

sewers & scientific thought

Nineteenth Century: Miasmatic Theory

In the 1850s sewers were state-of-the-art. At this time the predominant understanding of illness was miasmatic theory—the idea that disease was caused by foul or corrupt air—a legacy of Greek and Medieval medical thought, passed down from Hippocrates and Galen to Renaissance and Enlightenment thinkers [1]. The solution to the sanitary problems of burgeoning cities, according to miasmatic theory, was to prevent bad air by evacuating waste from the city and diluting it in running water [2]. The sewers of Paris and London, marvels of nineteenth-century engineering, promised to clean the city by dumping raw sewage into their waterways.

Germ theory, developed by Louis Pasteur in the 1860s and Robert Koch in the 1870s, cast doubt on this strategy. Outbreaks of cholera in London were linked, controversially, to waterborne illness by Dr. John Snow in the 1849. But by the time germ theory gained wide acceptance, sewer systems had already been constructed in most European and American cities.

Twentieth Century: Germ Theory

The sewers, rooted in miasmatic theory, made no distinction between wastewater and stormwater (based upon the mistaken belief that once waste was diluted it was effectively treated); thus retrofitting the sewers proved difficult. The germ-theory-inspired waste treatment facilities, affixed like filters to the end of the pipe, assuaged the worst of the human health concerns, but were not sized for major rain events. Today, major North American cities from Vancouver to Cincinnati regularly discharge sewage into local waterways [3]—a legacy we owe, ultimately, to miasmatic theory.

Twenty-first Century: Biology & Ecology

Since the installation of sewage treatment facilities, biological and ecological sciences have continued to illuminate the myriad effects of sewage—even treated sewage—on human and ecological health. PCBs, endocrine disruptors, heavy metals, and phosphates are routinely discharged into waterways, with

mounting negative consequences [4]. Treatment facilities—rooted in the science of germ theory—were not designed to remove these contaminants.

What is the waste system that will be inspired by the new science of ecology? Can it be applied as a band-aid fix to existing infrastructure—that lingering built expression of Medieval science? Or does it require something else entirely?

Architect William McDonough and chemist Michael Braungart propose a cradle-to-cradle paradigm in which “waste equals food,” flows are cyclical, and toxins are designed out of the system from the outset [5]. This paradigm recognizes both the human health impacts illuminated by germ theory and ecological understanding of the twenty-first century. What will a no-waste, 100% good, cradle-to-cradle waste system look like? This is our challenge.

[1] John M. Last, “Miasma Theory,” *Encyclopedia of Public Health*, ed. Lester Breslow (New York: Macmillan Reference, 2001), 765. For a discussion of the intellectual lineage of 19th-century sewers, see Rebecca Williamson, *The Breath of Cities*, in *Aeolian Winds and the Spirit in Renaissance Architecture*, ed. Barbara Kenda (London: Routledge, 2006).

[2] Carlo M. Cipolla, *Fighting the Plague in Seventeenth-Century Italy* (Madison: University of Wisconsin Press, 1981). See also Leon Battista Alberti’s *On the Art of Building in Ten Books* (1450), which was oft cited by Enlightenment thinkers.

[3] Elaine MacDonald, *The Great Lakes Sewage Report Card* (Canada: Sierra Legal, 2006). www.sierralegal.org

reports/great.lakes.sewage.report.nov.2006b.pdf.

[4] Graeme Wynn, Graeme. *Risk and Responsibility in a Waste-Full World*, forward to *The Culture of Flushing*, by Jamie Benidickson (Vancouver: UBC Press, 2007).

[5] William McDonough and Michael Braungart, *Cradle to Cradle: Remaking the Way we Make Things* (New York: North Point Press, 2002).