Pneumothorax Then and Now
Annmarie Adams and Kevin Schwartzman
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This article begins with a photograph of the Children's Memorial Hospital in Montreal depicting the induction of a pneumothorax, a treatment for tuberculosis (TB) used from the 1920s to the 1940s. The authors place the photograph in historical context and review the contents of the room it shows, including a patient's chest X ray. Building on Martha Langford’s *Suspended Conversations*, the authors examine the use of such photographic and X ray images in depictions of TB care in the mid-20th century. The authors parallel the spaces shown explicitly (the treatment facility) with those shown implicitly (the chest cavity) and then juxtapose these historical images with those of medical thoracoscopy, a current technique for visualizing chest disease that likewise begins with pneumothorax. Finally, the authors consider the changing audience for these images by highlighting the evolving role of the patient as actor and consumer rather than as passive recipient of health care expertise.

Keywords: pneumothorax; tuberculosis; design; architecture; history of medicine; sanatorium; imaging; photography; X ray

This article focuses on a single photograph as a window on past and present relationships of the sick body, technology, and the built environment (Figure 1). Its main
intention is to demonstrate the ways visual evidence links to other material and non-
material sources in the history of medicine and architecture. The image shows a nurse
and a physician inducing pneumothorax in a young patient as a treatment for tuber-
culos isis (TB). What basic medical and architectural facts can be gleaned from a single
photograph? Two other substantive questions inspire this article. What is the historic
and contemporary role of the visual image in the treatment of TB and chest disease?
What can a historical photograph tell us about the relationship of today’s patient to
technology as he or she peers inside his or her own body?

The article is part of an ongoing quest to explore the intersection of architecture
and medicine. We are an architectural historian with a special interest in material
culture and the history of hospital design (A. Adams) and a respirologist and epide-
miologist (K. Schwartzman) at the Montreal Chest Institute, now part of the McGill
University Health Centre. Our research methods thus combine classic approaches to
material culture (survey, inventory, fieldwork, archival research, contextual history)
with real-life experiences of chest medicine today.

In particular, we are interested in historical investigations of the spatial negotiations
between new procedures and the places, architectures, and situations in which tech-
nology and people interact. We use the photograph, then, as an inventory of medical
material culture that may tell us something distinct from textual medical history and
as a window onto the hidden, “unseeable” history of TB and its treatment.

Pneumothorax and Chest Radiography Then

The medical procedure captured in the photograph in Figure 1 is artificial (in-
duced) pneumothorax. It involves the introduction of air into the pleural space (a
space between the lung and chest wall) to force the collapse of the adjacent lung.
Practitioners once believed that this impaired the growth of TB bacteria within the af-
fected lung because lung deflation led to the collapse of cavities, which were important
sites of bacterial proliferation. Practitioners also believed that the deflation of infected
lung tissue deprived the bacteria of oxygen needed for growth. Pneumothorax was
first performed by Italian surgeon Carlo Forlanini in 1888 (Herzog, 1998, p. 11; see
also Burrell, 1924; Lawrence, 2002) and first performed in Canada in 1898 by Dr. J. M.
Rogers in Ingersoll, Ontario (Holtslander & Rutherford, 2004).

The historic photograph is remarkably sharp. Medical information and the all-
important X ray, for example, are easy to read. Located just above the nurse’s head,
next to the window, the x-ray is actually reversed. It shows the mediastinum (the part
of the chest cavity between the lungs containing the heart) on the left of the image.
Conventionally, the mediastinum appears on the right, as if the patient stood facing
the physician/viewer. (Figure 2 shows a current chest X ray, in conventional projection,
with the mediastinum on the viewer’s right.) Despite the reversal, it is possible (for a trained eye) to see that the X ray in Figure 1 indicates an infiltrate in the left midlung zone and probable cavitary disease in the right lung. The doctor and nurse in the photograph are working on the patient’s left side.

Images of the interior of the chest were an important part of 19th-century medicine, as clinicians even made experiments to introduce cameras into live bodies, giving pictures of the internal organs (Kemp, 1997, pp. 143-145). X rays brought the additional possibility of objectively showing hidden structures not normally accessible even to vision (Daston & Galison, 1992, p. 106). The legacy of this claim to objectivity is that even today, chest physicians consider the X ray an indication of medical truth. For example, they cannot imagine evaluating a new patient for a chest complaint or condition without seeing his or her chest X ray; often, they examine the X ray even before interviewing and physically examining the patient.

Indeed, physical examination is a notoriously poor method for detecting and characterizing chest problems. Most TB patients treated by pneumothorax in the period of the photograph likely had minimal (if any) findings that would show up on a physical exam, and so were diagnosed on the basis of chest X ray findings and sometimes microbiological data.

Figure 1. Pneumothorax Treatment for Tuberculosis at Children’s Memorial Hospital, Montreal, Canada, Circa 1930
Source: Montreal Children’s Hospital.
Discovered with other photographs at the Montreal Children's Hospital, the pneumothorax photograph likely shows the institution's immediate precursor, the now demolished CMH (Figure 3), perhaps best known as the setting of chapter 18 in Gabrielle Roy's (1945) classic novel Bonheur d'Occasion, first published in English in 1947 as The Tin Flute. Where and when the photograph was taken are difficult to specify: Unfortunately, the temporal and spatial/architectural contexts can be determined with far less precision than the condition of our patient's lungs.

From 1910 to 1956, CMH stood on the southern slopes of Mount Royal, facing today's Montreal General Hospital, just west of the Shriners' Hospital for Crippled Children. The heavily wooded, sloped, and snow-covered site is visible through the two windows in the photograph (see Figure 1). The general arrangement of the site, as drawn by architects David Robertson Brown and Hugh Vallance, was a series of 14 pavilions linked by walkways, forming a loop up from Cedar Avenue (Figure 4). Part of CMH's benevolent vocation was thus fulfilled by the site, because the hospital was intended to enhance the healing of sick, poor children by removing them from the crowded and damp quarters in which they lived to the low-density, high-altitude, and fresh air of Mount Royal. Indeed, Daniel, the young boy in The Tin Flute, hailed from the crowded, working-class district of St. Henri, between the St. Lawrence River and the Lachine Canal, about 110 meters below the hospital in elevation.

Because the space depicted in the pneumothorax photograph is an office rather than a purpose-built space for surgery, it is impossible to know in which pavilion the photograph was taken. Of hundreds of photographs we have examined of CMH, none shows the exact same six-pane, closely spaced windows shown in our photograph. We speculate, however, that the room is probably at the rear of a building, perhaps the Kiwanis hut for TB described in physician Jesse Boyd Scriven's (1979, p. 76) history of the hospital.
The design of CMH differed significantly from that of other institutions gracing Mount Royal, notably the Royal Victoria Hospital. The CMH was a comparatively nonscientific institution. Its modest buildings—the ensemble was composed of temporary, unheated huts (Figure 5)—had undecorated rooms with visible structure and (sometimes) exposed plumbing. Even after the opening of a new wing in 1930, the hospital's medical staff members complained of outmoded facilities. In 1938, the hospital had but one, too small operating room; its X-ray department lagged behind others; its outpatient department was difficult to access; and it had only “bad” accommodations for interns and nurses.

In fact, the spaces resemble the portable, “knockdown” construction of overseas military hospitals erected by the U.S. government during World War I, both in their emphasis on rehabilitation and in the flimsy, ephemeral appearance of the architecture. Figure 6 shows the standardized World War I overseas hospital designed by American architect Edward F. Stevens.

Inside the Pneumothorax Room

Inspired by Lizabeth Cohen's (1980) classic article “Embellishing a Life of Labor: An Interpretation of the Material Culture of American Working-Class Homes, 1885-1915,” in which she explored photographs of working-class houses in Chicago as inventories, we survey the office shown in the photograph. Like John Tagg's (1988, pp. 184-186) description of the domestic interior portrayed in Lewis Hine's 1936 photograph “Young Couple,” here we presume that an objective description of
the photograph will inspire us as viewers to understand the image in its physical and medical contexts.

As a set of nested ideas, the room interior dwells inside the snowy, wooded exterior in the same way the patient’s body inhabits the room, and the diseased lung occupies the body, a parallel emphasized by the series of containers included in the image. The photograph shows three walls of a (probably) rectangular room; two framed, horizontal, six-paneled, single-hung sash windows at close proximity reveal its location at the corner of a relatively modern building. The walls and ceiling are flat, undecorated, and painted white; the floor is hardwood. A slender radiator behind the nurse is the only visible source of heat. Against the far wall of the room, centered beneath a window, is a dark, probably oak, roll-top desk with assorted papers and a desk lamp with a flexed metal gooseneck and a curved shade. A light-colored, Windsor-style chair with bentwood back, turned splats, turned legs and spindle, and a flat apron sits next to the desk in the corner of the room, facing inward. Two identical chairs, though darker, lurk in the shadows near the desk, partially blocked by the bed frame. Considering that other photos of CMH show this same type of chair, it was likely used throughout the hospital.

The other corner of the room contains three black objects, one of which is a Type 293 wall telephone, a technology introduced in Montreal in 1925 but available to customers in the hospital’s district only after September 1930. Between the phone and the two unidentified black rectangles, two lab coats on wire hangers hang from simple hooks. Note that the electrical cord of the desk lamp climbs up across the window, over the coat hooks and plugs in near the phone. A calendar or framed image is also beneath the phone, just above the young physician’s back.

The wall on the right side of the photograph has a dozen or so plastic bags suspended in two horizontal rows from pegs. These are likely probes, perhaps used to enter the chest cavity to produce the pneumothorax. They are probably in sealed plastic bags because they were sterilized and arrayed on the wall in a range of sizes for easy access and selection while remaining out of the way. They appear to be the same type of instrument used by the doctor in the photograph to enter the patient’s chest.

The doctor’s probe is hooked up to a manometer, used here to measure the amount of pressure in the chest cavity (to collapse the lung, some positive pressure is needed, relative to atmospheric pressure). Manometers such as this one were portable, because pneumothorax was frequently performed in a patient’s home (Packard, Hayes, 1930).

Figure 6. U.S. World War I Overseas Hospital Unit, Designed by Architects Edward F. Stevens and Charles Butler

Source: Stevens (1918, pp. 266-267).
Pneumothorax Then and Now

& Blanchet, 1940, p. 65; Riviere, 1917, p. 39). The type in the photograph became quite famous after Norman Bethune, a thoracic surgeon at CMH’s sister institution, Royal Victoria Hospital in Montreal, redesigned the basic model. As Allan and Gordon (1952, pp. 51-52) recount, it was Bethune’s professional and personal struggle with TB that led directly to his interest in the pneumothorax apparatus (Figure 7). Suspended from the head of the metal bed frame is a pouch that holds additional instruments, or possibly used instruments.

On the left side of the photograph, above the nurse, the poster over the bulletin board lists different sites of TB in the body by percentage and presumably corresponds to the series of cases treated at this hospital (what proportion of patients had each type/site); for example, the top entry is “Parenchymal lesion: 9.0%.” Below, on the same poster, are Mantoux test results. In this test, different concentrations of diluted tuberculin are introduced beneath the skin to detect the body’s immune response to TB. For the least dilute (1:1,000) solution, 100% of patients reacted, indicating that they were or had been infected by TB; for the next least dilute (1:10,000), the reaction rate was 90%, and so on down to the most dilute (1:200,000), for which only 2% reacted.

The Photograph and Hospital Narratives

Having completed a Cohen-inspired inventory, let us turn to a Martha Langford–style narrative. Here, we build on the innovative scholarship of Langford’s (2001) Suspended Conversations, in which the art historian argues for a more precise understanding of the complex cultural situations in which photographs are taken and displayed. “A close reading of a photograph is like a stone dropped in a pond, with its ever-expanding inclusions, occlusions, and allusions,” writes Langford (p. 4). Suspended Conversations focuses on family photograph albums. Still, the book’s central premise that photographs relate to an oral condition by retelling a story is not only relevant to our examination but even anticipates it: “The unaccompanied album requires of its viewer both interrogation and performance. Each of us must play the dual role of teller and listener” (p. 190).

This relationship of word and image is a central issue in the history of photography. It resonates, too, for historians who use mute photographs as primary sources, as is common in architectural history, material culture, cultural geography, and a number of object- or place-based fields (Barthes, 1977/1982; Taft, 1938; Tagg, 1988; Trachtenberg, 1989). How can we reconstruct the photographic story? How do we know if an image was posed?
The story told by our photograph includes three characters: a masked graduate nurse who operates the pump, a gloved and masked physician, and a reclining patient in bed in the center of the room. The mediator between them is the technology, both the manometer and the camera. The photograph was almost certainly taken by a professional photographer, a verdict based on the intense lighting of the scene, the visible wood grain of the wooden floor, the whiteness of the linens, the darkness of the shadows, and the neat parallel edges of various planes, likely corrected with a special lens. In an interview (conducted by A. Adams, October 25, 2004) during which she examined our picture, Langford herself described the cumbersome equipment needed to stage the scene, noting that there was “no room for spontaneity in this type of photograph.” “Did hospitals have photographers on staff? Could it be a training photograph?” she asked. And finally, Langford also suggested that “the photographer here is playing the role of the medical student.”

A complete surprise to us was the discovery that this CMH photograph in fact resembles many others. Although few can be dated accurately and precisely, external evidence indicates that they were produced from about 1920 to about 1940 and thus constituted a specific interwar genre. An example from Waverly Hills Sanatorium near Louisville, Kentucky (Figure 8) is quite similar to the CMH photograph in its depiction of a corner of a room, minus the office trappings. In the Kentucky photograph, both the nurse and physician are ungloved; the setting visible through the open window is again wooded. This photograph may be more realistic than our Montreal example, in that practitioners did not necessarily perform pneumothorax under sterile conditions. Or it may be less realistic, considering that they do not actually appear to be probing the patient’s chest, as in the CMH photograph.

A slightly “higher tech” version from Toronto Free Hospital for Consumptives shows two nurses preparing a patient for the procedure (Figure 9). Noteworthy are the arrangement of scrub room and operating room at the back and the surprising absence of both a physician and a chest X-ray.

Yet another example, now in the collection of the Lung Association of Saskatchewan, was taken at the Fort Qu’Appelle Sanatorium during the 1920s (Figure 10). Note-worthy elements of this photograph include the direct gaze of the patient, the relatively passive mode of the nurse, and the absence of a window. The all-important role of the manometer as mediator, however, is blatant. And here, because the patient is looking right at the viewer, the presence of the photographer is palpable.
As with the images from Louisville and Toronto, this last example from Fort Qu’Appelle corresponds to the first of three basic categories of hospital photographs: the “good” hospital, the “bad” hospital, and the “human” hospital. The three types constitute a rather contradictory portrait of the burgeoning institution in the first half of the 20th century, fast becoming a setting both for high technology and human drama, as simultaneously good and bad (Adams, 2000). “Good” and “bad” photos were presumably intended to act as counterpoints to each other and were quite widespread in fund-raising campaigns.

Images of the bad hospital, on one hand, such as the powerful photograph of the chaos of construction in the tunnels of Royal Victoria Hospital (Figure 11), were intended to prove that the institution needed more money to become a good hospital. These photographs typically document overcrowded clinics and laboratories, antiquated equipment, and worn-out buildings. On the other hand, images of the good hospital were intended to demonstrate that donors’ money had been well spent. As in the 1926 photograph of nurses at the recently completed Ottawa Civic Hospital (Figure 12), photos in the good category typically show the hospital as clean (never any blood visible), efficient, orderly and comforting on the inside, and welcoming and urbane on the outside.

The remarkable thing about the CMH photograph is that it showcases both the good and the bad. The interior furnishings and decoration are plain and rustic. The electrical cord from the desk lamp, for example, simply runs across the window. In fact, of all the pneumothorax photos we have found, the CMH example is the one that most clearly presents this surgical procedure outside a setting designed for surgery. Nonetheless, the health care workers appear clean, caring, focused, and professional.

The genre of pneumothorax photos, transgressing the classification of good and bad, is compelling not only because of what the images show but because of what remains hidden from view. The induction of an artificial pneumothorax involves breaching the otherwise closed chest cavity: in some sense opening the closed space where tubercle bacilli grow. With the creation of a pneumothorax, there is also the implicitly spatial notion of entering the chest to battle the bacillus on its own turf, an implication perhaps carried to its logical extreme by the much more aggressive and mutilating surgical TB therapies such as thoracoplasty (the surgical removal of ribs, used in TB patients to collapse the lung).
Pneumothorax Now

What are the links between pneumothorax then and now? Figure 13 shows the room now used for medical thoracoscopy at the modern-day Montreal Chest Institute. This procedure always takes place after a pneumothorax has first been induced, to permit the safe entry of the thoracoscope, a hollow cylinder containing a fiber-optic bundle with a video projection attachment. Thoracoscopy was actually invented in 1912 to enhance the pneumothorax treatment of TB. A physician could look directly inside the chest cavity for adhesions between the lung and chest wall, which could then be broken up for the lung to collapse. Of course, at that time, the procedure involved looking directly through a hollow tube. Today, patients remain awake while physicians examine the pleural space and adjacent structures from within. But rather than looking through the thoracoscope directly, physicians, observers, and patients see video images projected onto a large television monitor.

Earlier, we described the X ray as a purveyor of medical truth. How the X ray came to be considered as a reliable, objective indicator of medical condition is not quite straightforward; after all, the X ray purports to show something that the eye cannot see (Keller, 2004). It took some time for this nonvisual realm—the world revealed by radioactivity—to gain acceptance as reality. The disclosure of hidden realms tied X rays simultaneously to science, to the Freudian unconscious, to mysticism, and to other “extrasensory phenomena” (Nickel, 1999, pp. 39-40; see also Cartwright & Goldfarb, 1992). As historian Joel D. Howell (1989, p. 132) has argued, however, it took even more time before the X ray became commonplace in medical practice. Howell warns that the existence of a technology does not determine how, where, or when it is used. New digital imaging technologies, for instance, like magnetic resonance imaging, are “fundamentally changing the way analog technologies, such as X rays, are used,” claims historian Scott Curtis (2004, p. 218). Still, the X ray remains a vital diagnostic tool, retaining its central role as a “window” to the chest (see Figure 2), despite this new video thoracoscopic technology.

In Canada, since the postwar period, asthma, chronic obstructive pulmonary disease (emphysema), and lung cancer have eclipsed TB as the major chest diseases. However, many chest specialists still work in hospitals originally established to combat TB, and the major professional organizations of chest medicine are all rooted in the anti-TB and sanatorium movements. Moreover, thoracoscopy today is an explicit transposition of older technologies to newer chest problems, notably cancer and its complications. And doctors still use Mantoux skin testing to uncover the body’s immune response to TB, to detect otherwise hidden TB carriers.

Another parallel with the world disclosed by the photograph and medicine today is the space in which thoracoscopy takes place. Just as the CMH photograph showed pneumothorax induction in a room originally built for other purposes (i.e., it looks like an office rather than an operating room), medical thoroscopies are now performed in a former operating room of the Montreal Chest Institute (Figure 13). During the
1980s, all surgery at the Montreal Chest Institute was transferred to Montreal General Hospital. Nonsurgeon chest physicians then salvaged the former operating rooms for minimally invasive procedures, performed under local anesthesia. They reused the same space, adapting it to a different set of circumstances, just as the CMH office with its nonmedical trappings (phone, desk) became the setting for pneumothorax.

What is new in today’s pneumothorax setting is the reliance on artificial lighting (note the blocked window, Figure 13), the separation of sterile and nonsterile spheres, and above all the role played by the patient. During pneumothorax induction for TB treatment, practitioners of the 1930s examined chest X rays alone to deduce the most appropriate needle entry points. Video thoracoscopy now allows today’s patients to peer directly into their own bodies, introducing a very different dynamic. For patients, the opportunity to see their diseased lungs makes the abstract more concrete and tangible. Today, a chest specialist would likely point to the X ray to show the patient the spot on his or her lung (perhaps a cancer) or the fluid collection around the lung that is limiting his or her ability to breathe. With thoracoscopy under local anesthesia, the specialist can take this a step further, showing the patient the abnormality on the video screen, in real time, complete with movements of the lung and diaphragm, and transmitted pulsations from the heart and large arteries (Figure 14). Unlike the chest X ray, abnormalities seen with thoracoscopy may be evident even to the untrained eye. Doctors can describe and illustrate normal and abnormal structures to patients and observers with much less need for translation or imagination than is necessary for more widely used real-time imaging technologies, such as obstetrical ultrasound.

**Figure 14.** Still Images Taken From Video Footage of a Medical Thoracoscopy at the Montreal Chest Institute, Montreal, Canada, 2004.

*Source:* Photograph by Kevin Schwartzman.

*Note:* The first image in the upper row shows the parietal pleura, the membrane that lines the inner surface of the chest cavity. It is thickened and has multiple tumor nodules. The second image in the upper row shows a normal lung surface, viewed from within the pleural space. The third image in the upper row shows the thickened parietal pleura at the upper left, while the normal outer surface of the lung is visible at the lower right. The first image in the lower row shows the surface of the diaphragm, which separates the chest and abdominal cavities. A tumor nodule is visible, reflecting light from the fiber optic source. The second image in the lower row highlights the surface anatomy of the lung, with the fissure separating upper and lower lobes. The third image in the lower row shows a tumor nodule on the parietal pleura at upper left, with pleural fluid seen as an ill-defined haze below that nodule.
Conclusion

We speculate that the genre of pneumothorax photographs has not survived perhaps because of ethical concerns about photographing patients but also because hospitals in Canada and elsewhere no longer needed “good” photographs to attract patients and benefactors. The most recent pneumothorax photograph that we could find dates from World War II. Yet the medical procedure and the technologies involved have survived in an almost unchanged state. What is completely different today is that the viewer is the patient. The image is evidence of situational or contextual change, rather than technological change per se. This argument highlights the dangers of limiting enquiry to “the objects themselves,” a methodological focus described by Harry M. Marks (1993) in Companion Encyclopedia of the History of Medicine as “the most direct route to the history of medical technology” (p. 1592).

Our study reinforces the need to explore the historical relationship of technology and place, the links between seemingly outdated and cutting-edge technologies, and their social and spatial contexts. The lesson it teaches allows us to draw a parallel between the physician’s diagnostic procedures and the historian’s research methods: The story told by the photograph, as with diagnoses made possible by X-ray and video images, is impossible to discern from nonvisual sources; generalist histories of architecture and medicine, like the physical examination of the tubercular body, would miss the story altogether. Our pneumothorax photograph thus serves researchers the way the X-ray helps the physician: It helps us to see the unseeable.

Notes

1. On the new wing, see the anonymous article in Construction (“Children’s Memorial Hospital, Montreal,” 1931) and “Report From the Medical Board re: Building and Equipment in Connection With Campaign—Children’s Memorial Hospital,” typescript, Montreal Children’s Hospital archive.

2. We are grateful to Lise Noel, Bell Historical Services, for this information. She kindly looked up CMH in the Montreal telephone directories of July 1930, January 1931, and July 1931. In the July 1930 directory, CMH had a phone number in the Uptown exchange (UPtown-9020). This exchange was a manual exchange (i.e., operator assisted) until it closed in June 1931. Customers served by manual exchanges had phones without dials. In the January 1931 directory, CMH’s telephone number had been changed to Fitzroy-4661; new automatic switching equipment was put in service in September 1930, and customers served by this exchange had dial phones.

3. A former Laurentian Hospital patient reported that he was quite certain that the doctors who performed his pneumothorax treatments—repeatedly—did not wear masks or gloves; the procedure was done without local anesthetic (interview with patient, conducted by M. A. Poultanen and K. Schwartzman, January 21, 2005).

4. Dr. D. D. Munro, retired surgeon-in-chief, Montreal Chest Hospital, confirms that this setting for pneumothorax was common at CMH in the 1940s. Even at Royal Edward, he says, such procedures would be done while patients straddled chairs (interview conducted by A. Adams, November 1, 2004).
References


Annmarie Adams is a professor in the School of Architecture at McGill University. She is the author of *Architecture in the Family Way: Doctors, Houses, and Women, 1870-1900* (McGill-Queen’s University Press, 1996) and coauthor (with Peta Tancred) of *Designing Women: Gender and the Architectural Profession* (University of Toronto Press, 2000). Her current research explores the intersections of 20th-century architecture and medicine.

Kevin Schwartzman is an assistant professor of medicine at McGill University. He is a respirologist and researcher based at the Respiratory Epidemiology Unit of the Montreal Chest Institute. His research focuses on the epidemiology, spatial distribution, and transmission of tuberculosis.