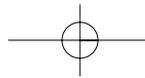
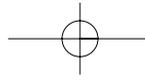


Puffs of Air: Communicating by Vacuum

Shannon Mattern On a trip home to visit my parents in rural Pennsylvania, I stopped by the drug store to drop off a prescription for my mom. Just as I was swinging into a parking spot in front of the town's brand new Rite Aid, I noticed signs for a drive-thru—something the old drug store, in a strip mall down the street, never had. I realized that, since becoming a New Yorker, I had been deprived of the drive-thru's charming vernacular theater, the puppet-show-like quality of the clerk in the window. So I followed the signs. Rounding the building's perimeter, I faced a choice of multiple lanes, each linked to the pharmacist inside by a pneumatic tube. The discovery instantly took me back to childhood visits to the drive-thru bank with my mom, when I'd slide off my seat and onto her lap to marvel at the magical appearance and disappearance of canisters containing bills and deposit slips, and to delight in the invigorating *whoosh* that announced these comings and goings.

London Telegraph Office, 1932 © Hulton-Deutsch Collection / Corbis.





That sound also scores my visits to the New York Public Library on Forty-second Street. The hiss of the tubes—although not quite as immediate as the whoosh at the bank—is, to me, the library’s keynote, as the composer R. Murray Schafer might call it. It is the audio track over which the building’s other sounds—heavy wooden chairs scraping across terrazzo floors, books thumping on tables, whispers ricocheting off hard surfaces—are laid. Since the building opened in 1911, a system of pneumatic tubes has shuttled call slips from the reading room down into the seven levels of stacks, where assistants review the slips and retrieve the books requested. Those books are sent upstairs to the “delivery enclosure” via a conveyor system, which replaced an older dumbwaiter. Patrons wait for their numbers to be called, and receive their books. Given the size of the library’s collection and the spread of the stacks, the system is remarkably fast and reliable; even in the early days of the library’s operation, the tubes allowed librarians to deliver 30 percent of all requested books within five minutes and 77 percent within ten (“Explains Library’s Secrets of Speed,” *New York Times*, 1 April 1920). When there’s the occasional tube jam, librarians use a snake, much like the contraption plumbers use to unclog drains, to release the stuck canister.

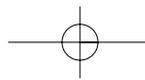
Edmond A. Fordyce, a man in the tube business, reported in 1903 in *Cassier’s* magazine that pneumatic tubes had become an “indispensable part of the mechanical equipment of large public libraries.... As messengers, they do their work with all the celerity of the telephone—and do it withal in perfect harmony with the spirit of silence that pervades the atmosphere of a library, which the telephone could not do.” Libraries’ tube systems seemed a perfect marriage of the efficiency of the Age of Steam with the decorum of the Progressive Era; the library itself, as an institution, also integrated these values. But even nearly a century later, in the mid-1990s, when the NYPL was designing its new Science, Industry and Business Library in the former B. Altman department store on Thirty-fourth Street and Madison Avenue, planners chose to use the store’s old pneumatic tubes, which at one time

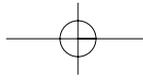
ferried receipts and money throughout the store, for book retrieval. Why stick with tubes in this age of increasing computerization, and particularly in a library focused on technology? Why not? “They’re elegantly simple,” explained senior project manager Mark A. Hirsch (Marcia Biederman, “This Old Technology Hasn’t Gone Down the Tubes,” *New York Times*, 5 June 1998).

Nevertheless, the tubes, after ninety-eight years of service at the Forty-second Street library—now known as the Stephen A. Schwarzman Building—will soon breathe their last breath (upon this writing, in July 2009). As part of a services upgrade that included, in the summer of 2009, the launch of a new comprehensive catalogue and a single system-wide library card for both the research and branch libraries, the Forty-second Street library will eventually introduce digital call slips. Phasing out handwritten requests on index-card-sized slips will allow for quicker and more accurate transmission of information. But it also means silencing the hiss, stopping the breath flowing through tubes at the library’s core. Given that the word *pneumatic* is derived from the Greek *pneuma*, meaning air, breath, or spirit, we might say that the eventual retirement of the library’s pneumatic tubes signals the passing of the spirit of their age.

ENIGMATIC URBAN NETWORKS

There remains today a tangled network of tubes under the city’s streets and inside its buildings’ walls, tubes that carried their last messages long ago. In 1893 the *Washington Post* declared that “the present era is likely to be known to history as the pneumatic age. What with pneumatic tubes and pneumatic tires and pneumatic bells and pneumatic guns ...” (“Here and There,” 10 November 1893). The principle of pneumatics is much older. Hero of Alexandria wrote his *Pneumatics* in the second century B.C., but in the early nineteenth century, inventors were busy investigating potential applications of pneumatic tubes, particularly for communication and for the transportation of people and things. With the early-twentieth-century arrival of phones and cars,





the age of electricity and the internal combustion engine supplanted the steam age. But even then, through the Belle Époque, the First World War, the Jazz Age and the Depression, pneumatic systems continued to power many cities' networks and services.

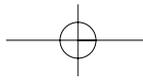
By the 1890s, many city businesses were using tubes for internal and limited intra-city dispatch. Department stores in many cities, including Macy's, Gimbel's, and Altman's in New York, used tube systems to move money, sales slips, and even small goods like jewelry through their stores (Jan Whitaker, *Service and Style*, 2006). Some even envisioned using tubes to deliver parcels from the city's shopping district to customers' suburban homes, even before the customer had reached her own front door, although this proved impracticable. Warehouses and freight depots were using tubes to transmit signed orders and receipts among floors and between shipping and receiving points, and in some plants and terminals tubes pumped coal or wood pulp. A January 1930 article by Alden Armagnac in *Popular Science* describes tubes unloading grain from barges at a ship terminal, removing arsenic from a Colorado smelter, and shooting Brazil nuts onto ships at a Brooklyn shipping dock.

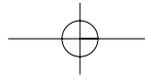
The founder of the Daniels & Fisher store in Denver described the tubes as "little tornadoes caught and trained to serve you," perhaps more reliably than clerks or "cash boys" (Whitaker, *Service and Style*, 2006; also "Pneumatic Tubes Supersede Cash Boys," *The Manufacturer and Builder*, 1881). Within the offices of the *Chicago Herald*, tubes carried copy between the telegraph, local, and composing rooms ("Model Newspaper Office," *New York Times*, 22 November 1891). Western Union, in New York, used tubes for delivery between its main office and branches, and between their headquarters and the city's newspapers. Tubes inside Chicago's main Western Union office connected the intra- and inter-city processing floors. Tom Standage describes the office as a "vast information processing centre—a hive of activity surrounded by a cat's cradle of telegraph wires, filled with pneumatic tubes, and staffed by hundreds" (*The Victorian Internet*, 1998).

These wires and tubes were the circulatory and respiratory systems of many cities' communications networks.

One of the earliest and most widespread applications of pneumatic tubes was as a supplement to the telegraph or the postal system. Molly Wright Steenson, a Princeton doctoral student who studied Paris's pneumatic post systems, explains how such systems—of which there were many by the early twentieth century—served as an "antidote to increasing urban congestion and traffic on the streets above." She focuses on pneumatic tubes' relationship to the urban landscape—how they functioned as "interfaces" to nineteenth-century urbanization and modernity: "At once buried and tangled, emerging into the interiors of buildings and offering varied interfaces for its users, the pneumatic tube presents an enigmatic image of modernity—the merger of construction and communication." Their influence on the shape of the urban environment was alternately visible and invisible; they rose from beneath the streets, then plunged back underground, and snaked in and out of interior walls. The relationship between the tube system and the urban landscape was thus muddled, enigmatic. As film historian Tom Gunning explains in "From the Kaleidoscope to the X-Ray (*Wide Angle*, 1997), the creation in the nineteenth century of a "substratum beneath the city surface which supported the circulation of energy, communication and transportation"—a network of pipes, tubes, wires, cables, tunnels, etc.—conjured up images of the city as an "enigmatic labyrinth." E. B. White also commented on the morass below ground: "Every time an incision is made in the pavement, the noisy surgeons expose ganglia that are tangled beyond belief" ("Here Is New York," 1977). New cultural forms—the emerging detective genre, and early city photography—attempted to visualize and make sense of this urban underground, to get at the "stage machinery behind a visible illusion" on the city surface (Gunning). Yet the words and pictures often failed to untangle these ganglia, reflecting the tension between urban "spectacle and mystery."

This enigmatic relationship between subterranean urban networks





and the city surface paralleled similar tensions within nineteenth-century approaches to and values of communication. The late nineteenth and early twentieth century marked the arrival and popular acceptance of photography, the telegraph, the telephone, and the gramophone—media that aimed to alter or eliminate the materiality of their content, and whose identities were rooted in their relationship to the material. As Allan Kardec describes in his 1861 *The Book on Mediums*, “the *tac-tac* of the telegraph writes thousands of miles away,” yielding, “on a slip of paper, the reproduced letters of the dispatch, the visible from the invisible world, the immaterial from the incarnated world.” These oscillations between the physical and the immaterial, the visible and invisible are reflected within nineteenth-century spiritualism, which strongly informed popular understanding of communication at the time.

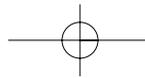
The spiritualist tradition, communication scholar John Durham Peters explains in *Speaking into the Air* (1999), proposed that “communication happens best when bodies and language are transcended in favor of more ethereal modes of thought transference”—perhaps when bodies and media evaporate into air. Yet, accepting that media, like bodies, are “pipes that [have a] tendency to become clogged,” spiritualism “oscillates between the dream of shared interiorities and the hassle of imperfect media,” between the ideal of bodiless minds “speaking into the air” and the realization that both bodies and air are inescapably material and prone to failure. This uncertainty, and people’s discomfort with it, inspired certain “materializing mediums,” including, in their most “desperate” version, ectoplasm, which embodied a wish that flesh itself could be “replicated over distance.” Such re-embodiments of the nineteenth century’s new communications technologies reflect an attempt “to ... quench gnawing doubts about simulation, fakery, and breakdown in communication.”

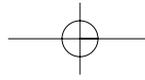
Some applications of pneumatic tubes might also be read as a response to doubts about immaterial, disembodied communication. Of course, in most cases, pneumatic tubes were introduced to address

practical problems—to supplement oversaturated telegraph networks, speed the delivery of call slips to subterranean library stacks, or alleviate urban congestion, for instance—but they might also evince a desire to re-embody a media culture characterized by increasing dematerialization and depersonalization. The tubes themselves embody the spiritualist dilemma: this *pneuma*-, or “spirit-,” communication relies on an invisible and virtually weightless substance—air—flowing through solid metal pipes. Unlike its cousin, the telegraph, which is noted for severing communication from transportation and translating an analog message into a digital form, tubes rely on the physical transport of a material medium—one that in some cases even carries a personal trace of the sender. Through the physical tubes, the sender’s “spirit” can fly through the air, transmitted in a manner that is simultaneously material and immaterial, personal and impersonal. These contradictions are also reflected in the pneumatic tubes’ relationships to human labor and the human spirit in communication.

MACHINES AND BODIES, COMMUNICATION AND SPIRIT

In the early 1850s, the telegraph link between London’s Central Telegraph Office and the Stock Exchange branch, only 200 meters away, became terribly congested with frequent communications, most of which addressed urgent business matters—and all of which had to be retranscribed and retransmitted at each intermediate point in the telegraph system, repeatedly duplicating the clerks’ efforts. The link became a bottleneck in the system. Josiah Latimer Clark, a telegraph company engineer, proposed a steam-powered pneumatic tube system to carry telegraph forms directly from the Stock Exchange to the telegraph office, thereby easing the burden on the connection. Hard-copy forms would be placed into containers that were blown through tubes to the central office, where they would be telegraphed to their destinations. Meanwhile, messenger boys returned the empty carriers to the Stock Exchange (Standage; Willson, *The Story of Rapid Transit*, 1903). Later on, other telegraph systems employed messenger





boys to carry messages along overburdened telegraph routes, which was faster than retranscribing messages at the switching points. However, this form of labor, Tom Standage says, “gave the impression that the telegraph system was merely a glorified and far more expensive postal service.” The human message transcriber or courier was still a necessary link in this communication system—and because it was not completely automated its efficiency was called into question.

Eventually, London added a second tube and integrated compressed air into the vacuum system, thus allowing for two-way delivery of carriers. Larger tubes, three inches in diameter, permitted delivery of a greater volume of messages—the equivalent of “seven telegraph wires and fourteen operators working flat out.” The assumption was that a truly efficient and economical system would involve as little human labor as possible: ideally, none at all.

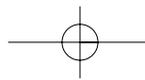
Although the construction of a tube system can be expensive, William Tegg offered in 1878, “they are cheaply worked, because they do not require clerks,” and “they can be worked with simplicity, delivering the letter by a single operation, without the re-transmissions and duplicate copying required in ordinary telegraphs.” The goal of replacing human labor was paramount: Fordyce reported in 1903 that depots and warehouses used tubes to “replace the tardy, tired, and sometimes lazy feet of messenger boys.” He also told of the arrival of a new skyscraper in New York’s financial district in which messages would be delivered on “a puff of air,” leaving the elevators free of messengers and relieving brokers of their dependence on the boys’ “uncertain footsteps” (Armagnac; also Downey, *Telegraph Messenger Boys*, 2002). Meanwhile, the tube system in the New York Life Insurance Building promised to do “the work of 300 messenger boys.” The Chicago Press Association, “out of patience with the slow and unsatisfactory delivery of telegraphic news dispatches by messenger boys,” also built a subterranean network of tubes connecting the main Western Union office, the association’s offices, the city’s newspapers’ offices, City Hall, and the central police station. In 1930, Alden

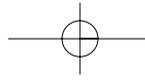
Armagnac put it bluntly: “Not alone as a message-carrier, but as an errand-runner, pneumatic tubes replace human labor.” Yet the human element proved difficult to remove entirely.

Following London’s lead, Berlin introduced its Rohrpost, or “pipe post,” in 1865, and Paris its Poste Pneumatique in 1879. In the Parisian system, the sender composed his or her message on a little blue pre-paid card, a *petit bleu*; then stuffed it into a special Pneumatique mailbox, submitted it at the telegraph counter at the post office, or dropped it into a box mounted on the back of a tram. From any of these points it would be speedily sent via pneumatic tube to the post office nearest the recipient. A messenger would then deliver the *pneu*, or *pneumatique*, to the recipient’s door. In America, some envisioned door-to-door tube systems linking every household in the country, but when that vision proved a pipe dream, the final leg of a pneumatically dispatched letter’s journey was made in a postman’s or messenger’s bag.

Unlike a telegram, a message transmitted via *pneumatique* stayed in its original format for the entire journey; “the telegraph form the sender wrote the message on actually ended up in the hands of the recipient” (Standage). The document would carry date stamps from each of its stops along the route, chronicling its journey through the city on currents of air and in messengers’ hands. It also retained something of the soul, or spirit, of the sender by presenting its message in his or her own physical handwriting. Telegrams “had their own language of quickness and saturated content,” befitting their name: *tele*, meaning “distant” (“Paris Pneumatique Is Now a Dead Letter,” *New York Times*, 31 March 1984). *Pneus* also traversed distances in their delivery, but they always kept at least a trace of the sender’s *pneuma*, “soul.” So, while other contemporary media of communication “transcend[ed] bodies,” the *pneumatique* preserved the spirit of the communicator, and carried it through a distribution system reliant on both air and human labor.

Between 1897 and 1953 New York’s pneumatic mail delivery system carried a large proportion of the city’s mail from Harlem to downtown

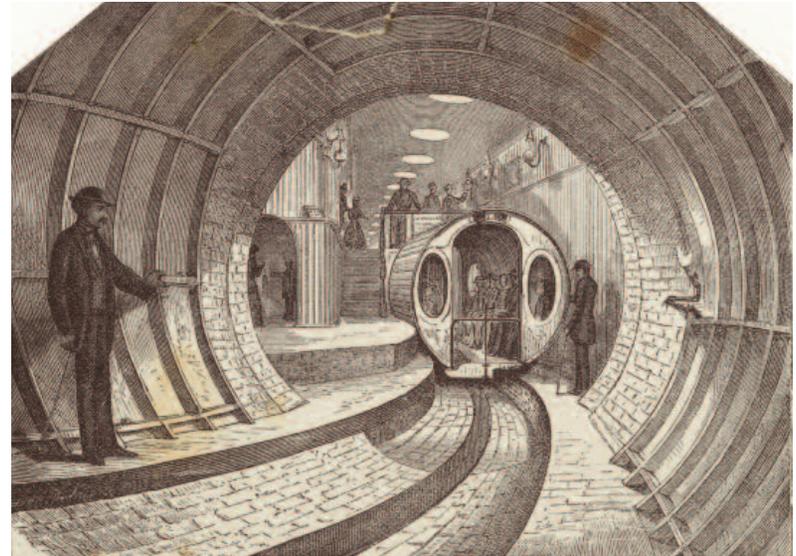




Manhattan and into Brooklyn, employing an extensive system of subterranean tubes that occasionally ran alongside the 4, 5, and 6 subway lines, and even crossed the Brooklyn Bridge (Robin Pogrebin, “Underground Mail Road: Modern Plans for All-but-Forgotten Delivery System,” *New York Times*, 7 May 2001). Rumor has it that a distraught cat owner once rushed her sick feline to the animal hospital via pneumatic tube. This would not have been the first time that an animate being was safely transported by tube. New York’s first subway, built in 1870, was a 95 meter pneumatic tube propelling a twenty-two-passenger conveyance between Broadway and Murray Street. A few years before, in 1864, a 550 meter pneumatic railway was exhibited at the Crystal Palace and was to have been implemented under the River Thames.

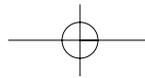
Pneumatic subways proved impractical. Tube maintenance costs were prohibitive for some cities, and eventually the telephone and the automobile rendered the pneumatic tube all but obsolete. New York’s postal tubes remained in operation until 1953, thanks to the persistent efforts of lobbyists, and Prague ran its pneumatic post until 2002, when the system was flooded. Ultimately, tubes, once part of the dream of efficient, immaterial communication via “puffs of air,” proved vulnerable to the material weaknesses of metal pipes and vacuums.

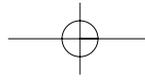
Soon Cynthia Rosado, the New York Public Library’s Manager of Access and Research Services, will find that she can no longer rely on the building’s constant hiss to confirm that “everything’s working”; she’ll no longer hear the building “breathe.” Today, pneumatic tubes are still used, now mostly for the transport of solid objects. Hospitals sometimes use tube systems for internal delivery of medicines and lab specimens, drive-through pharmacies use pneumatic tubes to deliver prescriptions to customers in cars, and banks use tubes to transport signed checks and cash. Yet tubes are no longer a widely viable mode of communication—although some have been repurposed as conduits for newer communications infrastructures, like networks of fiber optic cable.



Broadway Pneumatic Underground Railway, 1870s. Picture Collection, The Branch Libraries, The New York Public Library; Astor, Lenox and Tilden Foundation.

Still, there’s a continuing and even increasing fascination with pneumatic tubes and similar anachronistic technologies, perhaps because once again we are experiencing anxiety over the dematerialization (and acceleration) of communication. In this age of WiFi and digital mobility, we wonder uneasily about the messages swirling through the air around our material bodies, and occasionally long for the tangibility, the certainty, of material media. Frustrated by the impenetrable complexity of digital gadgets, we’ve rediscovered the appeal of machines with visible, comprehensible, manipulable parts. “Today we have the Internet—a vastly superior network of tubes which nonetheless somehow don’t (sic) seem quite as awesome,” writes Adam Bonislawski in a November 2008 issue of *The L Magazine*, a New York arts and culture guide. “Chalk up another win for the physical immediacy of the analog system!”





Swatch Timeship store design, 1996. Design by Daniel Weil and James Biber/Pentagram Architects. Photo by Peter Mauss/Esto.

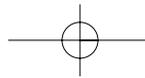
In 1985, Terry Gilliam aestheticized pneumatic tubes, and parodied their role as a bureaucratic interface, in *Brazil*. More recently, pneumatic tubes have been used as decorative elements and aesthetic attractions in several New York design projects and art installations. Swatch's Timeship store in midtown Manhattan, designed in the mid-'90s by Pentagram Architects, features glass pneumatic tubes that allow customers to watch their watches shuttling between the building's three floors, thus creating a sense of dynamism befitting the company's product. In 2007, the Lower East Side welcomed a new coffee shop, the Roasting Plant, where tubes deliver beans to the roaster and suction up precise amounts for brewing individual cups on demand. The following summer, David Byrne's "Playing

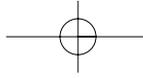


The Roasting Plant's pneumatic bean system. Courtesy of Roasting Plant Coffee, New York City.

the Building" installation made use of pneumatic tubes to "play" the pipes of the Battery Maritime Building as if the structure were a giant pipe organ.

Tubes have also reappeared in "steampunk," a cultural movement that takes aesthetic cues from the Victorian period, focusing in particular on real or fantastical technologies of the "steam age"—dirigibles, gas lamps, automata, early attempts at analog computers, and, of course, tubes. Some argue that the steampunk "genre" is rooted in historical science fiction, particularly the work of Jules Verne. Post-modern and contemporary literary examples include Bruce Sterling and William Gibson's *The Difference Engine*, Paul di Filippo's *Steampunk Trilogy*, Philip Pullman's *The Golden Compass*, and the *Girl Genius*





comics. Steampunk art and design offers such creations as hand-made steam-powered technologies and “Victorianized” iPods with visible, although fake, internal gears, and computer keyboards made to look like typewriters; films, such as *The Illusionist*, *Steamboy*, and Disney’s *Atlantis: The Lost Empire*; and role-playing games like *Arcanum: Of Steamworks and Magick Obscura*. In any genre, steampunk is less concerned with historical accuracy than with recreating a past that has a Victorian, steam-age “feel.” Rooted in part in nostalgia for a time “before the frustrations of complex late/liquid modernity,” in longing for a time “when people felt they understood the workings of technology, rather than the more instrumental knowledge most people have of contemporary information technologies,” steampunk finds its materials in our desire to recapture a “lost authenticity,” and creates a historical context for our doubts about the digital present and future (Alice R. Bell, “The Anachronistic Fantastic,” *International Journal of Cultural Studies*, 2009).

Our ancient human desire to communicate “perfectly” as disembodied voices “speaking into the air” foreshadowed nineteenth-century aspirations to float letters and telegrams on “puffs of air,” which in turn presaged the contemporary vision of an atmosphere permeated with beams, waves, and bits of digitized information. Yet such dreams are also informed by our fears about dematerialized, depersonalized communication, about the vaporization of language and communication conduits. We continue to wonder if our communicating spirits can really ride, as they seem to, on air—through ether, through tubes, through computing clouds—and we sometimes take reassurance in the constant hiss, that sucking sound, an empirical sign that “everything’s working,” that our networks are breathing, that the spirit is flowing.

