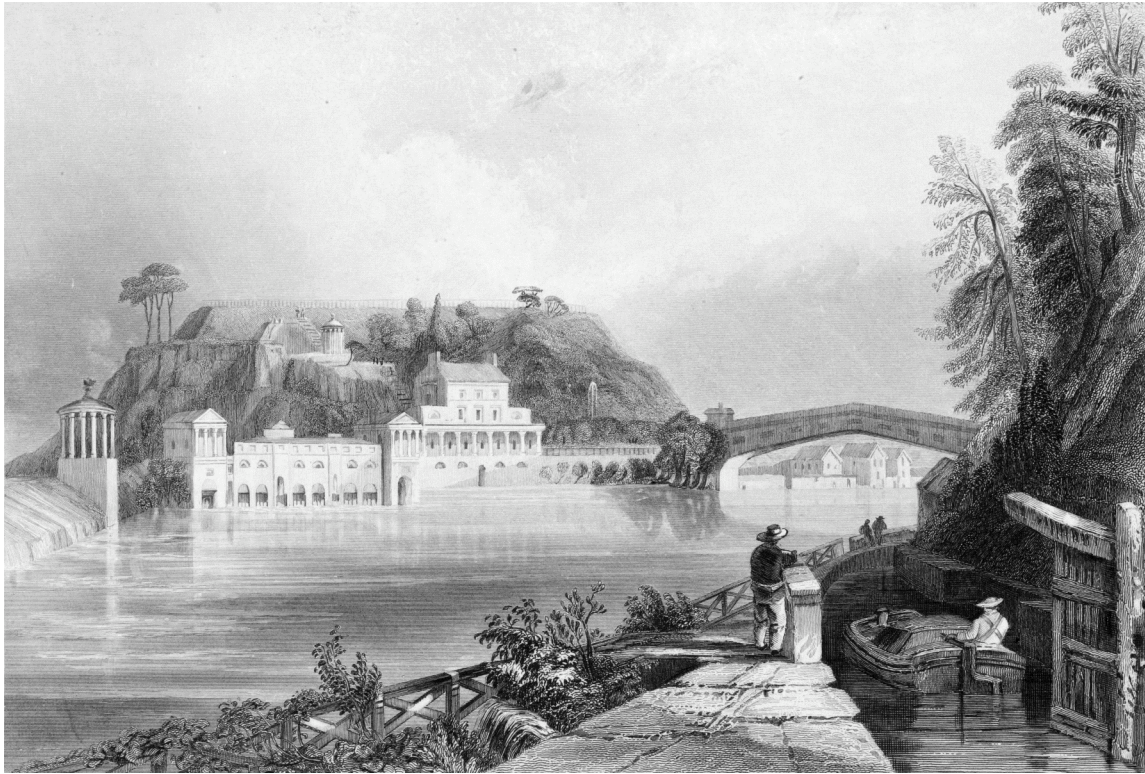


Figure 4. Frederick Graff's Waterworks, engraving by W. H. Bartlett, 1843 (Library Company of Philadelphia)

vital fluid of the urban body. The allusions remained mythic, but shifted away from the subterranean toward the ethereal. Avoiding any allusion to the earth, Graff recast water in the tradition of pastoral poetry as a sparkling substance of air and light.

Fictive Underground

By the nineteenth-century, after urban wells had fouled, fictional images of the underground in novels turned from nurturing and essential to sinister and suspect. Peering down into architectural depths often signaled introspection, looking inward to reveal hidden lusts that are the forces of nurturing corrupted. The cellar was well used in an 1844 novel by Philadelphia native George Lippard. *The Monks of Monkhall* was a hugely popular dirty book that promised to reveal the retrograde sexual secrets of the city (Figure 5).²² Lippard's story, modeled on tales by sometime Philadelphian Edgar Allen Poe and more specifically on *Mysteries of Paris* by Eugene Sue, tells a morality tale designed to reveal a lusciously evil underbelly beneath the prim city. Lippard told of the undoing of a well-bred young woman within a diabolical 'gentleman's club' and her brother's doomed attempts to save her. He summoned the social propriety of Philadelphia's buildings to sharpen the contrast between trim, proportional facades and the horrors of depraved souls lurking in guttural hallways and fathomless basements. Like repressed memories of the psyche, ghosts of past crimes inhabited the pit of Monkhall with the power to humble even Devil Bug, the most threatening of the building's creatures. A buried stream runs through, its black water murmuring in "the whispered tones of fiends, chuckling with glee as they spoke of the murders done in the

Pit of Monk Hall.”²³ The hero, as Orpheus, enters this hell driven by desires that also teeter between filial and incestuous, but he cannot reach his sister. He barely escapes being buried alive before he is rescued by a woman (another motif of shame) and rises again to the living world. His journey through the underside of the city’s architecture and through his own passions proffered an image of a bodily underground that was sexual, liquid and rightly suppressed.²⁴

Lippard’s excavation was explicitly introspective for his villains are “gentlemen” who maintained an outward appearance of respectability to conceal their crimes. Even his heroes are impure. The gentlemen of Monkhall, their building, and the city parallel one another in structure, leaving little doubt that Philadelphia’s underground, its inner passions, and its waters were foul. When Lippard was writing in the 1840s, many of the city’s natural streams, following Dock Creek, had been enclosed as sewers so the image of a buried stream carrying black water was not inaccurate.²⁵

By the twentieth century, stratification of architecture up and down still represented a social hierarchy, yet with the installation of sewers, the tone had shifted. In stories, the underground was habitually associated with the social underclass, which was increasingly portrayed not as a place of moral degradation but of lower class true grit. Many novels and films played on the tensions of social inequity identified with Philadelphia, constituting a minor genre. The plot was standard; upper class heir falls in love with working class girl and tries to bring her into his world, usually without success.²⁶ Recent popular films such as Sylvester Stallone’s “Rocky,” play on these old metaphors remaking them to other purposes. Boxer, Rocky Balboa’s triumphant run from down in a meat locker in the Italian Market of South Philadelphia up to the top of the steps at the Art Museum treads a geographic polarity in the physical city as well as in the hero’s career. Rocky’s heart, the source of his strength, originates in the warmth of his relationships nurtured in the depths of the city. The heroes of many novels find strength, wisdom and their own humanity down in the heart of the working class city, if not literally in the basement (Figure 6). In these images, the underground has kept its duality as a place of both terror and of nurture, fire and water. The stories cling geographically to the city, attaching their Aenean stories to the popular identity of specific places. The smell of a tunnel (now demolished) on 15th Street was described as typically Philadelphian, not dry like New York, but “a thick, wet, careless smell, inefficient, human and nostalgic.”²⁷

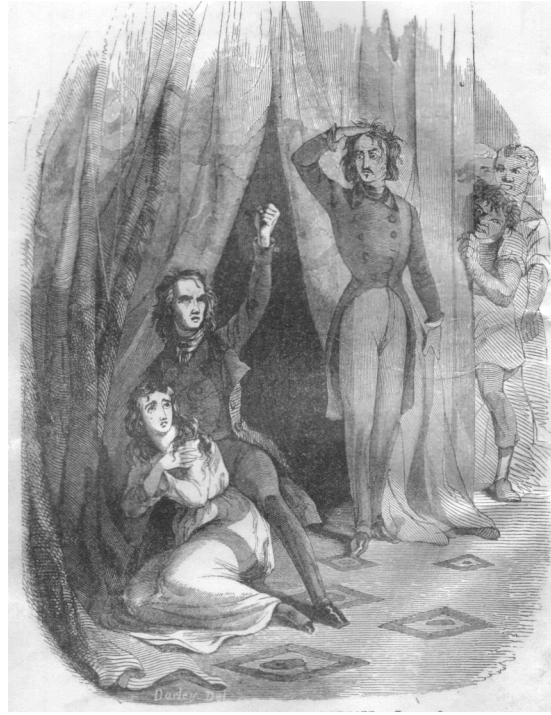


Figure 5. Frontispiece of *Monks of Monkhall*

Philadelphia's Sewer System

By the mid-nineteenth century, Philadelphia's waterworks provided running water to most of the city core, yet drainage systems lagged. Privy pits unable to absorb sufficient wastewater often overflowed and rains carried raw waste into the streets. In response, Philadelphia's Department of Highways unified the sporadic creek-sewers into a complete system to drain the city, which carried ever-larger quantities of waste away from the streets into the rivers.²⁸ Over the course of the nineteenth century, the Delaware River became increasingly polluted, then the Schuylkill, eventually contaminating the water

drawn at Fairmount. As the city grew, it sought to incorporate land and water outside its original limits and threatened to absorb surrounding towns. The pressure to consolidate surrounding towns into the city became so intense that in 1854, the city reached an agreement to annex a large area to the north and west in exchange for freezing the city limits in perpetuity. As a result of the agreement, Philadelphia could draw water only from within its own boundaries, unlike cities such as New York, which piped water from a distant source. As a result, Philadelphians discovered sooner than most that picturesque rivers, which spoke of primal nature, could purify water no more effectively than the earth below. By the end of the nineteenth century, cycles of disease, notably typhoid fever, had resumed, increasing year to year.

Collectively, Philadelphia's citizens made several attempts to protect the water supply. In 1867, Fairmount Park was established on the banks of the Schuylkill River to prevent development and in 1882 intercepting sewers were built to carry waste from neighborhoods just above the city's intake pipe to just below. In the early twentieth century after nearly a century of operation, Fairmount waterworks was closed in favor of a new system that drew water from the upper Delaware River, filtered, and treated it to meet drinkable standards. The Fairmount reservoir was filled to become the site of the Philadelphia Museum of Art at the head of the Benjamin Franklin Parkway, a monumental Greek temple visible from across the river, which rises above Graff's delicate acropolis. The new water supply and drainage system has no architectural celebration and is all but invisible to citizens.

At Headhouse Square, installation of citywide sewers in the late nineteenth century paralleled a florescence of the market as a center of commerce between dense ethnic neighborhoods. Relieved of open privies, the area could support more people in reasonable health. Houses were subdivided, apartments overcrowded and emigrants poured in, creating a street life as lively as any that Philadelphia has known.



Figure 6. Scene from "Birdy" 1986

By the twentieth century, the city was cleaner, yet both of the city's rivers received increasing quantities of waste, growing dirtier each year, until only industry and the poor inhabited their banks. By the 1930s, the stench from the Delaware River reached several blocks inland, rendering a large area, including Headhouse Square, so unpleasant that it deteriorated to slum conditions.

In 1944, an exasperated reporter wrote that standing at Broad and Chestnut Streets, he could smell the rivers.²⁹ Finally in 1946, armed with federal, state and local funding, and driven by the Federal Clean Streams Act, the city built a series of large interceptor sewers along both riverbanks to collect all of the wastes that had formerly flowed into the rivers and carry them to new treatment plants.³⁰ Only by the 1980s could sludge be treated to the point that it could be returned to the land as fertilizer. The city's excreta, which traditionally re-entered the ground through privy pits, is now used to reclaim strip-mined land in central Pennsylvania, returning black earth to the ground (albeit hundreds of miles away) after a century of being dumped into the rivers.

Redeveloping Underground Circulation

The sewage treatment project of the 1950s coincided with a major planning effort in Center City headed by architect Edmund Bacon, who redefined Philadelphia's underground in a series of transportation viaducts. The spine of Bacon's plan for the redevelopment of Philadelphia was a pedestrian concourse under Market Street that connected the subway system with two commuter rail hubs: Pennsylvania Railroad Suburban Station to the West of City Hall and Reading Terminal to the East.³¹ The concourse was intended to give suburban professionals who worked in Center City offices an integrated path of movement separated from street traffic and linked to the surface by a series of sunken plazas, which he called "an extension of architecture underground."³² The concourse was celebrated and integrated into a series of new buildings along the Market Street corridor to the extent that some of the architects considered access at the street level secondary. Bacon praised a scheme by John Bower, which took pedestrians down two levels to pass under the subway so they could walk from an office tower at 1234 Market Street into the bank on other side without crossing the street (Figure 7).³³

Much of the architecture associated with redevelopment muted the street level and emphasized the underground spine as an arterial corridor. Bacon wrote that the concourse should clearly orient pedestrians to the cardinal directions, North and South, but should run free of the 'oppressive' presence of the street plane.³⁴ He equated the underground concourse with upper level passages over the streets and promoted both as elements of modern, urban circulation.

In this sense, both Bacon's redevelopment of the center of Philadelphia and the new sewer system sought to rehabilitate city's underground realm by cleansing it and penetrating it with systems associated with the upper world. Bacon wrote that three-dimensional connections between simultaneous movement systems should be celebrated architecturally to make a city exciting and attractive. He described the city as an organism with defined channels of energy that direct future growth in relation to a center so that citizens retain a "sense of orientation to a continually enlarging order."³⁵ The city as organism refined the urban body metaphor as a circulatory system extending outward from central arteries, so transportation systems underground in the heart of the city

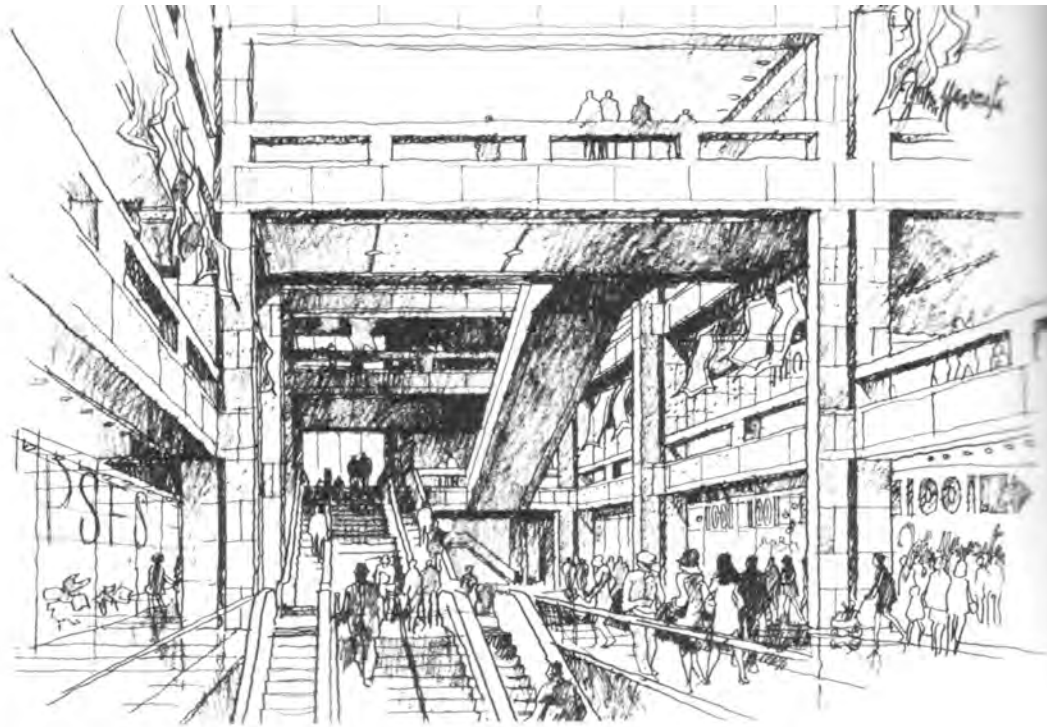


Figure 7. 1234 Market Street, Drawing by Bower Fradley, 1971 (Bacon, *Design of Cities* p.290)

extend to a large number of train lines or capillaries on the periphery. People, as corpuscles, move in and out from the heart to the suburbs in a vital flow.

In practice however, Bacon could not cleanse the underground, either of its accumulated associations nor of its gloom. The Penn Center concourse was never lively or loved. Most stores soon closed their architecturally elegant entrances below grade, abandoning the space to subway riders and vagrants. In the 1980s, homeless men and women established a stable community in a concourse below Broad Street that the police and citizenry tolerated for several years.

At the same time that the concourse was under construction, Bacon also sought to improve the residential areas in Center City. Under his leadership, the Philadelphia Redevelopment Authority (RDA) developed a model for urban renewal that included rehabilitating old buildings alongside new construction. The strategy included cleaning buildings physically, enhancing their historic character, and associating them with modern structures, tying the past to the present in a single narrative. The first RDA project in Philadelphia, the redevelopment of Society Hill in 1960, depended on completing a sewage treatment plant to serve Center City. The signal project, the renovation of Headhouse Market, could not begin until the new sewer system had released the river from sludge and hence the waterfront from a pervasive stink. Secondly, the RDA had to assume control of the entire area, empty buildings of impoverished, largely African-American tenants, and relocate a group of wholesale food markets from Dock Street to a newly built site in South Philadelphia. Redevelopment implied a major redefinition of the area and of the city both below ground and above, cleansing it of smells, of dirt, and of any remaining population, so old buildings could present a new narrative to new residents.

Bacon's strategy overturned the archaeological strata of past and present as well as above and below, mixing them together in a clean, modern composition. The subterranean city was no longer repressed and the past was rehabilitated into the present. Philadelphia novelist Steve Lopez wrote that "time sort of piles up on itself, sometimes making the past, the present and the future indistinguishable."³⁶ Likewise, modern buildings, which rose in Philadelphia as part of Bacon's plan, no longer rest on basements with layers of living stories above. They float so that transportation connections can sprout from several levels: to subway, to street, to a bridge above or a "plaza level" at any elevation. By elevator, an Aenean journey to the underworld looks the same as a ride to the top and always returns. The modern city offers history not as a stratified progress but as "con-temporary" (meaning with time) and simultaneous.

The reversal of past and present, linked with up and down emerged explicitly in one of Philadelphia's stories of the 1990s. "12 Monkeys," directed by Terry Gilliam and released in 1995, used Philadelphia to paint a future so dismal it becomes camp. Life on the surface has been wiped out by a virus, so the city's buildings are in ruins and humanity occupies a surreal, or subreal, realm underground. (Disease is again linked with the underground as so often before.) The underground has become a totalitarian hell, a makeshift maze of prison chambers. The hero, a prisoner sent back in time to the present, 1995, finds freedom on the not yet poisoned surface as he breathes the exhaust fumes of I-95 and cries, "I love your air." In a reversal of Aeneas' pilgrimage, going up means going back in time for the surface not the underground holds the secrets of history. The final scene is set in an airport where the hero, about to fly away from the ground entirely, sees his own past and future in a flash of recognition before he is shot and killed. The story swings back on itself to fold past into present. In fact, the time-travel plot also is an old story reworked. Gilliam based "12 Monkeys" on "La Jetée," a surreal 1964 science fiction film by Chris Marker, which borrows in turn from Alfred Hitchcock.

Modern Infrastructure: Visible and Invisible

The earth below Philadelphia is penetrated with systems that both supply and structure the city. Their mechanisms are concealed, and machinery removed to basements or to the building core where they are all but invisible. Heated or cooled air, hot and cold water, electricity to power appliances and telephone access arrives in rooms with little hint of its origins beyond a monthly bill. Uniform comfort and invisibility are the ideal.

Points where utility lines penetrate building skin are marked with meters that transfer ownership of the stuff as it passes. Like the intake pipes below Frederick Graff's Schuylkill acropolis that marked where water entered the city, meters are 'indiscrete,' evidence of a violation of the skin. Contemporary plumbing moves the celebration to the design of water faucets and fixtures that are often advertised as having "the luxurious feel of ancient Rome." And indiscretion also remains in basement water meters that are property of utility companies so homeowners must allow meter-readers access into the very bowels of their houses. Resignation to this infrastructural indignity emerged in South Philly sexual terms in a novel by a local columnist. In speaking of a man everyone knew was seeing his wife, Mickey didn't blame him, "it's like when the pipes froze and they came and dug up the street in front of your house. You don't blame somebody for looking in your hole."³⁷

Older buildings received their networks of utility pipes and wires years after they were built and did not do so gracefully. Their fabric is tight, interior plaster was traditionally applied directly to brick walls or to wood lath tacked to the wall without a hollow space between, so plumbing is worn on the outside or thread through the interior spaces. Utilities also changed the spatial hierarchy of old houses by introducing an order of layering that proceeded from an inner service core outward to rooms on the perimeter. New houses hide their bathrooms in lightless interiors huddled around a concealed pipe-chase and high-rise office spaces radiate around an elevator core. In this configuration, positions low or high in the structure are less significant than positions inside or outside. Likewise, the hierarchy of front rooms to rear kitchens in traditional planning gave way to modern centralized kitchens that left the outer walls for dining and living rooms.³⁸

Modern underground systems move through buildings in dark internal raceways that penetrate walls and floor slabs, linking basements and attics. This interior underground pierces the roof, sprouting penthouses for air-conditioning chillers, exhaust stacks, and satellite dishes. Each system delivers its services through specialized devices: plumbing faucets and fixtures, lights, appliances, radiators, grates and grilles inside buildings, as well as fire hydrants, street lights, telephone booths, drains water fountains outside of buildings. Like fruiting bodies, these devices are fed from below and are the culmination of the system both physically and symbolically. Buildings themselves can be seen as terminus spaces that make utilities available, portals that mark openings, or points of access to larger networks, such that the city above ground becomes the visible part of invisible underground systems.

Yet the more invisible the lines of service become locally, the more visible they are at an urban scale and the more effect they have on the regional ecology and on national politics. Like Poe's telltale heart, water supply politics and natural resource management beat loudly as arenas of public debate that affect policy decisions at every scale of government. From the strength of local labor unions (utility companies have traditionally been union strongholds) to the Persian Gulf, supply networks have their impact. Communications technology drives the stock market and affects every part of daily business.

In a similar reversal, modern buildings can be seen as almost an above-ground underground, a constructed environment sealed from the outside yet penetrated by utility lines and served by networks that bring water, power and air into interior rooms. The "inner" city, "downtown," all are metaphorically within or below, enclosed and separated from the surrounding countryside, reachable only by transportation 'arteries' to the 'heart' of the city. Yet the more closed inner rooms become, the more dependent they are on utility networks, the more extensive these networks must be, and the larger the demands on natural systems. An office in Headhouse Square draws its water from the upper Delaware, sends its wastewater to the lower Delaware, and its sewage sludge to upstate Pennsylvania. It draws natural gas from the Gulf of Mexico and electricity from uranium mined in the west and broken down in a nuclear power plant on the Susquehanna River. Telephone, radio, cable communications, subway and highway transit all travel infrastructural corridors and each is operated by a separate complex of public and private interests, labor and capital. These local networks link with neighboring systems to extend their limits without geographic boundaries until all are interdependent. So at its limit an infinitely hermetic enclosure, requires infinite

extension. The designed 'visible' part is sealed ever more tightly until it disappears underground, while utility systems, considered 'invisible' to design, are present everywhere. Increasingly, Philadelphia, like Gulliver, is not so much tied down to a landscape as it is tied up with it.

¹ Pierre Sansot, *Poétique de la ville* (Paris: Meridiens Klincksieck, 1988), 44.

² John Le Carré, *The Naive and Sentimental Lover* quoted in Wendy Lesser, *Life Below Ground* (NY: Faber and Faber, 1987), 13.

³ Rosalind Williams, *Notes on the Underground* (Cambridge: MIT Press, 1990), Page.

⁴ The natural clay layer that served to separate privies and wells was an imperfect barrier. By the 1790s, water contamination was a serious problem contributing to disease. See Henry Birkinbine, "History of Water Works, City of Philadelphia and Annual Report of the Chief Engineer of the Water Department," (Philadelphia: City of Philadelphia, 1860), 2.

⁵ In 1628, William Harvey wrote *An Anatomical Essay Concerning the Movement of the Heart and the Blood in Animals*, which disputed the galenic model and argued that blood is pumped by the heart and circulates to nourish the body in a vital flow rather than a meandering stream. In the eighteenth century, the circulation of blood was adopted as a metaphor for urban circulation. See Richard Sennett, *Flesh and Stone* (NY: W.W. Norton, 1994), 255ff.

⁶ Ibid. 324ff.

⁷ John Edgar Wideman, *Philadelphia Fire* (NY: Vintage, 1990), 20, 23.

⁸ "Philadelphia's Hidden Streams," 1889 (Archives of Philadelphia Water Department) online: www.phillyh2o.org/backpages/HiddenStreams_1889.htm

⁹ See Ann Whiston Spirn, *The Language of Landscape* (New Haven: Yale University Press, 1998), 160-72., for a discussion of the suppression of Mill Creek in Philadelphia and efforts to recognize the lost stream. See also Adam Levine, "From Creek to Sewer: A Philadelphia Story," in *Philadelphia Drainage History*, ed. Adam Levine (City of Philadelphia Water Department, 2002) and online www.phillyh2o.org.

¹⁰ Mikhail Bakhtin "Discourse in the Novel" in Mikhail Bakhtin, *The Dialogic Imagination* (Austin: University of Texas, 1981), 340. He discusses 'reported speech,' retelling what has been previously spoken.

¹¹ Hippocrates, *Kitab Buqrat Fi'l-amrad al-Biladiyya: Hippocrates On Endemic Diseases (Airs, Water, Places)*, trans. J. N. Mattock and M.C. Lyons (Cambridge: Middle East Center, 1969), 2.

¹² "Constitution of the Academy of Medicine of Philadelphia," 1799 (Pamphlet, Historical Society of Pennsylvania) p.1

¹³ John L. Cotter, Daniel Roberts, and Michael Parrington, *The Buried Past*, Barra Foundation Book (Phila.: University of Penna. Press, 1992).45. Most did not drink water directly, but drank beer or tea.

¹⁴ Ibid. 164.

¹⁵ Report to the Select and Common Councils on the Progress and State of the Waterworks, 1799. P.21 Benjamin Franklin called attention to water problems in the 1780s. His will of 1789 recommends bringing water of the Wissahickon into the city, and making the Schuylkill River navigable. See Birkinbine, "History of Water Works, City of Philadelphia and Annual Report of the Chief Engineer of the Water Department," 2.

¹⁶ Ivan Illich, *H2O and the Waters of Forgetfulness* (Berkeley: Heyday Books, 1985), 37. And Roma, la città dell'acqua, (Rome: Ministeri per i beni Cultural, 1994), 83.

¹⁷ Nelson Manfred Blake, *Water for the Cities; a History of the Urban Water Supply Problem in the United States* (Syracuse, NY: Syracuse University Press, 1956), 30.

¹⁸ Darwin H. Stapleton, ed., *The Engineering Drawings of Benjamin Henry Latrobe* (New Haven, Connecticut: Yale University Press, 1980), 29. See also John Reys, *The Making of Urban America* (Princeton, NJ: Princeton University Press, 1965), 172.

¹⁹ Benjamin Henry Latrobe, *View of the Practability and Means of Supplying the City of Philadelphia with Wholesome Water* (Philadelphia: 1799).

²⁰ Joseph Rykwert, *The Idea of a Town: the anthropology of urban form in Rome, Italy and the ancient world* (Cambridge, Mass: MIT Press, 1988), Page.

²¹ Stapleton, ed., *The Engineering Drawings of Benjamin Henry Latrobe*, 33. Bruce Laurie, "Fire Companies and Gangs in Southwark: The 1840s," in *The Peoples of Philadelphia*, ed. Allen Davis and Mark Haller (Phila: Temple University Press, 1973), 75.

²² George Lippard, *The Monks of Monkhall* (NY: Odyssey Press, 1970 (1844)). Lippard's book was called "the most immoral work of the age," and was wildly popular, selling 60,000 copies the year it was published and was still being bought at the rate of 30,000 per year when Lippard died in 1854. Lippard, a populist and advocate of labor reform, wrote several popular histories of the American Revolution that credited the common man on the battlefield as a hero rather than the prominent citizens lauded by Philadelphia's historical institutions. See Gary B. Nash, *First City: Philadelphia and the Forging of Historical Memory* (Philadelphia: University of Pennsylvania Press, 2006), 217.

²³ Lippard, 315.

²⁴ Notably the villains in the story are upper class gentlemen, the black servant is treated sympathetically and the main characters are from the middle classes. See *Historic Philadelphia*, (Philadelphia: American Philosophical Society, 1953).

²⁵ Adam Levine, "From Creek to Sewer" www.phillyh2o.org

²⁶ The best known is probably Philip Barry's play "The Philadelphia Story" that was rendered to film by Katherine Heburn and Carry Grant.

²⁷ Struthers Burt, *Along These Streets* (NY: Scribners, 1942), 203.

²⁸ Richard Tench, *London Under London* (London: J. Murray, 1993), 66. A rise in standards of personal cleanliness in the nineteenth-century ironically resulted in a dramatic increase in water pollution. The popularization of the flush toilet early in the nineteenth-century turned privies into cess pits then drowned them in waste water so all cities suffered as London from "the great stink" of mid-century. Philadelphia's solution, years behind London, was a city-wide network of sewers that drained directly into the rivers and an ordinance requiring property owners to use them, thus deflecting the problem from the streets to the waterfront

²⁹ Quoted "Clean Streams for Philadelphia" Philadelphia Water Department 1983.

³⁰ W.D. Bush, "Sewage Disposal Project," (Philadelphia: Department of Public Works, 1932). See also "Annual Report," (Philadelphia Water Department, 1957). The work had been delayed since the beginning of the century an experimental sewage treatment plant was designed as early as 1909 and a plan for the whole city developed in 1915. A small Northeast Sewage Treatment works began operations in 1923 to protect the city's water supply intake on the Delaware.

³¹ Edmund N. Bacon, *Design of Cities* (NY: Viking Press, 1967).

³² Ibid. 275.

³³ Ibid. 291. See also a critical analysis of Bacon's plan in Philadelphia, Richard M. Sommer, "Philadelphia - The Urban Design of Philadelphia: Taking the Towne for the City," in *Shaping the City: Studies in History, Theory and Urban Design*, ed. Edward Robbins and Rodolphe El-Khoury (London: Routledge, 2004).

³⁴ Bacon, *Design of Cities*, 291.

³⁵ Ibid. 301.

³⁶ Steve Lopez, *Third & Indiana* (NY: Penguin Books, 1994), 47.

³⁷ Pete Dexter, *God's Pocket* (NY: Random House, 1983), 265.

³⁸ As part of the Society Hill Towers project of 1960, I. M. Pei also designed blocks of row houses to surround the towers. These houses were some of the first in the city to have kitchens located in the center of the house rather than the rear.