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“Thirty spokes converge on a hub  
What is not there makes the wheel useful  
Clay is shaped to form a pot  
What is not there makes the pot useful  
Doors and windows are cut to shape a room  
What is not there makes the room useful  
Take advantage of what is there  
By making use of what is not.”

“Using what is not,” *Tao te Ching*, chapter 11  
(in Pattison 2009, 180).

### There’s a lot of history here

Corner of Broadwick & Lexington,  
Soho, Greater London.  
July 1986.

My befuddlement was all too obvious.

A woman emerged from the front door of  
the John Snow Pub. Need some help, dear?

Well, yes. Can’t locate the curbstone com-  
memorating the Broad Street pump.

Carry on a few more yards down Broad-  
wick. It’s pink. A very light pink, mind you. Di-  
rectly in front of the side door to the pub. Easy to  
miss, but there’s a lot of history here.

Yes, there certainly is. Thanks.

The woman re-entered the pub. I followed  
her directions to a nondescript granite curbstone,  
looked at it awhile, then resumed my walk north-  
west toward the Tube station at Oxford Circus.

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What had happened near the corner of Broadwick and Lexington to make the owners of a public house in London's West End decide it was advantageous to rename it after a man who had long advocated teetotalism?

Two American journalists think they have the answer. In October 2010, Joe Palca introduced a segment of National Public Radio's "Science Friday" in the following manner:

Over 600 people died of cholera in London during the outbreak of 1854, and it was a pretty mysterious disease back then. The prevailing medical theory of the day blamed it on contaminated vapors, but the English physician, John Snow, had his own theory. To prove it he mapped out the cholera deaths during the outbreak, and he noticed that many of the deaths were concentrated around one particular water pump on Broad Street. Snow recommended disabling the pump; and sure enough, the outbreak was

contained, so they knew it had something to do with water.

The archive page for this segment (NPR 2010) lists three related books, including Steven Johnson, *The Ghost Map*, which focuses on the Broad Street pump episode, and Charles Rosenberg, *The Cholera Years*, which analyzed changing perceptions and responses to the disease in the United States, especially in New York, during the nineteenth century.

Cholera in New York, albeit 1832, was also the subject of an exhibition at the New York Historical Society. In a review, John Noble Wilford (2008) wrote that "a turning point in prevention came in 1854, when a London physician, Dr. John Snow, established the connection between contaminated water and cholera.

Dr. Snow tested the idea by plotting cholera cases on a map of SoHo [*sic.*]. This showed that most of the victims drew their water from a public pump on Broad (now Broadwick) Street. An infected baby's diapers had been dumped into a cesspool near the well. A recent book, 'Ghost Map,' by Steven Johnson, recounts the discovery.

The cholera research was an early application of mapping in medical investigations, a technique that has become widespread now that computers facilitate the display and analysis of such data.

But readers of Johnson's book will find a very different description of Snow's doings than what Wilford and Palca offer. With respect to

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disease mapping, Johnson (2006) depicts Snow only as “imagining the paths residents might take” (136) when he began to investigate the cholera outbreak at the beginning of September 1854; “he drew maps in his head, looking for patterns, looking for clues” (149). Johnson chose an appropriate title for his book since mapping was a figment of Snow’s imagination until he “began working on his first map of the Broad Street outbreak sometime in the early fall of 1854” (193). This map’s sole purpose was to illustrate Snow’s discussion of investigative findings he had conducted during several weeks for a second edition of an essay, *On the Mode of Communication of Cholera [MCC2]* (1855). As to the impact of Snow’s investigation on cholera mortality, nowhere in *The Ghost Map* does Johnson say that removal of the pump handle “contained” the Broad Street outbreak, as Palca stated. On the contrary, Johnson states explicitly that cholera mortality had begun dropping dramatically several days before the handle was removed (155), in agreement with what Snow had written on three occasions (1854c, 322; 1855, 51; 1855b, 118).

So, what went wrong? Palca and Wilford do their homework. They know their stuff. Yet one cannot square their explanations with the one source cited by both of them, *The Ghost Map*, which is faithful to Snow’s account. Admittedly, Johnson’s book is complex and ambitious, with multiple purposes and many topics, but his

narrative of how Snow and his contemporaries struggled to make sense of a mysterious disease is clear and straight-forward.

My hunch is that Palca and Wilford had default cognitive assumptions about the Broad Street pump episode which automatically trumped historical evidence imbedded in *The Ghost Map*. From where have such assumptions come?

\* \* \*

Austin Bradford-Hill (1955) thought he knew the source of Palca’s notion that removal of the pump handle brought an end to the Broad Street cholera outbreak. Bradford-Hill was instrumental in organizing various commemorative events in 1955 to mark the hundred-year anniversary of the publication of *MCC2*. In addition to facilitating a transformation of The Newcastle-upon-Tyne into The John Snow Pub, he gave a talk at the Royal Society of Medicine. With respect to Snow’s “most famous field of study” (the Broad Street outbreak), Bradford-Hill said,

I think it is necessary in this centenary year once more to point out that Snow’s claim to fame does *not* rest upon the removal of a pump handle and a *post hoc propter hoc* argument which he would, I believe, have despised. Yet that belief is widespread. It may well have its origin in Sir Benjamin Ward Richardson’s fine memoir of Snow . . . (1009).

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On this occasion, Bradford-Hill was alluding to a heavily redacted biographical memoir by Benjamin Ward Richardson (1887) reprinted in *Snow on Cholera* (Frost 1965), which also contained a reprint of *MCC2* where Snow had discussed the Broad Street outbreak. Bradford-Hill then quoted Richardson's description of what ostensibly had transpired when, "On the evening of Thursday, September 7th, the vestrymen of St. James's were sitting in solemn consultation on the causes of the [cholera] visitation. . . .

A stranger had asked, in modest speech, for a brief hearing. Dr. Snow, . . . had fixed his attention on the Broad Street pump as the source and centre of the calamity. He advised the removal of the pump-handle as the grand prescription. . . . The pump-handle was removed, and the plague was stayed (1009; Richardson 1887, 286).

"It is difficult to resist the final dramatic touch," continued Bradford-Hill; "it is almost sacrilege to attempt to de-bunk it. Yet perhaps it is fair in a centenary year to see what Snow himself wrote" (1009). He then reproduced a portion of Snow's table (1855) of fatal attacks from late August until mid-September 1854 (49), which, according to Bradford-Hill, unequivocally demonstrated "that the end of the epidemic was not dramatically determined by its [the pump-handle's] removal. The deaths had already been declining from a very

marked peak for at least five days" (1010).

So, Palca's notion that closure of the Broad Street pump ended a violent cholera outbreak in Soho had its origins in a tale first told more than 150 years ago, a tale because it is at odds with what Snow and other actual witnesses said had happened. The second postlude of the Prologue contains my hunch of what motivated Richardson to create the tale that "the plague was stayed" by removing the handle of the Broad Street pump.

During the next great London cholera epidemic in the summer of 1866, Edwin Lankester, a knowledgeable veteran of the Soho outbreak, self-servingly decided to compound Richardson's mischief. Lankester featured the Broad Street pump episode in *Cholera: What is It? And How to Prevent It*. "This case demands attention," wrote Lankester, "not only on account of its completely demonstrating the fact that the cholera poison may be conveyed by water, but on account of its showing that of all sources of unsuspected danger, the pump of a surface well may be most fatal and destructive in its influences" (33). He had tried, unsuccessfully, to close such street pumps since the Broad Street pump was implicated as a source of the 1854 Soho outbreak.

Edwin Lankester was well-informed about cholera in general, the Soho outbreak in particular. He was a physician; a vestryman of the Parish of St. James, Westminster; the author of

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an 1854 report on worrisome well-water quality throughout the parish; and the prime instigator for the creation of a parish Cholera Inquiry Committee (CIC) to look into the causes of the outbreak once it was over. As a leading figure in the CIC, he would have been instrumental in adding Snow to the committee after Snow presented a report detailing his investigations, including the table of fatal attacks which showed that the outbreak was subsiding before parish authorities removed the handle of the pump at the corner of Broad and Lexington Streets. Eventually, Lankester was elected to chair the sub-committee that presented all reports collected by the CIC, including "Dr. Snow's Report" (1855b), to the vestry. When the vestry of St. James, Westminster parish voted to designate funds to print the CIC's findings, Lankester helped supervise publication by J. Churchill in New Burlington Street (CIC 1855, 96).

Lankester (1866) endorsed the CIC's conclusions about the cause of the 1854 outbreak. He noted that the sixteen members "unanimously came to the conclusion that the water of the Broad-street pump was poisoned on the 31st of August, and that the [subsequent] outbreak of cholera . . . depended entirely on the poisoned nature of that well. The evidence adduced was most circumstantial and conclusive" (35). But when it came time to describe Snow's investigations during the Broad Street outbreak, he seems to have thought that Richardson's version

of the Broad Street pump episode was ever so much more compelling than the probabilistic and unheroic narratives provided by Snow in the CIC report. The following passage demonstrates Lankester's familiarity with Broad Street and the outbreak that came to bear its name. Nonetheless, he decided to plagiarize part of Richardson's account:

In the parish of St. James, Westminster, is a street in the district of Golden-square, known by the name of Broad-street. It is a wide street, and healthy, because it is wider than the height of the houses on either side. In this street stands a pump, an ordinary street pump, connected to a well about 25 feet deep. . . . It was a popular pump . . . because of its coolness and liveliness. . . . On the night of the 31st of August, there was weeping and lamentation in all that district. The shadow of the angel of death had passed over it. . . . On the 1st of September the Board of Guardians met to consult as to what ought to be done. Of that meeting the late Dr. Snow demanded an audience. He was admitted, and gave it as his opinion that the pump in Broad-street, and the pump alone, was the cause of all the pestilence. . . . The pump was closed . . . and the plague was stayed (1866, 34-35).

The cribbed portion is not entirely verbatim, and the devil is again in the details. First, Lankester did consult one of Snow's accounts since both said the group with whom Snow met was the Board of Guardians, not the vestry of Richardson's version. Second, Lankester wrote that

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Snow met with local authorities on 1 September; Richardson said it was the 7th, as had Snow in three different places, including his report (1855b, 102) published by CIC. Otherwise Lankester followed Richardson's account of the proceedings and the impact of closing the pump.

The wrong date may have been a typographical error, or it may have been intentional. Lankester knew that a dramatic reduction in fatal attacks began on day four (Sunday 3 September) of the outbreak, and many others knew that as well. He had to make it seem that the pump handle was removed whilst the outbreak was raging to claim that closing the pump halted the outbreak. Setting the meeting on the evening of day two (Friday 1 September) fit that bill; fatal attacks would have continued for a few days longer until residents had consumed the last of the water from this very popular pump. Lankester firmly believed the outbreak was caused by contamination of the pump in Broad Street, but closing the pump on day ten (Friday 8 September) of the outbreak, when the fatal attacks had been waning since Sunday, did not seal the deal. Having Snow ostensibly made his case on 1 September raised the causal relation between pump closure and ending the cholera epidemic to near medical certainty.

Whether Lankester was careless or opportunistic about the date on which the pump handle was removed doesn't change the impact of his action. By altering Richardson's pump-

handle tale to incorporate the actual epidemic curve discovered by Snow, Lankester imbued both re-tellings — his own and Richardson's — with medical-scientific gravitas. Posing an earlier date for Snow's meeting protected Lankester from future epidemiological criticism (from anyone who knew the facts) and helped him make a case that the Broad Street pump was representative of what could happen to any street pump in the metropolis if it was situated in highly populated areas with sewage-contaminated soil. In October 1855, the St. James, Westminster paving board, which had authority over street pumps, had bowed to popular demand and re-opened the Broad Street pump. The paving board had ignored the advice of many medical men in the parish, including himself. In Lankester's mind, this infamous pump was again a potential source of contamination during the 1866 London cholera epidemic.

The Richardson/Lankester pump-handle tale had legs from the outset. At a monthly meeting of the London Epidemiological Society in May 1867, Reverend Henry Whitehead (1868) noted that "it is commonly supposed, and sometimes asserted even at meetings of Medical Societies, that the Broad Street outbreak of cholera in 1854 was arrested in mid-career by the closing of the pump in that street." Whitehead went on to affirm "that this is a mistake . . . [because] the outbreak had already reached its climax, and had been steadily on the decline for several days before the pump-

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handle was removed” (99). As proof, he presented a table depicting fatal attacks and deaths by day, starting on 31 August 1854.

Although Whitehead refrained from commenting on the source of the misconception he identified, my hunch is that Lankester’s essay was the likely suspect. In the late 1860s, Whitehead was a curate with extensive experience in public health matters. In 1854 he was senior curate at St. Luke’s, Berwick Street Anglican Church when the Soho cholera outbreak occurred. He undertook a personal investigation, interviewed residents throughout the district he served, and self-published a pamphlet on “The Cholera in Berwick Street” (1854). Subsequently, the eight original members of the Parish of St. James, Westminster CIC (including Lankester) invited him to join the committee, as they did Snow and six other men. As such, Whitehead conducted an epidemiologically nuanced investigation of the cholera outbreak in Broad Street, eventually discovering the likely index case at 40 Broad Street.

Epidemic cholera reappeared in London in 1866, when Whitehead was the curate at the parish church of St. Anne’s, Highgate Rise. He had held this post for nearly two years, during which time he had become increasingly concerned about sanitary conditions in the East End of London (Rawnsley 1898, 68). The prevalence of cesspools in contiguity with surface pumps reminded him of what he had observed in St. James, Westminster. He published two essays (1865; 1866) on

the Soho outbreak of 1854 which described the findings of the CIC, which Whitehead believed validated Snow’s theory that cholera was communicable by neighborhood surface pumps. Whitehead also summarized the South London study spearheaded by Snow and wondered if Greater London, a decade after full implementation of the Water Act that prevented water companies from drawing supplies from tidal zones of the Thames and Lea, was really safe from a re-occurrence of a metropolitan-level outbreak of similar magnitude as long as sewage was poured directly into these rivers.

So, when massive mortality occurred in East London during the 1866 cholera epidemic, Whitehead offered to assist investigators from the General Registry Office in locating the cause of the outbreak. They discovered that sewage contamination from the River Lea was inadvertently piped to customers by the East London Water Company. Whilst undertaking this investigation, it is likely that Whitehead came across the essay, *Cholera: What is It? And How to Prevent It*. After all, it was written by a former colleague from the parish committee that had investigated a major incident during the previous epidemic to visit London. Of course, it is also possible that Whitehead had heard the misconception expressed either at meetings of medical societies such as the one he addressed in 1867, or by residents in one of the four parishes in which he had served since the Soho outbreak occurred in 1854.

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If so, I wondered if pump-handle tales similar to what Richardson and Lankester produced had been mentioned in print prior to Whitehead's remarks at the Epidemiological Society. I decided to investigate the *Times* of London. It published letters to the editor submitted by readers from the entire social spectrum, including the marginally literate. In addition, the *Times* Digital Archive makes it possible to undertake word searches in editorials (called leading articles in Whitehead's era), as well as in titles assigned to letters and articles. I used the online *Times* Digital Archive available through the Michigan State University Libraries to search for specific words between 1 August 1854 and 31 December 1867 (the year Whitehead delivered his paper before the Epidemiological Society).

"Broad-street" and "Broad Street" (two common ways at the time when referring to specific streets) returned forty-four citations. Only two of these referred specifically to Broad Street, Golden Square, one of which mentioned the Broad Street pump: a July 1866 letter in which a surgeon and a chemist (who had analyzed Broad Street water samples the previous year) were puzzled that parish authorities refused to close a pump that dispensed "little else but filtered sewage" during the current cholera epidemic (Miller and Frankland 1866).

Word searches for "St. James" and "cholera" resulted in three citations, none of which were relevant for this topic. Searches for "cholera" alone during the thirteen-year time span resulted

in 378 citations. But none of them contained the common supposition that Whitehead singled out in his talk to the Epidemiological Society.

I then limited the search for "cholera" to editorials for the entire period. Two citations were suggestive, at best: (1) an August 1865 editorial warning that contamination of street pumps by adjacent cesspools remains a possibility throughout London if cholera returns. As an example, the editors cited the local 1854 outbreak in Soho as very probably caused by cesspool seepage into an adjacent pump (the Broad Street pump is not specifically mentioned, perhaps to avoid angry letters from local authorities and merchants). Although the editors assert that eliminating such sewage seepage would prevent future outbreaks, they do not claim that the local outbreak ended with the closure of the pump. And (2) an editorial the following April, when the 1866 epidemic was well underway, asserts unequivocally that a local pump caused the Soho outbreak, but again the editors neither mention the pump's name nor claim that the outbreak ended with the removal of the pump handle. In short, my online word search of the *Times* between 1854 and 1867 was fruitless.

Almost two decades later, however, another reverend did express the common supposition Whitehead sought to correct. Thomas Snow, John Snow's younger brother, sent a letter to the editors (1885b). He objected to an editorial in the *Times* which claimed that



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it was only when the inhabitants of a court in Broad-street, during the London epidemic of 1854, were struck down in very large proportions, that the sagacity of the late Dr. Snow caught at the possibility of water being a common channel for the diffusion of the poison, and led him to institute observations for the purpose of confirming or disproving his hypothesis.

Not so, asserted Reverend Snow. "Dr. Snow prosecuted his researches and furnished abundant facts in confirmation of his theory, long before 1854." He first expressed his views in 1849, including the possibility of the very mode of communication mentioned by the *Times*.

So far from the case of the Broad-street pump suggesting in 1854 the possibility of water being a common channel for the diffusion of the poison, the remarkable facts of this case were of the same character as those with which he had already become familiar. But in this case the facts took what may be called a dramatic form; and *the immediate abatement of the cholera — when, on Dr. Snow's urgent appeal, the authorities removed the handle of the pump —* was the means of bringing his theory before the notice of the general public, and hence the mistaken impression has arisen that his researches commenced with the case of the Broad-street pump (italics mine).

Thomas Snow's error caught me off-guard. Several weeks earlier, he had corrected a *Times* correspondent who claimed that John

Snow's theory of the propagation of cholera required "cholera excreta tainted water." Reverend Snow's correction (1885) included the statement that his brother "devotes several pages of his book — *On the Mode of Communication of Cholera* — to the pointing out of modes of propagation otherwise than by water." Although he had read *MCC2* with care at some point, what I have identified as the Richardson/Lankester version of events had somehow trumped what his brother had written about this episode. Whitehead's second letter to the *Times* contained an inadvertent disservice to his brother's legacy.

Whitehead's criticism of a notion that Thomas Snow later assumed to be correct suggests that the tipping point toward widespread acceptance of this pump-handle tale did occur within a decade of John Snow's death in 1858. Richardson's motivation for expressing or devising it is unclear, but Lankester's is apparent. An ardent sanitarian, he re-configured the closure of the Broad Street pump as an iconic event in the cause of public health advocacy. Improvements in drinking water quality had been a primary goal of English sanitarians at least since the Health of Towns Reports in the mid-1840s. The *Report* by the St. James, Westminster Cholera Inquiry Committee was a sanitarian exoneration of the parish officials who had the Broad Street pump disabled. Many locals were not mollified, however, and the pump eventually was re-opened, much to the dismay of sanitarian reformers.

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Whether or not Richardson (an ardent sanitarian) invented the tale that removal of the pump handle had ended the outbreak, it encapsulated the sanitarian argument that shallow-well street pumps were potential disease cauldrons. Lankester enhanced the sanitarian lesson imbedded in Richardson's pump-handle tale during the 1866 London cholera epidemic. Netten-Radcliffe's analysis of mortality in East London — the natural experiment of the 1866 epidemic — brought a wave of converts to Snow's theory and belated respect for his South London investigations, but there is no indication of renewed interest in his or Whitehead's accounts of what had actually happened during Broad Street outbreak. On the contrary, Thomas Snow (1885b) found it useful to employ a Richardson/Lankester-like version ("the immediate abatement of the cholera" when the handle was removed) as the "dramatic" event that brought "his [brother's] theory before the notice of the general public."

And the band played on. In 1887, Richardson extensively revised the 1858 memoir for an issue of *The Asclepiad*; he transformed Snow from a man of his time into a man for all time. Snow is no longer the quirky, opinionated, controversy-loving, not-afraid-to-go-out-on-a-theoretical-limb person that makes Richardson's 1858 biographical memoir so endearing, its many historiographical warts notwithstanding. Richardson (1887) excised many passages from the original memoir, but he left most paragraphs on

cholera in South London and Broad Street intact through the first use of the clause, "the plague was stayed" (286). D'Arcy Power (1898) cited both the 1858 and 1887 memoirs when composing an entry on Snow for the *Dictionary of National Biography*; although he says nothing about the Broad Street outbreak, the citations served to enhance the authenticity of Richardson's memoirs. At the turn of the century, the 1887 revision of Richardson's biographical memoir of Snow was republished (1800) in a posthumous collection of Richardson's essays entitled *Disciples of Æsculapius*. Wade Hampton Frost placed Richardson's sanitized, 1887 memoir of Snow at the beginning of *Snow on Cholera* (1936, reprint 1965), which includes complete reprints of MCC2 and Snow's essay *On Continuous Molecular Changes*. Frost's editions remained the most accessible introductions to Snow's investigations of cholera, as well as Richardson's account of his life, until the 1990s.

Several historians of medicine and public health have picked up the pump-handle tale set in motion by Richardson and Lankester. Amongst the earliest to do so was Fielding Garrison (1929), whose brief error-filled entry about Snow includes the following: "During a severe London epidemic of cholera in 1854, he told the vestrymen of St. James that the outbreak would cease if the handle of the Broad Street Pump were removed, which proved to be the case" (713). Garrison does not provide a reference,

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but the subsequent comment that *MCC2* “cost him [Snow] £200 and netted him a few shillings” gives it away; Richardson (1858) had written that Snow “spent more than £200 in hard cash, and realized in return scarcely so many shillings” on this monograph (xxii). Thirty-five years later, Anthony Wohl (1983) repeated the Richardson/Lankester version in a study of Victorian public health:

When he [Snow] managed to persuade the local authorities to lock the handle of a pump in Broad Street in Soho (a compact area where over fifty people a day were dying of cholera) the deaths there came to a sudden halt . . . (125).

Wohl’s endnote (373-74) for the paragraph containing this passage cites Sheppard (1971), who had written that the Soho cholera outbreak occurred “in an area only some 250 yards wide, over 500 people died within ten days” (276); Sheppard cited Longmate (1966), who stated that “in ten days in an area only 250 yards across there were more than 500” fatalities (191); Longmate noted that “Snow’s claims were really established in the memoir . . . by Richardson”; and it’s obvious that this chain of references began with Richardson’s (1858) sentence that “within two hundred and fifty yards of the spot where Cambridge-street joins Broad-street, there were upwards of five hundred fatal attacks of cholera in ten days” (xx). The same reference chain applies to the claim that closing the pump

halted the epidemic: from Wohl to Sheppard (“the outbreak ended with the same dramatic suddenness as it had begun” [1971, 277]) to Longmate (“the outbreak ended almost as suddenly as it had begun” [1966, 192]) to Richardson (“the pump-handle was removed, and the plague was stayed” [1858, xxi]). Most intriguingly, Longmate also quoted Snow (1855) that the flight of local residents early in the outbreak likely kept the mortality from being even higher (38), but he ignored Snow’s subsequent comment that the outbreak had peaked long before the vestry had the pump disabled.

More recently, W. F. Bynum (1994) added a curious wrinkle to the pump-handle tale when he wrote that “Snow’s carefully prepared analysis convinced local councillors that the well was the source of cholera and they removed the handle of the pump. The local epidemic soon subsided, although it had already been abating” (79). I admit to being confounded by Bynum’s phraseology, which affirms first the Richardson/Lankester version (“the local epidemic soon subsided”), thereafter the Snow/Whitehead version (“it had already been abating” before the handle was removed). How can both occur? Bynum’s bibliography isn’t helpful in this matter, since he only lists Frost’s (1936) reprint of *MCC2* and noted that Snow’s work is “considered in detail in Pelling’s monograph” (235). Pelling (1978), however, does not discuss the aspect of the Broad Street pump episode quoted above.

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Roy Porter (1997) consulted Bynum, as well as Richardson, when writing his textbook on the history of medicine:

On 7 September he [Snow] requested the parish Board of Guardians to disconnect the pump. Sceptical but desperate, they agreed; the handle was removed, the number of cases plummeted (the outbreak was already declining), and Snow had confirmation of his theory (413).

Porter admitted as much when I spoke with him about this passage in the summer of 2001. He said he had often relied on secondary sources while writing a book of this scope; in this instance, he had consulted Bynum since they were colleagues at the Wellcome Trust Centre of the History of Medicine at the time and had collaborated on other projects. I gave Porter a photocopy of page 413 of his textbook, with several items circled, which he promised to reconsider for a projected revised edition. However, he died the following March before completing revisions.

I think it fair to say that repetitions of Richardson's pump-handle by Garrison, Longmate, Sheppard, and Wohl, as well as Bynum's variation that Porter repeated, have given this version of events considerable scholarly validation. It's an example of what may happen when commentators repeat each other instead of consulting primary sources.

Part of the problem in this instance is that until

Frost published *Snow on Cholera* in 1936, Snow's version of the Broad Street pump episode was relatively unavailable. He had offered it in three places: as a short letter to the editor of the *Medical Times and Gazette*, a medical journal (1854c); in *MCC2* (1855), but less than sixty copies of the original were ever sold (Bradford-Hill 1955, 1011); and in an essay published within the Report of the St. James, Westminster parish Cholera Inquiry Committee (Snow 1855b), which was no best-seller either.

After Snow's death, Whitehead took his place in the lists with two articles in which he restated his view (identical to Snow's) that the outbreak had mysteriously begun to wane long before a parish paving board worker removed the pump handle. The first article appeared in a literary magazine (1865), the second in the transactions of an epidemiology society (1868). After Snow's brother dropped his baton in 1885, there was no resuscitation of the "official" account until William Sedgwick's book on *Sanitary Science* (1902), which contained extensive abstracts from the reports that Snow and Whitehead had submitted to the parish Cholera Inquiry Committee. Sedgwick quoted the entirety of Snow's initial investigation of 83 deaths and the removal of the pump handle during the first week of September 1854 (173-74). He also duplicated Snow's chart displaying the information he eventually gathered on the fatal attacks and deaths of 616 individuals during the local outbreak, which explicitly shows

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that the number of attacks had plummeted five days before authorities disabled the pump (177). So Sedgwick had no part in perpetuating the Richardson/Lankester pump-handle tale.

One would think that Frost's reprint of *MCC2* would eventually have given Snow's version of events a renewed life, but it's ever so much easier to think one may obtain the gist by scanning Richardson's memoir than wading through Snow's long, closely argued essays. For example, Jan Vandenbroucke (2001), a Snow champion for many decades, "was forced to abandon" Snow exercises based on the Frost reprint when medical students complained about having to read so many pages of "outdated" material (291). I've experienced the same reaction myself; "excessive" and "boring" reading were frequent comments on student evaluations for a history of medicine short course on the Broad Street pump episode that Howard Brody and I (1991) prepared for medical students some years back. The lesson is clear: the presence of an alternative doesn't make it viable.

All of Snow's writings and many of his recorded contributions at meetings of London medical societies are now available to anyone with an internet access (for example, as posted on JSA&RC). But people must choose to read them rather than accept what others have written about Snow. Even if they do so, we often find only what we are looking for; that is, we see more often than we observe. My hunch is

that's what happened to Joe Palca and the team of writers for "Science Friday." Their cognitive default was the Richardson/Lankester version that removing the pump handle had ended the epidemic. Snow's version of that episode as presented in the three books recommended on the home page (NPR 2010) never stood a chance of receiving serious consideration.

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Palca's introductory remarks contain a second myth about the Broad Street outbreak which isn't attributable to either Richardson or Lankester — that mapping was part of Snow's initial investigation during the first week of September. Palca said Snow "mapped out the cholera deaths during the outbreak, and he noticed that many of the deaths were concentrated around one particular water pump on Broad Street." Hardly. Snow would have avoided this tactic because in his day, spot-mapping was becoming an essential and increasingly persuasive part of the miasmatist's tool-kit. An air-borne dispersal of the morbidic cholera agent would display as a cluster of deaths, disseminating circularly from the suspected source at its center.

In actuality, Snow's theory of cholera communication required a different approach in a situation such as the point-source outbreak in St. James, Westminster. Since an eruption of this magnitude was hypothetically traceable to a

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source of potable water that had been contaminated by discharges from a previous cholera victim, Snow's initial response (1854c) was to see if most of the new victims in this cholera field had drunk water drawn from a common source. The pump at the corner of Broad and Lexington was a likely suspect. As a former resident of the area, he knew that locals considered Broad Street water highly desirable because it was cool and effervescent. There had been over 400 fatal attacks, more than 350 of which had already died, before Snow was able to receive any reliable information from the General Register Office, and that only a list of 83 deaths that sub-district registrars had recorded since the outbreak began on the evening of 31 August 1854. Snow did not need a map to realize that the overwhelming number of those addresses were closer to the Broad Street pump than the other four pumps he had been testing for organic impurities since Sunday evening. He then made house-to-house inquiries about the drinking-water habits of the deceased, and presented his findings (that 83 % had probably patronized the Broad Street pump) to members of the parish Sanitary Board on 7 September. A majority were sufficiently alarmed to order the pump-handle removed the following day.

So, when Wilford (2008) says Snow discovered "that most of the victims drew their water from a public pump on Broad (now Broadwick) Street," this generalization only applies to Snow's initial investigation during the first week of Sep-

tember. Snow's subsequent investigations of the Soho outbreak occurred many weeks after the outbreak had ended, when it proved impossible to make thorough inquiries about drinking habits because many families of the deceased had fled the neighborhood (1855, 41). Since the total number of deaths potentially attributable to contamination of this pump exceeded 600, Snow never learned the drinking-water habits of more than 15% of the victims (1855b, 101-16). Moreover, Snow never said, anywhere, that he arrived at any information about drinking water habits "by plotting cholera cases on a map" (as Wilford puts it). And while Wilford is correct that baby Lewis at 40 Broad Street was the likely index case, Henry Whitehead, not Snow, made that discovery in the spring of 1855.

A year before Wilford's article appeared, Sandra Hempel (2007) made a similar assertion that Snow had mapped the drinking habits of cholera victims during his investigation of the Broad Street outbreak. According to Hempel, Snow

marked the deaths, house by house, on a street plan, a line for each fatality. And as he did so, a distinct pattern began to emerge. . . both figuratively on the map and physically in Broad Street, right at the heart of the outbreak . . . .

. . . . .

Setting aside those victims who drank the Broad Street water even though the pump was not the nearest to their homes, the map clearly showed that the deaths had either

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plummeted or stopped altogether at every point where it was easier to go to another pump . . . . (212, 214).

Hempel relies extensively on *MCC2*. She incorporates specific information from Snow's essay throughout the narrative. Even though he never mentioned using a map during the investigative process, Hempel makes him out to be a forerunner in the use of "a vital tool in the science of epidemiology, disease-mapping" (212). Perhaps the source of her cognitive default lies here; like Wilford (2008), who thinks Snow's "cholera research was an early application of mapping in medical investigations," Hempel may have assumed that Snow must have employed medical mapping, even if he never said as much, because it's a commonplace in our time.

When we were writing *CC&SoM*, Mike Rip found an association between the emergence of medical geography/cartography as an academic discipline and the notion that Snow's two maps of the Broad Street outbreak were pioneering examples of medical cartography as a tool in establishing disease causation. Rip counted more than forty recreations of these maps, plus commentary, between 1952 and 2001 (*CC&SoM*, 396-99); and in a follow-up study he readily admits that this list was not exhaustive (Rip 1966b, 7).

Most recreations during the half century Michael Rip researched are depictions of Map 1 from *MCC2* (1855). Snow commissioned this

map late in the fall of 1854, after completing multiple investigations beyond what he undertook the first week of September. In toto, he found evidence that 616 deaths could be directly connected to the Broad Street/Golden Square cholera outbreak; the map does not contain 616 bars, however, since not all house numbers where fatal attacks or deaths occurred were registered. Snow had the map engraved because he thought it would illustrate the extent of the cholera field: "The deaths which occurred during this fatal outbreak of cholera are indicated in the accompanying map, as far as I could ascertain them" (45). Much to his surprise, however, critics saw something more — convincing evidence of aerial, effluvial communication from the contaminated pump in Broad Street. One reviewer remarked:

On examining a map given by Dr. Snow, it would clearly appear that the centre of the outburst was a spot in Broad-street, close to which is the accused pump; and that cases were scattered all round this nearly in a circle, becoming less numerous as the exterior of the circle is approached. This certainly looks more like the effect of an atmospheric cause than any other; if it were owing to the water, why should not the cholera have prevailed equally everywhere where the water was drunk? (Parkes 1855, 458).

It's very likely that Snow received a similar reaction when he displayed an advance copy of this map at a meeting of the London Epidemiological Society early in December

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1854. It was too late to pull Map 1 from *MCC2*; by then, the printing process was ineluctable. So, he seems to have returned to the old cholera field with a copy of Map 1 in hand, where he noted the position on every street that demarcated an equal walking distance between the Broad Street pump and the nearest rival pump. When done, he asked the lithographer to add these lines to a revised spot map he planned to present before the parish Cholera Inquiry Committee (Snow 1855b) in mid-December, and altered his report accordingly. It had proved impossible, so long after the outbreak was over, to establish that most of the 616 people who died had consumed water from the Broad Street pump, as he had in the small sample investigated during the outbreak itself. The equidistant walking lines, however, represented probable consumption-habits in favor of that pump. It was the best he could do under the circumstances.

William Sedgwick (1902) included a compressed and slightly altered version of Snow's CIC map (dots replace bars, and the entire map fits on a regular size page) in a book on public health (174). It's the first recreation of either of Snow's two disease maps that I've come across. And Sedgwick published it without comment. Forty-seven years had passed without anyone reproducing Snow's maps or trumpeting his cartographic achievements. No wonder. With the shift in medical

worldview to germ theory, spot-mapping was generally viewed as an anti-contagionist remnant.

Another half century would pass before medical geographers began making the case for medical cartography as a sharp tool in the epidemiologist's box and that John Snow was a pioneering exemplar. Map 1 in *MCC2* (Snow 1855) emerged as the presumptive favorite among those who argued that mapping was an effective way to establish disease causation. In his survey of the literature, Michael Rip (2006b) found thirty authors, mainly but not exclusively medical geographers, who believed that Snow used mapping (such as, or identical to, the *MCC2* map) during his initial investigation in September 1854 (31).

Dudley Stamp (1964) was amongst the earliest progenitors of this mapping myth. He delivered several lectures at the University of London, subsequently published. In one he said:

On a large-scale map he [Snow] plotted exactly the house where each of the victims was attacked. It centred round a spot in Broad Street where there was a manual pump from which local residents obtained their drinking water. On 8 September the handle of this pump was removed at Snow's request and the incidence of new cases ceased almost miraculously. (15-16, including a redrawn map).

Stamp's version of events also contains the pump-handle tale that I previously traced to Rich-



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ardson and Lankester. But I sense neither of their ulterior motives in Stamp's use of the mapping myth. On the contrary, he seems simply to have assumed that Snow would have done what any medical cartographer did in the mid-twentieth century. By then, maps were ubiquitous and easily obtained.

Stamp was aware that Snow's investigation prior to meeting with parish officials was a limited one; perhaps Stamp assumed that Snow had just added more marks to the base map that appeared in *MCC2* ["a large-scale map" gives him away] as he proceeded with inquiries thereafter. That map, however, was commissioned late in the fall, specifically to accompany *MCC2*; it contains no house numbers, so how would Snow have known "exactly the house where each of the victims was attacked" if he had it in hand after making a list of deaths at the GRO on 5 September? To my knowledge (Vinten-Johansen 2013), no up-to-date frontage map with house numbers was available for this cholera field when Snow undertook investigations during the first week of September.

I'm also unclear why Stamp thought removing the pump handle halted the outbreak. He cited neither Richardson nor Lankester. Whatever the reason, he would have plenty of company in coming decades. Over half of the thirty authors identified by Rip (2006b) as presenting the mapping myth also said that removal of the pump handle soon ended the epidemic (31).

It's important to distinguish the mapping myth (that Snow marked on a map the addresses of the 83 fatal attacks he investigated prior to meeting with parish authorities) from general statements that Snow mapped the Broad Street outbreak. Unless commentators specify the first week of the outbreak, they may simply be referring to the fact that Snow eventually made two maps containing marks for the total number of fatal attacks he could connect to specific addresses. In short, many medical geographers and cartographers have stated that Snow "mapped" the outbreak, without necessarily perpetuating the mapping myth. Moreover, the association between the appearance of the mapping myth and arguments for the importance of disease mapping does not mean that medical geographers and cartographers created the mapping myth. Such a causal connection has not been established. And it's equally important to clarify that the explicators of the mapping myth identified by Michael Rip, and myself for the period after 2001, aren't limited to medical geographers and cartographers.

For example, three free lance science writers present the pump-handle tale and/or the mapping myth in order to portray Snow as an interventionist-minded public health advocate. Laurie Garrett (1995) adds a blooper to the mix, situating the Broad Street outbreak in 1849:

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During London's devastating 1849 cholera epidemic, physician John Snow demonstrated that cholera was transmitted via water by removing the handle of the Broad Street pump . . . . The local epidemic, of course, came to a halt.

Authorities were unconvinced, however, so during London's 1854 epidemic Snow mapped cholera cases and traced their water supplies. [she then refers to the South London experiment] (242).

I cannot find anything like the above in the sources Garrett cites on the cholera epidemics. Her description of the Broad Street outbreak may be a default assumption; I have come across several authors who believe that Snow disabled the pump, rather than parish authorities. As to South London, Snow never produced a disease map on the natural experiment; map 2 in *MCC2* (1855), which depicts the catchment areas of two private water companies and registration sub-districts, is an adaptation of older plans produced for the *Health of Towns Reports* and the GRO.

In *The People's Health*, Robin Marantz Henig (1997) used three of the same arrows found in Garrett's quiver to depict Snow as a man who didn't shy from direct intervention. Henig's beginning, however, is reminiscent of Stamp's, when she writes that Snow "sat down one afternoon with a map of London, where a recent outbreak had killed more than 500 people in one dreadful 10-day period":

He marked the locations of the homes of

those who had died. From the marks on his map, Snow could see that the deaths had all occurred in the so-called Golden Square area. . . .

Then comes the interventionist twist to the now-familiar pump-handle tale.

So Snow went down to Broad Street, where he suspected that one particular pump was the source of the contaminated water. And, in a gesture that still reverberates among public health scholars today, he removed the handle of the Broad Street pump.

Once the pump was out of commission, the epidemic abated. (1).

Henig's endnote states that this is an oft-told story, but she only cites George Rosen's *History of Public Health* (1993 reprint), which does not substantiate her account. As was the case with Garrett, I suspect a cognitive default to a version she had come across at some point (perhaps the Richardson/Longmate/Sheppard/Wohl reference chain), which did not seem to require re-examination.

Two years later, Gina Kolata (1999) described the Broad Street outbreak as part of a run-up to her account of the 1918 influenza pandemic. "In August 1854, cholera roared into London's Soho district, killing ninety-three people" (46). Whoops! I've come across that number before. Sure enough, Kolata cited Roy Porter (1997) for this page, but about Robert Koch rather than Snow. However, Porter did state on another page

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that Snow had investigated 93 cholera deaths that occurred the week ending 2 September (413), incorrect since the actual number was 83 (see Snow 1854c, or Appendix B). Kolata also wrote that when Snow “decided to investigate, . . . [h]e graphed the deaths from cholera and noticed that they seemed to occur in people who drank from one of several public wells.” Here she parallels Hempel and Wilford in connecting Snow’s mapping exercise to the water consumption of the deceased.

Graphing was a figment of Kolata’s imagination; Porter doesn’t say anything of the kind.

Kolata’s ending also suggests the dangers of relying entirely on secondary



literature. Here’s what Kolata (1999) thinks Snow did after “graphing deaths from cholera” and noting a possible association with the Broad Street pump: “The water in that well, he proposed, must be the culprit. To test his hypothesis, Snow removed the pump handle from the suspect well and the cholera epidemic came to an abrupt end” (46). As I’ve already mentioned, Porter (1997) concluded his discussion of the Broad Street pump episode by stating that “the handle was removed, the number of cases plummeted (the outbreak was already declining), and Snow had confirmation of his theory” (413). No cognitive default here. Kolata understandably assumed that a preeminent historian of medicine had the facts straight. Porter usually did, but not this time. The sharp drop in fatal attacks as well as deaths occurred between 2 and 3 September; the handle was removed on the 8th. But it was Kolata’s interpolation to have Snow remove it.

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In July 1992, the modern equivalent of the St. James, Westminster parish paving board installed a replica of the Broad Street pump. Not on its original site next to the John Snow Pub, but across the street from it as part of street-scape renovations in the area. In Nigel Paneth’s photograph, duplicated here, the John Snow Pub occupies the ground and first floors of the building in the background to the left of the pump.

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If anyone wonders why the pump lacks a handle, a nearby descriptive plaque explains why there's a lot of history here. I've transcribed it below since the photograph is partially blurred, italicizing the mapping myth and the Richardson/Lankester pump-handle tale:

### "The Soho Cholera Epidemic

Dr. John Snow (1813-1858), a noted anaesthetist, lived near the focus of the 1854 Soho cholera epidemic which centred on Broad Street, as Broadwick Street was then called. In September of that year alone, over 500 people died in Soho from the disease.

Snow had studied cholera in the 1848-49 epidemic in Southwark and Wandsworth. His theory that polluted drinking water was the source of transmission of disease was confirmed when he *mapped cholera deaths in Soho with the source of the victim's drinking water*. He found that they were concentrated on the Broad Street Public Water Pump.

His theory initially met with some disbelief. But such was his conviction that he had the pump handle removed to prevent its further use. *Soon afterwards the outbreak ended.*"

Obviously, Austin Bradford-Hill (1955) was no longer about to say it wasn't so.

The plaque also points thirsty visitors to "the nearby 'Sir John Snow' public house" in the event they wish to ponder these words further. Sir John, eh? He must have been knighted in absentia when the pump replica and plaque were unveiled. The excerpts I have selected, concluding with what any visitor to Broadwick Street today would reasonably assume is the "official"



version, show that mapping myths and pump-handle tales about the Broad Street outbreak are now rooted in popular discourse, in addition to the recent scholarly and journalistic examples noted previously.

Does it really matter if the pump-handle tale and mapping myth are true? After all, both are often used as metaphors for encouraging public health advocates to take protective measures out of prudence and an abundance of caution, even when the evidence is inconclusive. Some myths about Snow and the Broad Street pump episode are by now indelible and do, at times, serve constructive purposes. If apocryphal stories are used to motivate groups of people to demand safe drinking water, doesn't that end justify an innocuous overstatement or minor historical inaccuracies?

Perhaps, but one should not ignore the negative consequences of perpetuating such myths and tales about John Snow. Their rep-

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etition has damaging consequences for public understanding of what actually happened: that many Londoners were on the scene long before Snow arrived, laboring to make sense of the outbreak and ministering to its sufferers. They deserve to have their stories told and be remembered, too. The pump-handle tale, in particular, does a disservice to Snow, as well. He was adamant that the outbreak was winding down for unknown reasons before he recommended that the pump be disabled. His motivation was to prevent future outbreaks from this pump during an ongoing metropolitan cholera epidemic, which would surely have happened since another resident on the ground floor of 40 Broad Street presented choleraic symptoms on Friday, 8 September, the day the paving board closed the pump.

The tale also does a disservice to the vestrymen who had the courage to resist inevitable public outrage in closing a pump dispensing water that many residents of the parish considered a cholera-preventive; and to do so on the recommendation of a physician whose theory of the communication of cholera was highly controversial and still unsubstantiated. It took almost a year of investigation by the parish Cholera Inquiry Committee to accumulate evidence that exonerated the Sanitary Board's decision, another decade and another metropolitan cholera epidemic with a horrific local outbreak to turn many of Snow's most thoughtful critics into converts. Why, then, do we need the Richardson/Lankester myth when

reality is compelling enough? It has long puzzled me that public health advocates have rarely glorified the vestrymen of St. James, Westminster. Had they not decided to remove the handle of the Broad Street pump, even though the evidence was inconclusive and Snow's theory unproven, there surely would have been repetitions of what began during the night leading to Friday 1 September 1854.

Since mapping myths and pump-handle tales often crowd out contemporary accounts of what had happened, think of how unfair we are being, not just to John Snow, but to everyone else who also investigated the causes of this horrific point-source outbreak and those who cared for its victims (Vinten-Johansen 2013).

One purpose of this website is to tell accurate stories, based on documentary evidence, about contemporaries to this horrific cholera outbreak. It's the least I can do as an historian. They are no longer able to speak for themselves.

### **Doing history**

My approach to writing the experimental narratives and historiographical unpacking essays posted to this website replicates the methodology I developed for all historiography courses (undergraduate and graduate) that I taught during three decades at Michigan State University. The structure of this introduction parallels my expectations for the research essay (duplicated in Appendix A) that all students in these classes were

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expected to follow. To wit:

The short scenario of my first visit to the John Snow pub sets up two journalistic examples (Palca and Wilford). Then I pose an **historical problem**: what is the origin of two widespread myths about John Snow's involvement in the Broad Street pump outbreak that contradict what Snow said had happened?

Next I undertook **literature reviews** of each myth. A comprehensive scholarly literature review, of course, assesses both primary and secondary sources. But when teaching historiography, I asked students to stress either the Primary Way (generally speaking, relevant documents and visual materials from the period under analysis) or the Secondary Way (non-contemporary commentaries), depending on their topics and the available bibliographical resources. "Way" is a conceit borrowed from a healing ritual, *The Blessing Way*, described in Tony Hillerman's mystery novel, *The Dark Wind* (1982), which students in my historiography courses read for the purpose of comparing the methodology employed by a fictional detective with their initial notions of what it meant to do history.

In my introduction to the Broad Street pump episode, the literature review of the pump-handle tale featured the Primary Way since I could trace its origins to contemporary accounts by Benjamin Ward Richardson and Edwin Lankester. The mapping myth seems to have appeared long after the age of Snow and his contemporar-

ies, so I followed the Secondary Way to locate early assertions that Snow used mapping to finger the pump.

These two literature reviews eventuate in a single, synthetic **thesis statement**, that repetition of these two myths over many decades has elevated them to cognitive default assumptions that frequently withstand conventional scholarly assertions that it wasn't so.

### **The structure of the experimental narratives**

I interpret some experiences of John Snow and his contemporaries as narrative episodes and scenarios that feature free indirect style, familiar to readers of Henry James and Virginia Woolf. I make no claims to breaking new ground as an historian, however; the same narrative style was often employed by Garrett Mattingly (1959, eg.) and, more recently, occasionally by Simon Schama (1992). My general approach in adapting free indirect style as used in fiction (Wood 2008) to historical narratives is explained where I unpack "John Snow's final days & Richardson's devious memoir," accessible via the Narratives & Unpacking page in the horizontal navigation menu.

All narratives are historiographically unpacked in parallel discussions of my reasoning and selection of scholarly evidence. I first encountered such an exercise in Jack Hexter's historiography seminar during my first semester in graduate school. He distributed a packet of documents relating to the Goodwin-Fortescue controversy

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during the first parliamentary session in the reign of James I of England. Our task was two-fold: sort out what we thought had happened and put it in the form of a narrative essay; and in a separate section, “unpack” the reasoning and analyze the sources that we used in composing the essay. Eventually, when it was my turn in the professorial role, I developed (in collaboration with several other junior faculty members at Michigan State) several approaches to history workshops on the Hexter model, with the exception that unpacking typically occurred during seminar discussions rather than as a written component (McDiarmid and Vinten-Johansen 1993; McDiarmid 1994; McDiarmid 1996). A previous sub-section header, “Doing history,” is taken from the title of a book Hexter (1971) published the year after I completed his historiography seminar, in appreciation for what he taught me.

Each historiographical unpacking essay is bracketed with the relevant experimental narrative, given the same title preceded by (HU). Some unpacking essays replicate the historiographical method I used in structuring this introduction (historical problem, literature review, etc.). The introduction is representative of the method I use for topics where one is familiar with both the primary and secondary literature. For the opposite situation, when one knows little to nothing about either primary or secondary sources on a topic, see how I unpacked the opening scenarios in the first experimental narrative about Florence

Nightingale, also accessible via the Narratives & Unpacking page. Although the content of each unpacking essay is shaped by the nature of the topic and/or particulars about the historical figures depicted, all contain an analysis of the scholarly evidence and writing style in the relevant experimental narrative.