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Sulphuric Utopias

A History of Maritime Fumigation

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Notes

Introduction

1. For the quarantine procedures and a detailed overview of the system of maritime sanitation, as devised by Joseph Holt, see Joseph Holt, "Quarantine operations," in *Annual Report of the Louisiana Board of Health, 1885 and 1886*, ed. Louisiana Board of Health (New Orleans: Louisiana Board of Health 1887), 23–38. See also Joseph Holt, "The sanitary protection of New Orleans, municipal and maritime," *The Sanitarian*, no. 194 (1886): 37–49.
2. Donna A. Barnes, *The Louisiana Populist Movement, 1881–1900* (Baton Rouge: Louisiana State University Press, 2011), 67.
3. Norman Howard-Jones, *The Scientific Background of the International Sanitary Conferences, 1851–1938* (Geneva: World Health Organization, 1975); Peter Baldwin, *Contagion and the State in Europe, 1830–1930* (Cambridge: Cambridge University Press, 2005); Mark Harrison, *Contagion: How Commerce Has Spread Disease* (New Haven, CT: Yale University Press, 2013); Alison Bashford, *Imperial Hygiene: A Critical History of Colonialism, Nationalism and Public Health* (Basingstoke, UK: Palgrave Macmillan, 2004); Marcos Cueto, *The Value of Health: A History of the Pan American Health Organization* (Washington, DC: Pan American Health Organization, 2007).
4. Alison Bashford, ed., *Quarantine: Local and Global Histories* (London: Palgrave Macmillan, 2016).
5. An overview of these systems can be gleaned from Anne Hardy, *The Epidemic Streets: Infectious Disease and the Rise of Preventive Medicine, 1856–1900* (Wotton-under-Edge, UK: Clarendon Press, 1993); Michael Worboys, *Spreading Germs: Disease Theories and Medical Practice in Britain, 1865–1900* (Cambridge: Cambridge University Press, 2000); Christoph Gradmann, "A spirit of scientific rigour: Koch's postulates in twentieth-century medicine," *Microbes and Infection* 16, no. 11 (November 2014): 885–892; J. Andrew Mendelsohn, "From eradication to equilibrium. How epidemics became complex after World War I," in *Greater than the Parts: Holism in Biomedicine*,

1920–1950, ed. Christopher Lawrence and George Weisz, (Oxford: Oxford University Press, 1998), 303–334.

6. Edmund Russell, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* (Cambridge: Cambridge University Press, 2001).

7. Linda Nash, *Inescapable Ecologies: A History of Environment, Disease, and Knowledge* (Berkeley, CA: The University of California Press, 2006).

8. William Coleman, *Yellow Fever in the North: The Methods of Early Epidemiology* (Madison: University of Wisconsin Press, 1987); François Delaporte, *The History of Yellow Fever: An Essay on the Birth of Tropical Medicine*, trans. Arthur Goldhammer (Cambridge, MA: MIT Press, 1991); Margaret Humphreys, *Yellow Fever and the South* (Baltimore, MD: Johns Hopkins University Press, 1999).

9. Carroll and Reed were part of the Cuba Yellow Fever Commission, which in 1900 proved experimentally that the mosquito *Aedes Aegypti* was indeed the primary vector of yellow fever, a theory that had been first conceptualized by Carlos Finlay in 1881. The results of the experiments were showcased in a large-scale and widely successful fumigation campaign across Cuba. José Amador, *Medicine and Nation Building in the Americas, 1890–1940* (Nashville, TN: Vanderbilt University Press, 2015), 30ff. See also Jaime Larry Benchimol, *Dos micróbios aos mosquitos: febre amarela e a revolução pasteuriana no Brasil* (Rio de Janeiro: SciELO—Editora FIOCRUZ, 1999).

10. Myron Echenberg, *Plague Ports: The Global Urban Impact of Bubonic Plague, 1894–1901* (New York: New York University Press, 2007).

11. Hans-Jörg Rheinberger, “Experimental systems. Historiality, narration, and deconstruction,” in *The Science Studies Reader*, ed. Mario Biagioli (London and New York: Routledge, 1999), 417–429.

12. Worboys, *Spreading Germs*; Nash, *Inescapable Ecologies*; Mark Honigsbaum, “‘Tipping the balance’: Karl Friedrich Meyer, ‘Latent infections, and the birth of modern ideas of disease ecology,” *Journal of the History of Biology* 49, no. 2 (2016): 261–309.

13. Indeed, as Graham Mooney points out, the invention of classical and even Homeric progenitors of fumigation was part and parcel of the latter’s Victorian consolidation. Graham Mooney, *Intrusive Interventions: Public Health, Domestic Space, and Infectious Disease Surveillance in England, 1840–1914* (Rochester, NY: University of Rochester Press, 2015).

14. Hans-Peter Kroner, “From eugenics to genetic screening. Historical problems of human genetic applications,” in *The Ethics of Genetic Screening*, ed. Ruth F. Chadwick, Darren Shickle, H. A. Ten Have, and Urban Wiesing (Berlin: Springer Science, 1999), 131–140; Lars Bluma, “The hygienic movement and German mining, 1890–1914,” in *History of the Workplace: Environment and Health at Stake*, ed. Lars Bluma and Judith Rainhorn (London and New York: Routledge, 2015), 7–26.

15. Baldwin, *Contagion and the State*, 227–228.
16. For discussion of utilitarian and Marxist receptions of utopianism, see Ruth Levitas, *The Concept of Utopia* (Oxford: Peter Land, 2010).
17. See: Charles E. Rosenberg, “The therapeutic revolution: Medicine, meaning and social change in nineteenth-century America,” *Perspectives in Biology and Medicine* 20, no.4 (1977): 485–506; Allan M. Brandt, *No Magic Bullet: A Social History of Venereal Disease in the United States since 1880* (New York: Oxford University Press, 1987).
18. Mark Olseen, “Totalitarianism and the ‘repressed’ utopia of the present: Moving beyond Hayek, Popper and Foucault,” *Policy Futures in Education* 1, no. 3 (2003): 526–552.
19. Ernst Bloch, *The Principle of Hope*, trans. Neville Plaice, Stephen Plaice, and Paul Knight (Cambridge, MA: MIT Press, 1995).
20. Christos Lynteris and Branwyn Poleykett, “The anthropology of epidemic control: technologies and materialities,” *Medical Anthropology* 37, no. 6 (2018): 433–441.
21. Ruth Levitas, “Educated hope: Ernst Bloch on abstract and concrete utopia,” *Utopian Studies* 1, no. 2 (1990), 14.
22. *Ibid.*, 15.
23. Bloch in *Ibid.*, 14.
24. E. P. Thompson, *William Morris: Romantic or Revolutionary?* (London: The Merlin Press, 2011).
25. *Ibid.*, 18, 17.
26. On “dreamscapes of modernity,” see S. Jasanoff and S.-H. Kim (eds.), *Dreamscapes of Modernity: Sociotechnical Imaginaries and the Fabrication of Power* (Chicago: University of Chicago Press, 2015). On the relation between Bloch’s notion of hope and the production of knowledge, see Hirokazu Miyazaki, *The Method of Hope: Anthropology, Philosophy, and Fijian Knowledge* (Stanford, CA: Stanford University Press, 2004).
27. Cat Moir, “Casting a picture. Utopia, Heimat and the materialist concept of history,” *Anthropology and Materialism* 3 (2016), <https://am.revues.org/573>; see also *Utopian Studies* 25, no. 1, Special Issue: Utopia and Architecture (2014).
28. Reinhart Koselleck, *The Practice of Conceptual History: Timing History, Spacing Concepts* (Stanford, CA: Stanford University Press, 2002).
29. Sebastian Conrad, *Globalisation and the Nation in Imperial Germany*, (Cambridge: Cambridge University Press, 2010), 8ff.

30. Kevin H. O'Rourke and Jeffrey G. Williamson, *Globalization and History: The Evolution of a Nineteenth-Century Atlantic Economy* (Cambridge, MA: MIT Press, 1999), chapter 3. Economic historians tend to ignore the impact of epidemics, hygiene, and technologies of sanitation in their account of the history of global trade.
31. Douglas Burgess, *Engines of Empire: Steamships and the Victorian Imagination* (Stanford, CA: Stanford University Press, 2017).
32. Tom Koch, *Disease Maps: Epidemics on the Ground* (Chicago: University of Chicago Press, 2011). Mark Monmonier, "Maps as graphic propaganda for public health," in *Imagining Illness: Public Health and Visual Culture*, ed. David Harley Serlin (Minneapolis: University of Minnesota Press, 2010), 108–125.
33. Michel Foucault in Burgess, *Engines of Empire*, 12. See also: Michel Foucault, "Of Other Spaces," *Diacritics* 16, no. 1 (1986): 22–27. <https://doi.org/10.2307/464648>.
34. David Boyd Haycock and Sally Archer (eds.), *Health and Medicine at Sea, 1700–1900* (Woodbridge, UK: Boydell Press, 2009).
35. Burgess, *Engines of Empire*, 17.
36. Pierre Bouguer, *Traité du navire, de sa construction, et de ses mouvemens* (Paris: Jombert, 1746).
37. Tamson Pietsch, "A British sea: making sense of global space in the late nineteenth century," *Journal of Global History* 5, no. 3 (November 2010): 423.
38. Alison Bashford, "Maritime quarantine: Linking Old World and New World histories," in *Quarantine: Local and Global Histories*, ed. Alison Bashford (London: Palgrave Macmillan, 2016), 11.
39. Krista Maglen, *The English System: Quarantine, Immigration and the Making of a Port Sanitary Zone* (Manchester, UK: Manchester University Press, 2014), 7.
40. Michel-Rolph Trouillot, *Silencing the Past: Power and the Production of History* (Boston, MA: Beacon Press, 2015).
41. Elizabeth Kolbert, "Louisiana's disappearing coast," *New Yorker*, March 25, 2019, <https://www.newyorker.com/magazine/2019/04/01/louisianas-disappearing-coast>; John McPhee, "Atchafalaya," *New Yorker*, February 15, 1987, <https://www.newyorker.com/magazine/1987/02/23/atchafalaya>.
42. Erwin Ackerknecht, "Anticontagionism between 1821 and 1867," *Bulletin of the History of Medicine* 22 (1948): 562–593.
43. *Ibid.*, 570; A similar constellation is described in detail for the case of New York in Howard Markel, *Quarantine!: East European Jewish Immigrants and the New York City Epidemics of 1892* (Baltimore, MD: Johns Hopkins University Press, 1999).

44. David S. Barnes, "Cargo, 'infection,' and the logic of quarantine in the nineteenth century," *Bulletin of the History of Medicine* 88, no. 1 (2014): 75–101.
45. Maglen, *The English System*, 7. On the importance of stasis as a medico-juridical notion, bridging human pathology and political disorder, see Kostas Kalimtzis, *Aristotle on Political Enmity and Disease: An Inquiry into Stasis* (New York: SUNY Press, 2000).
46. Miguel Abensour, "Persistent utopia," *Constellations* 15, no. 3 (2008): 407.
47. There are no thorough accounts of the historical conditions under which sulphuric and sulphurous acids became an epistemic object in the modern sciences. For oxygen as a comparable case, see Hasok Chang, "The persistence of epistemic objects through scientific change," *Erkenntnis* 75, no. 3 (November 2011): 413–429.
48. Simon Schaffer, David Serlin, and Jennifer Tucker, "Editors' introduction, Special Issue: The history of technoscience," *Radical History Review* 127 (January 2017): 3.
49. Simon Schaffer, "Measuring virtue: Eudiometry, enlightenment, and pneumatic medicine," in *The Medical Enlightenment of the Eighteenth Century*, eds. Andrew Cunningham and Roger French (Cambridge: Cambridge University Press, 1990), 281–318; Steven Shapin and Simon Schaffer, *Leviathan and the Air-Pump: Hobbes, Boyle, and the Experimental Life* (Princeton, NJ: Princeton University Press, 2011).
50. See, for example, Randall Packhard, *A History of Global Health: Interventions into the Lives of Other Peoples* (Baltimore, MD: Johns Hopkins University Press, 2016); Wenzel Paul Geissler (ed.), *Para-states and Medical Science: Making African Global Health* (Durham, NC: Duke University Press, 2015). David Reubi, "A genealogy of epidemiological reason: Saving lives, social surveys and global population," *BioSocieties* 13, no. 1 (March 2018): 81–102.
51. Marianne de Laet and Annemarie Mol, "The Zimbabwe bush pump: Mechanics of a fluid technology," *Social Studies of Science* 30, no. 2 (April 2000): 225–263.
52. Peter Redfield has more recently critically reappraised this "non-heroic vision of design" (2016: 160). Examining a postcolonial humanitarian device (the LifeStraw) Redfield puts stress on "science and technology in the form of infrastructure, the material frontline of norms that define 'modernity,' particularly in their absence" (Ibid). His analysis thus leads to an understanding of humanitarian devices in the age of neoliberalism as "substitute micro-infrastructures" deployed not simply in the absence of public (and public health) infrastructures but also in substitution of the latter's promissory and desiring regime: the commodified humanitarian pragmatics of "making a difference" for the emancipatory utopia of health as a public good. See Peter Redfield, "Fluid technologies: The bush pump, the LifeStraw® and microworlds of humanitarian design," *Social Studies of Science* 46, no. 2 (April 2016): 159–183.

53. De Laet and Mol, "The Zimbabwe Bush Pump."
54. Redfield, "Fluid technologies," 160.
55. De Laet and Mol, "The Zimbabwe Bush Pump," 252.
56. Gilles Deleuze and Felix Guattari, *Capitalism and Schizophrenia I: Anti-Oedipus*, trans. Robert Hurley (London: Penguin, 2009). See also Stephen J. Collier, Jamie Cross, Peter Redfield, and Alice Street (eds.), "Little development devices/humanitarian goods," *Limn* 9 (November 2017), <https://limn.it/issues/little-development-devices-humanitarian-goods/>.

Chapter 1

1. On the origin of the sulphur-mercury theory, see Allen G. Debus, *The English Paracelsians: The Chemical Challenge to Medical and Scientific Tradition in Early Modern France* (Cambridge: Cambridge University Press, 1991) and William R. Newman, "Alchemical and chymical principles. Four different traditions," in *The Idea of Principles in Early Modern Thought: Interdisciplinary Perspectives*, ed. Peter R. Anstey (London & New York: Routledge, 2017), 77–97.
2. James J. Garber, *Harmony in Healing: The Theoretical Basis of Ancient and Medieval Medicine* (London and New York: Routledge, 2008), 148.
3. Katherine Eggert, *Disknowledge: Literature, Alchemy, and the End of Humanism in Renaissance England* (Philadelphia: University of Pennsylvania Press, 2015), 65.
4. Claude Dariot in Allen G. Debus, *The Chemical Philosophy* (Mineola, NY: Dover Publications, 1977), 158.
5. For a concise history of mercurial treatments of syphilis, see Gérard Tilles and Daniel Wallach, "Le traitement de la syphilis par le mercure. Une histoire thérapeutique exemplaire," *Revue d'histoire de la pharmacie* 84, no. 312 (1996): 347–351.
6. Pierre Lalouette, *Nouvelle méthode de traiter les maladies vénériennes, par la fumigation: avec les procès-verbaux des Guérisons opérées par ce moyen* (Paris: Merigot, 1776); translation taken from Pierre Lalouette, *A New Method of Curing the Venereal Disease by Fumigation: Together with Critical Observations on the Different Methods of Cure and an Account of Some New and Useful Preparations of Mercury* (London: J. Wilkie, 1777), 12.
7. *Ibid.*, 39
8. *Ibid.*, 117–118.
9. On the camera obscura as a disciplinary apparatus, see Jonathan Crary, *Techniques of the Observer: On Vision and Modernity in the Nineteenth Century* (Cambridge, MA: MIT Press, 1990).

10. Halle, Dubois, Pinel, and Dupuytren in John Revere, *An Inquiry into the Origins and Effects of Sulphurous Fumigations in the Cure of Rheumatism, Gout, Diseases of the Skin, Palsy &c* (Baltimore, MD: Coale & Co, 1822), 5.

11. *Ibid.*, 7.

12. Marcia Ramos-e-Silva, "Giovan Cosimo Bonomo (1663–1696): Discoverer of the etiology of scabies," *International Journal of Dermatology* 37, no.8 (August 1998): 625–630; M. A. Montesu and F. Cottoni, "G. C. Bonomo and D. Cestoni. Discoverers of the parasitic origin of scabies," *American Journal of Dermatopathology* 13, no. 4 (August 1991): 425–427.

13. Revere, *An Inquiry into the Origins and Effects of Sulphurous Fumigations*.

14. Halle et al., in *ibid.*, 9.

15. *Ibid.*, 10.

16. J. C. Galès, *Mémoires et rapports sur les fumigations sulfureuses appliquées au traitement des affections cutanées et de plusieurs autres maladies* (Paris: L'Imprimerie Royale, 1816), 6.

17. *Ibid.*, 7.

18. G. Emerson, "Cases illustrative of the efficacy of sulphurous fumigations, in certain cases—with preliminary remarks," *The Philadelphia Journal of the Medical and Physical Sciences* 3 (1821): 130.

19. *Ibid.*, 132.

20. George Alfred Walker, *A Treatise on the Cure of Ulcers by Fumigation* (London: Longman, 1847), 75.

21. For their report, see Revere, *An Inquiry into the Origins and Effects of Sulphurous Fumigations*. Whether he should be acknowledged as the inventor of the method formed the subject of acrimonious public debate, with the doctor's critics claiming that since a sulphurization box had been mentioned by Glaubert in 1659, the modern box was simply an adaptation. The tribunal's opinion sided with those who considered that early modern invention to be forgotten and never applied in practice. For discussion, see Conseil général d'administration des hospices, *Descriptions des appareils à fumigations, établis, sur les dessins de M. D'Arcet, à l'hôpital Saint-Louis, en 1814 et successivement dans plusieurs Hôpitaux de Paris, pour le traitement des Maladies de la peau* (Paris: Impr. des Hospices civils, 1818).

22. Walker, *A Treatise on the Cure of Ulcers by Fumigation*.

23. Jean de Cerro, *Observations pratiques sur les fumigations sulfureuses* (Vienna: Charles Gerold 1819); David Luthy, *Notice sur les fumigations sulfureuses, appliquées au traitement des affections cutanées, et de plusieurs autres maladies, avec la description*

exacte d'un appareil pour les administrer (Fribourg, Switzerland: Aloyse Eggendorffer, 1818).

24. Mary Douglas, *Purity and Danger, an Analysis of Concepts of Pollution and Taboo* (London & New York, Routledge, 2002 [1966]). For studies following Douglas's reading of pollution, see Mark Bradley (ed.), *Rome, Pollution and Propriety. Dirt, Disease and Hygiene in the Eternal City from Antiquity to Modernity* (Cambridge: Cambridge University Press, 2012).

25. Jacques Jouanna, *Greek Medicine from Hippocrates to Galen: Selected Papers* (Leiden, Netherlands: Brill, 2012), 124.

26. For a discussion of *loimos*, and its difference, synergy, and confusion with *limos*, see Robin Mitchell-Boyask, *Plague and the Athenian Imagination: Drama, History, and the Cult of Asclepius* (Cambridge: Cambridge University Press, 2007); Rachel Bruzzone, "Polemos, pathemata, and plague: Thucydides' narrative and the tradition of upheaval," *Greek, Roman, and Byzantine Studies* 57 (2017): 882–909.

27. Jouanna, *Greek Medicine from Hippocrates to Galen*. See also: Fabian Meinel, *Pollution and Crisis in Greek Tragedy* (Cambridge: Cambridge University Press, 2015). For the invocation of this Homeric image as a progenitor of fumigation in Victorian texts see: Graham Mooney, *Intrusive Interventions: Public Health, Domestic Space, and Infectious Disease Surveillance in England, 1840–1914* (Rochester, NY: University of Rochester Press, 2015).

28. Galen, in the only passage of his work where he discusses miasmata, recounts Pliny's and Plutarch's legend that Hippocrates used fire using fragrant wood against the plague of Athens; no evidence of this practice exists in the Hippocratic corpus or in Thucydides. For discussion, see Jody Rubin Pinault, *Hippocratic Lives and Legends* (Leiden, Netherlands: Brill, 1992). On Hippocrates and gynecological fumigation, see Helen King, *Hippocrates' Woman: Reading the Female Body in Ancient Greece* (London and New York: Routledge, 1998).

29. Halle et al. in Revere, *An Inquiry into the Origins and Effects of Sulphurous Fumigations*, 6.

30. On plague and stench in medieval England, see Carole Rawcliffe, "'Great stench, horrible sights and deadly abominations': Butchery and the battle against plague in late medieval English towns," in *Plague and the City*, eds. Lukas Engelmann, John Henderson, and Christos Lynteris (London and New York: Routledge, 2018), 18–38.

31. Joseph P. Byrne, *Encyclopedia of the Black Death* (Santa Barbara, CA: ABC-CLIO, 2012). The hybrid was already in place in Galen's plague of Athens anecdote; see note 28, this chapter.

32. Père Maurice de Toulon, *Le Capucin charitable enseignant le méthode pour remédier aux grandes misères que la peste a coutume de causer parmi les peuples* (Lyon, France: Bruyet: 1722). On the question of corpses as sources of infection across the centuries, see Christos Lynteris and Nicholas H. Evans (eds.), *Histories of Post-Mortem Contagion: Infectious Corpses and Contested Burials* (London: Palgrave Macmillan, 2017).
33. For an account and diagram of how the machine would have worked, see Sylvain Gagnière, *La désinfection des caveaux d'églises après les grandes épidémies de peste* (Avignon, France: Impr. Rulliere frères, 1943).
34. Ibid.
35. The Franque family was the most successful family of architects in eighteenth-century Avignon, famous for its hospital designs; Béatrice Gaillard, "Les Franque et les bâtiments hospitaliers d'Avignon au XVIIIe siècle: entre tradition et mutations," *In Situ: Revue des patrimoines* 31 (2017), <http://insitu.revues.org/14242>.
36. Gagnière, *La désinfection des caveaux d'églises après*, 10–11.
37. Steven Connor, *The Matter of Air. Science and Art of the Ethereal* (London: Reaktion Books, 2010).
38. James Lind, *Two Papers on Fevers and Infections Which Were Read before the Philosophical and Medical Society in Edinburgh* (London: D. Wilson, 1763).
39. Ibid., 45.
40. Ibid., 46.
41. Ibid.
42. Ibid., 46–47.
43. Ibid., 49.
44. James Lind, *An Essay on the Most Effective Means of Preserving the Health of Seamen in the Royal Navy* (London: D. Wilson, 1762), 120.
45. John Howard, *The State of the Prisons in England and Wales: With Preliminary Observations and an Account of Some Foreign Prisons* (Cambridge: Cambridge University Press, 2013 [1777]), 166.
46. Louis-Bernard Guyton de Morveau, *Traité des moyens de désinfecter l'air* (Paris: Bernard, 1801). Translations taken from Louis-Bernard Guyton de Morveau, *A Treatise on the Means of Purifying Infected Air*, transl. R. Hall (London: J. & E. Hodson, 1802).
47. Ibid., 27.
48. Ibid. On Lavoisier's impact on Guyton, see Alain Corbin, *Le miasma et la jonquille. L'odorat et l'imaginaire social aux XVIIIe et XIXe siècles* (Paris: Champs histoire,

2016 [1982]); Elana Serrano, "Spreading the revolution: Guyton's fumigating machine in Spain. Politics, technology, and material culture (1796–1808)" in *Astonishing Transformations: How Chemistry Made and Managed the World, 1760–1840*, eds. Lissa Roberts and Simon Warrett (Amsterdam: Brill, 2017), 106–130.

49. Guyton de Morveau, *Traité des moyens de désinfecter l'air*, 28.

50. On Sydenham's concepts of epidemics, see Knut Faber, *Nosography. The Evolution of Clinical Medicine in Modern Times* (New York: AMS, 1930).

51. James Carmichael Smyth, *Description of the Jail Distemper as It Appeared amongst the Spanish Prisoners at Winchester, in the Year 1780* (London: J. Johnson, 1795).

52. *Ibid.*, 7.

53. *Ibid.*, 40.

54. *Ibid.*, 40–41.

55. *Ibid.*, 46.

56. *Ibid.*, 54.

57. *Ibid.*, 183–184.

58. "Report from the Committee on Dr. Smyth's Petition, respecting his Discovery of Nitrous Fumigation, Reported by Henry Bankes, Esquire, 10th June 1800," in *Reports from the Committees of the House of Commons, Reprinted by Order of the House*, Vol. XIV, Miscellaneous Reports 1793–1802, 192.

59. *Ibid.*

60. *Ibid.*, 195.

61. *Ibid.*, 193.

62. *Ibid.*, 198.

63. On life and work of Louis Odier, see de Georges Morsier, "La vie et l'œuvre de Louis Odier, docteur et professeur en médecine (1748—1817)," *Gesnerus* 32 (1975): 248–270.

64. On the parliamentary process, see Catherine Kelly, "Parliamentary inquiries and the construction of medical argument in the early 19th century, 1793–1825," in *Lawyers' Medicine: The Legislature, the Courts and Medical Practice, 1760–2000*, eds. Imogen Goold and Catherine Kelly (London: Bloomsbury, 2000).

65. "Report from the Committee on Dr. Smyth's Petition," 189.

66. *Ibid.*, 189.

67. Guyton de Morveau, *Traité des moyens de désinfecter l'air*.

68. Serrano, “Spreading the revolution.”

69. Ibid. For a study of the impact of Guyton’s fumigation method in the Netherlands, see Teunis Willem van Heiningen, “La contribution à la santé publique de Louis-Bernard Guyton de Morveau (1737–1816) et l’adoption de ses idées aux Pays-Bas,” *Histoire des sciences médicales* XLVIII, no. 1 (2014): 97–106. For a manual comparing Guyton’s method with other fumigation methods, and their efficacy, see Carlos de Gimbernat y Grassot, *Instruction sur les moyens propres à prévenir la contagion des fièvres épidémiques* (Strasbourg, France: F. G. Levrault, 1814).

70. As Serrano notes, this machine may look simple by comparison to previously described fumigators but it in fact incorporated extensive material and technological research as well as craftsmanship.

71. Serrano, “Spreading the revolution,” 106.

72. Ibid., 116, in the original the quote is all in upper case.

73. Ibid., 117.

74. Ibid., 120.

75. Antonio García Belmar and Ramón Bertomeu-Sánchez, “L’Espagne fumigée. Consensus et silences autour des fumigations d’acides minéraux en Espagne, 1770–1804,” *Annales historiques de la Révolution française* 383, no. 1 (2016): 177–202.

76. As Serrano (2017: 123) argues, fumigation allowed Miguel Cabanellas to design a new lazaretto model which may indeed “be understood as a chemically-based plant for recycling people and goods back to normal circulation.” See: Miguel Cabanellas, *Defensa de las fumigaciones ácido-minerales* (Madrid: Repullés, 1814). This use of fumigation for perfecting quarantine is also evident in the uses of Guyton’s method in the Netherlands; Heiningen, “La contribution à la santé publique de Louis-Bernard Guyton de Morveau.”

77. Friedrich Schnurrer, “Die geographische Verteilung der Krankheiten, vorgelesen in der Versammlung der deutschen Aerzte und Naturforscher zu München den 22. Sept. 1827,” *Das Ausland* 1 (1828): 357–359; Friedrich Schnurrer, *Die Cholera Morbus, ihre Verbreitung, ihre Zufälle, die versuchten Heilmethoden, ihre Eigenthümlichkeiten und die im Großen dagegen anzuwendenden Mittel* (Stuttgart, Tübingen: Gotta’sche Buchhandlung, 1831); R. Broemer, “The first global map of the distribution of human diseases: Friedrich Schnurrer’s ‘Charte Über Die Geographische Ausbreitung Der Krankheiten’ (1827),” *Medical History Supplement* 20 (2000): 176–85.

78. Köslin (Regierungsbezirk), *Amts-Blatt der preußischen Regierung zu Köslin* (Köslin, Prussia: C. G. Hendess, 1831), 172, 327.

79. H. Scoutetten, *Relation historique et médicale de l’épidémie de choléra qui a régné à Berlin en 1831* (Paris: J.-B. Baillière, 1832).

80. Erwin H. Ackerknecht, "Anticontagionism between 1821 and 1867," *Bulletin of the History of Medicine* 22 (1948): 562–593; Howard Markel, *Quarantine!: East European Jewish Immigrants and the New York City Epidemics of 1892* (Baltimore, MD: Johns Hopkins University Press, 1999); Krista Maglen, *The English System: Quarantine, Immigration and the Making of a Port Sanitary Zone* (Manchester, UK: Manchester University Press, 2014).
81. Guenter B. Risse, *Driven by Fear: Epidemics and Isolation in San Francisco's House of Pestilence* (Champaign, IL: University of Illinois Press, 2015).
82. John Henderson, "Filth is the mother of corruption: plague and the built environment in early modern Florence," in *Plague and the City*, eds. Lukas Engelmann, John Henderson, and Christos Lynteris (London and New York: Routledge, 2018), 69–90.
83. Markel, *Quarantine!*. See also Alan M. Kraut, *Silent Travelers: Germs, Genes, and the "Immigrant Menace"* (New York: BasicBooks, 1995); Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley, CA: University of California Press, 2001).
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90. Perrier, cited in Norman Howard-Jones, *The Scientific Background of the International Sanitary Conferences, 1851–1938* (Geneva: World Health Organization, 1975), 14.
91. *Ibid.*, 35. For a discussion of the Ottoman quarantine system, see chapter 3.
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93. *Ibid.*, 65. On early twentieth-century debates on this classification and its relation to fumigation, see chapter 4.
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114. Mooney, *Intrusive Interventions*, 135.

115. *Ibid.*, 136

116. *Ibid.*

117. William Henry, "Experiments on the disinfecting powers of increased temperatures, with a view to the suggestion of a substitute for quarantine," *Philosophical Magazine* 10, no. 9 (1832), 367

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119. William Henry, "Further experiments on the disinfecting powers of increased temperatures." *Philosophical Magazine* 11, no. 61 (1832): 22. William Henry, "Letter from Dr. Henry on a modified disinfecting apparatus," *Philosophical Magazine* 11, no. 63 (1832): 205.

120. Mooney (2015) has argued that Henry's heat-based disinfection method was to become the basis for the extensive guidelines for preventative disinfection produced by the chief medical officer of the Medical Department of England's Privy Council, John Simon, thirty years later. For the way in which chlorine-based fumigation of households was used against "the horrific gorgon" of cholera in Scotland, and the controversy that ensued, see James Sanders, "Report of the effects of the acid fumigation tried in Scotland during the prevalence of the epidemic cholera and the causes which prevented it from being every where known and adopted, &c," *London Medical and Surgical Journal* 3 (1833): 395–400.

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122. *Ibid.*, 139.

123. On how "disease surveillance generated its own forms of portability" (ambulances, disinfectors, hand held spray pumps, etc.), see *ibid.*, 9.

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126. See *ibid.*, 141, for discussion of these.

127. *Ibid.*

Chapter 2

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2. Kathryn Olivarius, "Immunity, capital, and power in antebellum New Orleans," *American Historical Review* 124, no. 2 (2019): 425–455.

3. Erwin H. Ackerknecht, "Anticontagionism between 1821 and 1867," *Bulletin of the History of Medicine* 22 (1948): 562–93.

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7. *Ibid.*, 6.

8. Ackerknecht, "Anticontagionism between 1821 and 1867," 566.

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10. *Ibid.*

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12. Additionally, the yellow fever epidemic had been accelerated by a parallel epidemic of cholera. See Erasmus Darwin Fenner, *History of the Epidemic Yellow Fever at New Orleans, La., in 1853* (New York: Hall, Clayton, 1854).

13. Gordon Gillson, *Louisiana State Board of Health: The Formative Years* (Baton Rouge: Louisiana State Board of Health, 1976), 58.

14. *Ibid.*

15. *Ibid.*, xvi.

16. *Ibid.*, 61.

17. *Ibid.*, 100.

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19. Gordon Gillson, *Louisiana State Board of Health. The Progressive Years* (Baton Rouge: Louisiana State Board of Health, 1976), 161.
20. Humphreys, *Yellow Fever and the South*, 54.
21. *Ibid.*, 27; Gillson, *Louisiana State Board of Health. The Formative Years*, 100–103.
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24. Humphreys, *Yellow Fever and the South*.
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26. Charles Brainon White, *Disinfection in Yellow Fever, as Practised at New Orleans, in the Years 1870 to 1875 Inclusive* (New Orleans, LA: J. W. Madden, 1876), 4.
27. *Ibid.*, 6.
28. A. W. Perry, "Effectual external regulations without delay to commerce," *Public Health Papers and Reports* 1 (1873): 437–440, 439.
29. White, *Disinfection in Yellow Fever*, 7.
30. *Ibid.*, 6.
31. *Ibid.*
32. Louisiana Board of Health, *The Louisiana State Board of Health*, 7.
33. Freeport Sulphur Company, *4,000 years of Yellow Magic; The Story of a Basic Element, Widely Used, Little Understood, Which for 40 Centuries Has Been Shaping the History of the World* (Freeport, TX; Port Sulphur, LA: n.p., 1900).
34. *Ibid.*
35. Perry, "Effectual external regulations without delay to commerce," 439.
36. *Ibid.*, 440.
37. *Ibid.* points to the work of the French chemist Bertholet, who had proven the equal distribution of carbolic acid in hydrogen in experiments in France just a few years earlier.
38. White, in Louisiana Board of Health, *The Louisiana State Board of Health*, 8.
39. The Matas Medical Library, Tulane University, "Louisiana Board of Health. *Annual Reports of the Louisiana State Board of Health*. New Orleans, 1875," 31.
40. Quoted in Louisiana Board of Health, *The Louisiana State Board of Health*, 9.
41. Gillson, *Louisiana State Board of Health: The Formative Years*, 167.

42. White, *Disinfection in Yellow Fever*, 14.
43. American Public Health Association, Committee on Disinfectants and Royal College of Physicians of Edinburgh, *Report of the Committee on Disinfectants of the American Public Health Association* (Baltimore: Printed for the Committee, 1885).
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45. John Dougall, "Disinfection by acids," *British Medical Journal* 2 (984) (November 8, 1879): 726–728.
46. American Public Health Association, *Report of the Committee on Disinfectants*, 40.
47. Émile Arthur Vallin, *Traité des désinfectants et de la désinfection* (Paris: G. Masson, 1882).
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49. American Public Health Association, *Report of the Committee on Disinfectants*.
50. *Ibid.*, 88.
51. Howard Markel, *Quarantine!: East European Jewish Immigrants and the New York City Epidemics of 1892* (Baltimore, MD: Johns Hopkins University Press, 1999)
52. American Public Health Association, *Report of the Committee on Disinfectants*, 91–92.
53. Robert Koch, "Ueber Desinfektion," *Mittheilungen aus dem Kaiserlichen Gesundheitsamte* 1 (1881): 287–338.
54. René Dubos, *Louis Pasteur, Free Lance of Science* (Boston: Little, Brown and Company, 1950), 139.
55. Humphreys, *Yellow Fever and the South*, 42; Louisiana Board of Health, *The Louisiana State Board of Health*, 16.
56. Joseph Holt, *Quarantine and Commerce, Their Antagonism Destructive to the Prosperity of City and State* (New Orleans: Graham and Sons, 1884), 5.
57. Humphreys, *Yellow Fever and the South*, 10ff.
58. Holt, *Quarantine and Commerce*, 1.
59. The Matas Medical Library, Tulane University, "Louisiana Board of Health. *Annual Reports of the Louisiana State Board of Health*. New Orleans, 1884–1885," 11.
60. Gillson, *Louisiana State Board of Health. The Progressive Years*, 11.
61. Joseph Holt, *An Epitomized Review of the Principles and Practice of Maritime Sanitation* (New Orleans: Graham, 1892).

62. *Ibid.*, 4
63. Kennedy, cited in Gillson, *Louisiana State Board of Health. The Formative Years*, 23.
64. The Matas Medical Library, Tulane University, "Louisiana Board of Health. *Annual Reports of the Louisiana State Board of Health*. New Orleans, 1888–1889," 61.
65. Gillson, *Louisiana State Board of Health. The Formative Years*, 21.
66. Olliphant was a physician from Louisiana who had previously served as vice president of the board under Holt. He also spent a year overseeing the sanitation procedures on on the Rigolet quarantine station south of New Orleans. See *The Times Democrat*, April 11, 1890, 11.
67. "Board of Health. An Address to the Public as to Its Policy and Plans," *The Daily Picayune* (New Orleans, LA), April 23 1890, 6.
68. [No title], *St. Landry Democrat* (Opelousas, LA) 1878–1894, April 19, 1890, 1.
69. Anonymous, "Board of Health. An Address to the Public as to Its Policy and Plans," *The Daily Picayune* (New Orleans, LA), April 23, 1890, 6.
70. The Matas Medical Library, Tulane University, "Louisiana Board of Health. *Annual Reports of the Louisiana State Board of Health*. New Orleans, 1890–1891," 17.
71. Anonymous, "Trip To Quarantine. Official Visit of Inspection by the Board of Health and Legislative Committees," *The Daily Picayune* (New Orleans, LA), June 2, 1890, 3.
72. The Matas Medical Library, Tulane University, "Louisiana Board of Health. *Annual Reports of the Louisiana State Board of Health*. New Orleans, 1890–1891," 17.
73. *Ibid.*
74. S. R. Olliphant and T. A. Clayton, "Fumigation Apparatus," Patent US490981, filed January 25, 1892, granted January 31, 1893.
75. *Ibid.*
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77. Louisiana Board of Health, *The System of Maritime Sanitation Inaugurated and Brought to Its Present State of Perfection by the Louisiana State Board of Health* (Chicago, 1893), 1.
78. *Ibid.*
79. *Ibid.*, 11.

80. On the history of the Alliance, see Donna A. Barnes, *The Louisiana Populist Movement, 1881–1900* (Baton Rouge: Louisiana State University Press, 2011).

81. A first entry illuminating the life of Thomas A. Clayton is to be found in the *Biographical and Historical Memoirs of Louisiana* (Chicago: The Goodspeed Publishing Company, 1892), 351.

82. See *St. Landry Democrat*, April 19, 1890, 1.

83. See *The Times-Democrat* (New Orleans), May 17, 1891, 3; *The Times-Democrat* (New Orleans), July 22, 1891, 3; and *St. Landry Democrat*, June 6, 1891, 4.

84. See *The Daily Picayune*, July 24, 1894, 11.

85. New Orleans, Louisiana, City Directory, 1895, 215.

86. Anonymous, "A Case in Point," *The Washington Post* (1877–1922), December 17, 1897, 6.

87. Yet, although the disease returned in the 1890s, hardly anyone questioned the validity and functionality of the fumigation device and the system of maritime sanitation that had been developed around it.

88. Thomas A. Clayton, "Method and Apparatus for Fumigating and Extinguishing Fires in Closed Compartments," Patent US633807, filed June 7, 1899, and issued September 26, 1899.

89. A first detailed description of the capacities of the Clayton system and its advantages over other systems is given in W. J. Simpson, *A Treatise on Plague; Dealing with the Historical, Epidemiological, Clinical, Therapeutic and Preventive Aspects of the Disease* (Cambridge: Cambridge University Press, 1905), 360ff. Another description of the apparatus can be found in the papers of the National Archives (UK) See National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship; Plague Precautions. Destruction of Rats on Ships, May 24, 1900."

90. Thomas A. Clayton, Method and Apparatus for Fumigating and Extinguishing Fires in Closed Compartments. Patent US633807. Filed June 7, 1899, granted September 26, 1899.

Chapter 3

1. M. Alper Yalçinkaya, *Learned Patriots: Debating Science, State, and Society in the Nineteenth-Century Ottoman Empire* (Chicago: The University of Chicago Press, 2015); Miri Shefer-Mossensohn, *Science among the Ottomans: The Cultural Creation and Exchange of Knowledge* (Austin: University of Texas Press, 2015); Amit Bein, "The Istanbul earthquake of 1894 and science in the late Ottoman Empire," *Middle Eastern Studies* 44, no. 6 (2008): 909–924.

2. Zeynep Devrim Gürsel, "Thinking with X-rays: Investigating the politics of visibility through the Ottoman Sultan Abdülhamid's photography collection," *Visual Anthropology* 29, no. 3, Special Issue: Visual Revolutions in the Middle East (2016): 229–242.
3. Richard Evans, *Death in Hamburg: Society and Politics in the Cholera Years, 1830–1910* (Wotton-under-Edge, UK: Clarendon Press, 1987).
4. Neil Pemberton, "The rat-catcher's prank: Interspecies cunningness and scavenging in Henry Mayhew's London," *Journal of Victorian Culture* 19, no. 4 (2014): 520–535, 526.
5. Henry Mayhew, *London Labour and the London Poor* (London: Dover, 1860–1861).
6. Pemberton, "The rat-catcher's prank," 523.
7. *Ibid.*
8. *Ibid.*, 532.
9. *Ibid.*, 533. Rodwell was the author of a popular treatise: James Rodwell, *The Rat: Its History and Destructive Character* (London: Routledge and Co., 1858).
10. C. Renny, *Medical Report on the Mahamurree in Gurhwal in 1849–50* (Agra, India: Secundra Orphan Press, 1851).
11. Emile Rocher, *La province Chinoise du Yunnan* (Paris: Lerous, 1879); Patrick Manson, "Dr. Manson's report on the health of Amoy for the half-year ended 31st March 1878," *Customs Gazette, Medical Reports* 2 (January–March 1878): 25–27.
12. *Hong Kong Government Gazette*, GA 1895 no.146; Medical Report on the Epidemic of Bubonic Plague in 1894 (incorporating J. A. Lowson, "The Epidemic of Bubonic Plague in Hong Kong, 1894," April 13, 1895): 369–422; Alexandre Yersin, "La peste bubonique à Hong Kong," *Annales de l'Institut Pasteur* 8 (1894): 662–667.
13. M. Simond, "Paul-Louis Simond and his discovery of plague transmission by rat fleas: a centenary," *Journal of the Royal Society of Medicine* 91, no. 2 (February 1998): 101–104.
14. A. W. Bacot and C. J. Martin, "Observations on the mechanism of the transmission of plague by fleas," *Journal of Hygiene, Plague Suppl.* 3 (1914): 423–39.
15. See, for example, Nicholas Evans, "Blaming the rat? Accounting for plague in colonial Indian medicine," *Medicine, Anthropology, Theory* 5, no. 3 (2018), doi.org/10.17157/mat.5.3.371.
16. On cholera and the Ottoman Empire, see G. Sariyildiz and O. D. Macar, "Cholera, pilgrimage, and international politics of sanitation: The quarantine station on the island of Kamaran," in *Plague and Contagion in the Islamic Mediterranean*, ed. Nukhet Varlik (Croydon, UK: ARC Humanities Press, 2017), 243–274; S. Erer and A.

D. Erdemir, "Preventive measures and treatments for cholera in the 19th century in Ottoman archive documents," *Vesalius* 16, no. 1 (June 2010): 41–48; Saurab Mishra, *Pilgrimage, Politics, and Pestilence: The Haj from the Indian Subcontinent* (Oxford: Oxford University Press, 2011). Plague had been absent from the Ottoman capital, Istanbul, since the mid 1830s; D. Panzac, *La peste dans l'Empire ottoman: 1700–1850* (Leuven: Editions Peeters, 1985).

17. Yıldırım specified that, in response to plague outbreaks in Istanbul and Anatolia, the particular "directive required for ships from the Ottoman State as well as foreign vessels that any captain coming from the Mediterranean up the Dardanelles had to show the passage certificate and passenger list to an official who approached the ship in a rowboat; if the ship was coming from an uncontaminated place it would not be stopped. If they were coming from an infected area they would be quarantined." Nuran Yıldırım, *A History of Healthcare in Istanbul: Health Organizations—Epidemics, Infections and Disease Control Preventive Health Institutions—Hospitals—Medical Education* (Istanbul: Ajansfa, 2010), 23. For a general history of quarantine in the Ottoman Empire, see D. Panzac, *Quarantaines et lazarets: L'Europe et la peste d'Orient (XVII^e-XX^e siècle)* (Aix-en-Provence, France: Edisud, 1986).

18. On the varying titles and the history of the establishment of the Council, see Nuran Yıldırım and Hakan Ertin, "European physicians/specialists during the cholera epidemic in Istanbul 1893–1895 and their contributions to the modernization of healthcare in the Ottoman State," in *Health Culture and the Human Body: Epidemiology, Ethics and History of Medicine; Perspectives from Turkey and Central Europe*, eds. İlhan Likilic, Hakan Ertin, Rainer Bromer, and Hajo Zeeb (Istanbul: BETIM Center Press, 2014), 189–215.

19. A. Arslan and H. A. Polat, "Travel from Europe to Istanbul in the 19th century and the quarantine of Çanakkale," *Journal of Transport & Health* (2017): 10–17, 16. The number of foreign delegates would later be amended in order to include Germany, the USA, and other international powers (Yıldırım 2010). International presence and influence was evident not only in the Council but also across the Ottoman Empire's emerging medical system. For discussion see: Marcel Chahrour, "'A civilizing mission'? Austrian medicine and the reform of medical structures in the Ottoman Empire, 1838–1850," *Studies in History and Philosophy of Biological and Biomedical Sciences* 38, no. 4 (December 2007): 687–705; Ceren Gülser İlikan Rasimoğlu, "The foundation of a professional group: Physicians in the nineteenth century modernizing century modernizing Ottoman Empire (1839–1908)" (Ph.D. Thesis, Boğaziçi University, 2012); Anne-Marie Moulin, "Initiating global health at the time of the Crimean war 1853–1856 and the projects of sanitary reform of the Ottoman Empire," *History of Medicine* 1 (2014): 61–79; N. Sari, "Turkey and its international relations in the history of medicine," *Vesalius* VII, no. 2 (2001): 86–93; Nermin Ersoy, Yuksel Gungor, and Aslihan Akpinar, "International Sanitary Conferences

from the Ottoman perspective (1851–1938),” *Hygiea Internationalis: An Interdisciplinary Journal for the History of Public Health* 10, no. 1 (2011): 53–79.

20. Yıldırım, *A History of Healthcare in Istanbul*, 24.

21. Ibid., 27. See 27–28 on how this system of reporting worked.

22. According to Ridvan Pasha (Istanbul’s mayor) 60 percent of the quarantine organization was composed by Greeks. See Yıldırım, *A History of Healthcare in Istanbul*, 31.

23. Sylvia Chiffolleau, “Les pèlerins de La Mecque, les germes et la communauté internationale,” *Médecine/sciences (Paris)* 27, no. 12 (December 2011): 1121–1126; Saurab Mishra, “Incarceration and resistance in a Red Sea lazaretto, 1880–1930,” in *Quarantine: Local and Global Histories*, ed. Alison Bashford (London: Palgrave Macmillan, 2016), 54–65; Birsan Bulmus, *Plague, Quarantines and Geopolitics in the Ottoman Empire* (Edinburgh: Edinburgh University Press, 2012); Michael Christopher Low, *The Mechanics of Mecca: The Technopolitics of the Late Ottoman Hijaz and the Colonial Hajj* (Ph.D. Thesis, Columbia University, 2015).

24. C. Stekoulis, “Bulletin épidémiologique,” *Gazette médicale d’Orient* 42, no. 11 (July 31, 1897): 169–171. See also Cozzonis Effendi, *Rapport sur la manifestation pestilentielle à Djeddah en 1898, suivi d’une esquisse sur les conditions générales de la dite ville* (Istanbul: Impr. Osmanié, 1898); Frédéric Borel, *Étude d’hygiène internationale. Choléra et peste dans le pèlerinage musulman, 1860–1903* (Paris: Masson, 1904).

25. Nükhet Varlık, *Plague and Empire in the Early Modern Mediterranean World: The Ottoman Experience, 1347–1600* (Cambridge: Cambridge University Press, 2015), 47. Varlık mentions that, although sources mention the use of rat poison (mainly arsenic-based), “there do not seem to be professional rat catchers in the early modern Ottoman Empire organized in a guild, wither because this was a service performed by another group of professionals or more likely because this was something done by individuals” (2015, 26).

26. Nicholas Taptas, “Peste bubonique. Étude clinique et bactériologique,” *Gazette médicale d’Orient* 42, no. 13 (August 31, 1897): 210–214, 212. The particular doctor should not be confused with the chief doctor of Istanbul’s Eftal Hospital and later the private doctor of the Turkish Prime Minister İsmet İnönü. On Taptas’s other medical contributions, see Alexander Karatzanis, Constantinos Trompoukis, Ioannis Vlastos, and George Velegrakis, “On the history of modern tonsillectomy: the contribution of Nikolaos Taptas,” *European Archives of Oto-Rhino-Laryngology* 268 (1687) (November 2011). <https://link.springer.com/article/10.1007/s00405-011-1751-3>.

27. Nicholas Taptas, “Peste bubonique. Étude clinique et bactériologique,” *Gazette médicale d’Orient* 42: 15 (September 15, 1897): 227–230. On the development of this theory in the context of Hong Kong, see Staff-Surgeon Wilm, *A Report on the*

Epidemic of Bubonic Plague at Hongkong in the Year 1896 (Hong Kong: n.p., 1897). On the question of plague and the infectious corpse, see Christos Lynteris and Nicholas H. Evans (eds.), *Histories of Post-Mortem Contagion: Infectious Corpses and Contested Burials* (London: Palgrave Macmillan, 2017).

28. This was seconded by Dr. Delacour in a paper on plague originally published in the *Journal de la Chambre de Commerce française* and reprinted as Delacour, "La peste," *Revue médico-pharmaceutique* 11, no. 8 (August 15, 1898): 97–99.

29. Taptas, "Peste bubonique," 230.

30. "Correspondence Re Improvement of Tai-Ping Shan, enclosed in Robinson to Ripon, 30 August 1894," Colonial Office. Original Correspondence: Hong Kong 1841–1951; Series 129/263, CO 17303.

31. On soil and plague-related research and policy in India and Hong Kong, see Christos Lynteris, "A Suitable soil': Plague's breeding grounds at the dawn of the third pandemic," *Medical History* 61, no. 3 (June 2017): 343–357.

32. Anonymous, "La peste," *Gazette médicale d'Orient* 44, nos. 19 and 20 (November 30 and December 15, 1899): 266–267; Anonymous, "Bulletin. La peste bubonique," *Revue médico-pharmaceutique* 11, no. 8 (August 15, 1898): 101–102. For an account of the 1899 plague in Alexandria, see Aristide Valassopoulo, *La peste d'Alexandrie en 1899 au point de vue clinique, épidémiologique, etc.* (Paris: A. Maloine, 1901). For the history of plague in nineteenth-century Egypt, see LaVerne Kuhnke, *Lives at Risk: Public Health in Nineteenth-Century Egypt* (Berkeley, CA: University of California Press, 1990); Echenberg, Myron, *Plague Ports: The Global Urban Impact of Bubonic Plague, 1894–1901* (New York: New York University Press, 2007).

33. C. Stekoulis, "Bulletin épidémiologique," *Gazette médicale d'Orient* 43: 24 (February 15, 1899): 353–354.

34. Anonymous, "La peste," 266. The Imperial Society of Health (Cemiyet-i Tibbiye-i Sahane) was formed in 1856 by foreign doctors who remained in the Ottoman capital after the end of the Crimean War (during which they had been employed by the Ottoman army) with the aim of "investigat[ing] the epidemics and prepar[ing] reports which were then presented to the relevant authorities"; Yıldırım and Ertin, "European physicians/specialists during the cholera epidemic in Istanbul 1893–1895," 189.

35. Stekoulis, "Bulletin épidémiologique."

36. C. Stekoulis, "La peste—La cholera," *Gazette médicale d'Orient* 44, nos. 23 and 24 (January 30 and February 15, 1900): 307–308.

37. *Ibid.*, 307

38. In *ibid.*, 308.

39. Michele Nicolas, "Pierre Apéry et ses publications scientifiques," *Revue d'histoire de la pharmacie* 94, no. 350 (2006): 237–247; Halil Tekiner and Afife Mat, "Les pharmacopées turques de langue française," *Revue d'histoire de la pharmacie* 57, no. 361 (2009): 17–22.
40. Alfred Swaine Taylor, "An account of the Grotta del Cane; with remarks on suffocation by carbonic acid," *London Medical and Physical Journal* NS 73 (October 1832): 278–285.
41. Pierre Apéry, "Moyen de destruction des rats à bord des bateaux surtout en temps d'épidémie de peste," *Revue médico-pharmaceutique* 12, no. 10 (October 15, 1899): 137–138.
42. Société Imperiale de Médecine, "Séance du 4 mai 1900; L'anhydride carbonique comme moyen de destruction des rats dans les cales des bateaux," *Gazette médicale d'Orient* 45, no. 7 (May 30, 1900): 108–113.
43. *Ibid.*, 109.
44. On this premechanized method of producing SO₂, see Pierre Apéry, "Note sur l'emploi de l'anhydride carbonique pour la destruction des rats dans les cales des navires," *Revue médico-pharmaceutique* 15, no. 1 (January 1, 1902): 1–3.
45. Société Imperiale de Médecine, "Séance du 4 mai 1900; L'anhydride carbonique comme moyen de destruction des rats dans les cales des bateaux," *Gazette médicale d'Orient* 45, no 7 (May 30, 1900), 112.
46. *Ibid.*, 113.
47. Société Imperiale de Médecine, "Séance du 18 mai 1900; L'anhydride carbonique comme moyen de destruction des rats dans les cales des bateaux, surtout en temps d'épidémie de peste," *Gazette médicale d'Orient* 45, no. 9 (June 30, 1900): 134–140.
48. *Ibid.*, 138.
49. Pierre Apéry, "Lettre ouverte, Reponse à M. Desguin, L'anhydride carbonique peut-il débarasser des rats les cales des bateaux?," *Revue médico-pharmaceutique* 13, no. 8 (April 15, 1900): 86–89. Invented by Petrus Jacobus Kipp (c. 1844), the Kipp apparatus would need to be massively scaled up for such an operation.
50. Société Imperiale de Médecine, "Séance du 18 mai 1900," 138–139.
51. *Ibid.*
52. Pierre Apéry, "Lettre ouverte, Reponse à M. Desguin."
53. *Ibid.*, 88.
54. Anonymous, "Destruction des rats à bord des navires," *Revue médico-pharmaceutique* 13, no. 23 (December 1, 1900): 266.

55. Anonymous, "Memoire sur l'influence des rats dans la propagation de la peste," *Revue médico-pharmaceutique* 13, no. 22 (November 15, 1900): 253–257.
56. Andreas David Mordtmann, "Bulletin sanitaire," *Gazette médicale d'Orient* 45, no.7 (May 30, 1900): 102.
57. Istanbul had been free from plague since 1838; Yıldırım, *A History of Healthcare in Istanbul*, 28.
58. Andreas David Mordtmann (1837–1912), not to be confused his son, the Orientalist Johannes Heinrich Mordtmann, was the German delegate to the Quarantine Council and previously the Consul of the Hanseatic League to the Sublime Porte. On his work on cholera, see Yıldırım and Ertin, "European physicians/specialists during the cholera epidemic in Istanbul 1893–1895."
59. Andreas David Mordtmann, "Bulletin épidémiologique," *Gazette médicale d'Orient* 45, no. 14 (September 15, 1900): 267, 268.
60. C. Stekoulis, "Bulletin épidémiologique," *Gazette médicale d'Orient* 45, no. 17 (October 31, 1900): 331–332, 331. On quarantine being an affliction more severe than plague itself, see C. Stekoulis, "Bulletin épidémiologique," *Gazette médicale d'Orient* 46, no. 13 (September 1, 1901): 738–739. The anti-quarantine sentiment was particularly fuelled by the pro-quarantine attitude of Bulgarian sanitary authorities, described by Mordtmann as a "sinister plan" involving "subjecting human beings" to unacceptable conditions of hygienic detainment; Andreas David Mordtmann, "Bulletin sanitaire," *Gazette médicale d'Orient* 45, no. 23 (January, 31 1901): 459–460, 459.
61. C. Stekoulis, "Bulletin épidémiologique," *Gazette médicale d'Orient* 46, no. 6 (May 15, 1901): 627; on Istanbul cases and their benign nature, see C. Stekoulis, "Bulletin épidémiologique," *Gazette médicale d'Orient* 46, no. 12 (August 15, 1901): 721–723.
62. C. Stekoulis, "Bulletin épidémiologique," *Gazette médicale d'Orient* 46, no. 13 (September 1, 1901): 738–739; Spiridion C. Zavitziano, "Bulletin épidémiologique," *Gazette médicale d'Orient* 46, no. 14 (September 15, 1901): 754.
63. C. Kelaiditis, "Opinion [sur] S. Balis, 'Contribution à l'étude des mesures sanitaires contre la propagation de la peste,'" *Revue medico-pharmaceutique* 15, no. 1 (January, 1 1902): 18.
64. Andreas David Mordtmann, "Bulletin épidémiologique," *Gazette médicale d'Orient* 46, no. 18 (November, 15 1901): 818.
65. Société Imperiale de Médecine, "Séance du 29 novembre 1901: Les quarantaines," *Gazette médicale d'Orient* 46, no. 22 (January 15, 1902): 887.

66. Ibid., 888. For a proquarantine response, see S. Serpossian, "La question des quarantaines, au sein de la Société Imperiale de Médecine," *Revue médico-pharmaceutique* 15, no. 6 (March 15, 1902): 67; S. Serpossian, "La question des quarantaines, au sein de la Société Imp. de Médecine," *Revue médico-pharmaceutique* 15, no. 7 (April 1, 1902): 76.
67. Pierre Apéry, "Bulletin épidémiologique," *Revue médico-pharmaceutique* 14, no. 16 (August 15, 1901): 181.
68. Pierre Apéry, "Bulletin épidémiologique. L'utilité des quarantaines," *Revue médico-pharmaceutique* 14, no. 21 (November 1, 1901): 241.
69. Ibid.
70. Ibid.
71. Société Imperiale de Médecine, "Séance du 13 décembre 1901, Les quarantaines," *Gazette médicale d'Orient* 46, no. 23 (February 1, 1902): 905.
72. Ibid., 908; It is not hard to imagine the frustration of Apéry's colleagues with this position, especially as only a few days earlier he himself had published an editorial in the *Revue médico-pharmaceutique* titled "Quarantined suppressed"; Pierre Apéry, "Les quarantaines supprimées," *Revue médico-pharmaceutique* 14, no. 23 (December 1, 1901): 265. Indeed, Apéry's editorial was read by Stshepotiew as suggesting that his method would lead, sooner or later, to the suppression of quarantines; Société Imperiale de Médecine, "Séance du 20 décembre 1901," *Gazette médicale d'Orient* 46 (24) (February 15, 1902): 915–917. However, the title, as Apéry explained, did not express his personal position but was the verbatim title of the French article from *Le Petit Journal* (December 7, 1901) that the editorial was referring to.
73. Pierre Apéry, "Bulletin épidémiologique. L'utilité des quarantaines," *Revue médico-pharmaceutique* 14, no. 21 (November 1, 1901): 241.
74. Ibid.
75. Ch. Bonkowski, "De l'emploi de l'anhydride carbonique pour la destruction des rats dans les cales des navires," *Revue médico-pharmaceutique* 14, no. 23 (December 1, 1901): 264–267.
76. Charles Zitterer, "Rapport sur les expériences de dératissage des cales des navires par le gaz acide carbonique présenté dans le Conseil Supérieur de Santé (séance du 8/21 janvier 1902)," *Revue médico-pharmaceutique* 15, no. 1 (January 1, 1902): 14–16.
77. Key bibliography on this includes: Suraiya Faroqi (ed.), *Animals and People in the Ottoman Empire* (Istanbul: Eren, 2010); Alpaslan Demir, "Mice problems in the Ottoman Empire and mice invasion in Tırhala in 1866," *IBAC* 2 (2012):

645–661; Alan Mikhail, *The Animal in Ottoman Egypt* (Oxford: Oxford University Press, 2014).

78. Robert Koch [Interview]. *Hamburger Freie Presse*, November 26, 1892.

79. Richard Evans, *Death in Hamburg: Society and Politics in the Cholera Years, 1830–1910* (Wotton-under-Edge, UK: Clarendon Press, 1987).

80. Bernhard Nocht, Emil von Behring, Joseph Brix, E. Pfuhl, and the Royal College of Physicians of Edinburgh, *Die Bekämpfung der Infektionskrankheiten: Hygienischer Theil* (Leipzig, Germany: G. Thieme, 1894), 472.

81. Bernhard Nocht, "Ueber die Abwehr der Pest," *Archiv fuer Schiffs und Tropen Hygiene* 1, no. 2 (1897): 92.

82. *Ibid.*, 97.

83. An exception to this rule were the vessels of the Hamburg-American Line, which were required to place rat poison upon arrival but not to undergo fumigation each time, but only upon the instruction of the port physician.

84. C. Smith, "Germany. Method of killing rats at Hamburg," *Public Health Reports (1896–1970)* 15, no. 17 (April 27, 1900): 1013.

85. G. Mazaraky, *Le rôle des rats dans la propagation de la peste* (Thèse de méd., Fac. de Médecine de Paris; Paris: Vigot Frères, 1901).

86. Bernhard Fleischer, "A century of research in tropical medicine in Hamburg: the early history and present state of the Bernhard Nocht Institute," *Tropical Medicine and International Health* 5, no. 10 (2000): 747–751.

87. The damaging capacity was according to Nocht solely ascribed to Pictolin containing sulphur. Nocht was convinced that therefore the Clayton gas, which was equally based on sulphur, was also to be ruled out as a means of establishing a reliable fumigation system in the port of Hamburg.

88. Ministère des Affaires étrangères, *Conférence sanitaire internationale de Paris: 10 octobre-3 décembre 1903, procès-verbaux* (Paris: Impr. Nationale, 1904), 369.

89. Bernhard Nocht and G. Giemsa, "Über die Vernichtung von Ratten an Bord von Schiffen. Als Massregel gegen die Einschleppung der Pest," *Arbeiten aus Dem Kaiserlichen Gesundheitsamte* XX, no. 1 (1904), 102.

90. *Ibid.*, 107.

91. *Ibid.*, 113.

92. Anonymous, "Method of fumigation of vessels at Hamburg," *United States Naval Medical Bulletin* 3 (1909): 368–370.

Chapter 4

1. Advertisement in *Industrial Management* 21 (1901): 998ff.
2. Nayan Shah, *Contagious Divides: Epidemics and Race in San Francisco's Chinatown* (Berkeley, CA: University of California Press, 2001), 60. See also Guenter B. Risse, *Driven by Fear: Epidemics and Isolation in San Francisco's House of Pestilence* (Champaign, IL: University of Illinois Press, 2015). Markel writes on the extensive introduction of fumigation in late nineteenth-century New York: Howard Markel, *Quarantine!: East European Jewish Immigrants and the New York City Epidemics of 1892* (Baltimore, MD: Johns Hopkins University Press, 1999), 50. Also see *The St. Paul Globe* (Minnesota), February 7, 1904, 21.
3. Anonymous, *New York Times*, October 30 1910, 17
4. Krista Maglen, *The English System. Quarantine, Immigration and the Making of a Port Sanitary Zone* (Manchester, UK: Manchester University Press, 2014), 2.
5. *Ibid.*, 8.
6. *Ibid.*, 40.
7. *Ibid.*, 40. Neither Maglen nor the corresponding "Report of the Medical Officer of Health for Port of London" specify how fumigation was employed or what substance was used.
8. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship; Plague Precautions. Destruction of Rats on Ships, 24 May 1900."
9. *Ibid.*
10. In fact, experiments regarding the fire-extinguishing properties of the Clayton machine had already taken place on January 18 of the same year at the Northumberland forge of the North-Eastern Marine Engineering Company in the presence of the president of the company, T. A. Clayton himself.
11. *Ibid.*
12. *Ibid.*
13. *Ibid.*
14. *Ibid.*
15. *Ibid.*
16. Anonymous, "The plague. The destruction of rats on shipboard," *The British Medical Journal* 1, no. 2106 (May 11, 1901), 1170. At the same time, similar experiments or demonstrations were taking place in other parts of the world, such as South Africa's Cape Town, where the Clayton was used to fumigate the steamship

Goorkha, achieving satisfactory results as regards vermin eradication and no tarnishing of materials; National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship; Plague Precautions. Destruction of Rats on Ships, 24 May 1900," enclosed pamphlet "The Clayton Fire Extinguishing and Ventilating Company, Limited."

17. *Ibid.*

18. "The Clayton Fire Extinguishing and Ventilating Company, Thomas A. Evans, to the Assistant Secretary, Marine Department, Board of Trade, Whitehall, October 29, 1901." National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship; Plague Precautions. Destruction of Rats on Ships, 24 May 1900."

19. M. Simond, "Paul-Louis Simond and his discovery of plague transmission by rat fleas: a centenary." *Journal of the Royal Society of Medicine* 91, no. 2 (February 1998): 101–104.

20. Rechit Khayat, *Prophylaxie de la peste par la destruction des insectes et des rongeurs* (Paris: Jules Rousset, 1902), 7. See also Jules Bucqcoy, "Une quarantaine au Frioul (séance du 29 octobre 1901)," *Bulletin de l'Académie nationale de médecine* 3, no. XLVI (1901), 422–436.

21. On the history of the scientific cruises of the *Revue générale des sciences pures et appliquées*, see Veronica della Dora, "Making mobile knowledges: The educational cruises of the *Revue générale des sciences pures et appliquées*, 1897–1914," *Isis* 101, no. 3 (September 2010): 467–500.

22. The man died in quarantine.

23. The experiences of the passengers were recorded in a memoir, including photographs by the pioneer of French cinema Léon Gaumont. See Jean Bertot, *Au lazaret. Souvenirs de quarantaine* (Tours, France: Deslis frères, 1902). See also Jacques Chevalier, "Une quarantaine de peste au lazaret de Frioul en 1901," *Histoire des sciences médicales* XLIX, no. 2 (2015): 179–188.

24. The role of rats in Alexandria had been noted by local medical authorities. See Aristide Valassopoulo, *La peste d'Alexandrie en 1899 au point de vue clinique, épidémiologique, etc.* (Paris: A. Maloine, 1901).

25. Anonymous, "La peste à bord du Sénégal," *Petit Journal* (December 1, 1901): 264; Anonymous, "Le lazaret du Frioul," *L'actualité* 91 (October 20, 1901): 1. For photographic coverage, see Anonymous, no title, *La Revue hebdomadaire* 4, no. 47 (October 19, 1901): 2–4.

26. Joseph Pellisier, *La peste au Frioul, lazaret de Marseille en 1900 et 1901* (Paris: Steinheil, 1902).

27. G. Mazaraky, *Le rôle des rats dans la propagation de la peste* (Thèse de méd., Fac. de Médecine de Paris. Paris: Vigot Frères, 1901), 81–82; see also Henri Monod, "Incident

du paquebot 'Sénégal' retenu au lazaret de Frioul le 20 septembre 1901 comme infecté de peste," *Recueil des travaux du Comité Consultatif d'Hygiène Publique de France et des Actes Officiels de l'Administration Sanitaire* 31 (1901), 186 note 1; on a review of rat studies in light of the *Sénégal* outbreak, see Pellisier, *La peste au Frioul*.

28. Pellisier, *La peste au Frioul*, 180; on the other incidents concerning vessels such as the *Niger*, the *Laos*, and the *Simla*, see A. Proust and Paul Faivre, "Rapport général sur les maladies pestilentiels exotiques (peste, fièvre jaune, cholera) en 1901," *Recueil des Travaux du Comité Consultatif d'Hygiène Publique de France et des Actes Officiels de l'Administration Sanitaire* 31 (1901), esp. 290–332.

29. These included the instructions of August 4, 1899, which recommended the sulphurization of boats and lazarettos against rats and mice, and the instructions of October 1, 1900, which instituted the surveillance of unloading of boats deriving from plague-infected ports for sick or dead rats.

30. This did not necessarily mean the use of the Clayton machine, but referred more broadly to the use of sulphur as a fumigant against rats. See Henri Monod, "Incident du paquebot 'Sénégal.'" "

31. In spite of Proust's self-defensive insistence that previous deratization rules sufficed, they in fact only mentioned rats tentatively. See Anonymous, "Discussions: Sur la police sanitaire maritime et le séjour du *Sénégal* au lazaret du Frioul (Séance 5 novembre 1901)," *Bulletin de l'Académie nationale de médecine* 3, no. XLVI (1901): 488–503.

32. Conseil Quarantenaire d' Égypte, "Rapport adressé à la présidence du Conseil Quarantenaire d' Égypte par M. le directeur P. I. de l'Office Quarantenaire d'Alexandrie sur la destruction des rats à bord des navires," *Recueil des Travaux du Comité Consultatif d'Hygiène Publique de France et des Actes Officiels de l'Administration Sanitaire* 31 (1901): 513–516.

33. *Ibid.*, 514.

34. Émile Arthur Vallin, "Rapport. Les services sanitaires et le lazaret du Frioul (séance 11 mars 1902)," *Bulletin de l'Académie nationale de médecine* 3, no. XLVII (1902), 332.

35. *Ibid.*, 333.

36. A. Proust and Paul Faivre, "Rapport sur différents procédés de destruction des rats à bord des navires," *Recueil des Travaux du Comité Consultatif d'Hygiène Publique de France et des Actes Officiels de l'Administration Sanitaire* 33 (1903), 371.

37. Vallin, "Rapport. Les services sanitaires et le lazaret du Frioul," 333.

38. Émile Arthur Vallin, *Traité des désinfectants et de la désinfection* (Paris: G. Masson, 1882).

39. Vallin, "Rapport. Les services sanitaires et le lazaret du Frioul."
40. Service Sanitaire Maritime, "Sulfuration des navires.—Emploi d'appareils permettant d'effectuer cette sulfuration avant déchargement, circulaire du president du conseil, ministre de l'interieur et des cultes, du 20 juillet 1903, aux directeurs de la santé," *Recueil des Travaux du Comité Consultatif d'Hygiène Publique de France et des Actes Officiels de l'Administration Sanitaire* 33 (1903), 103.
41. Adrien Loir, a nephew of Louis Pasteur, was the founder of the Pasteur Institute of Tunis and an internationally renowned bacteriologist.
42. Wellcome Library, Reference number b19884217, Port of London Sanitary Committee, "Annual Report of the Medical Officer to 31st December 1902," 30.
43. Proust and Faivre, "Rapport general sur les maladies pestilentiels exotiques," 307.
44. Gustave Duriau, "Quelques mots sur l'appareil Clayton," *Mémoires de la Société Dunkerquoise pour l'encouragement des sciences, des lettres et des arts* 36 (1902), 403.
45. Pierre Apéry, "De l'inefficacité des systems à base d'anhydride sulfureux employés jusqu'à ce jour pour la destruction des rats dans des navires," *Revue médico-pharmaceutique* 15, no. 4 (February 15, 1902): 36–39.
46. J.-P. Langlois and A. Loir, "La destruction des rats à bord des bateaux comme mesure prophylactique contre la peste," *Revue d'hygiène et de police sanitaire* 24 (1902), 413.
47. On Rosenstiehl, see Anne-Claire Déré, "Daniel August Rosenstiehl (1839–1916): An Alsatian chemist in the synthetic dyestuffs industry," in *The Chemical Industry in Europe, 1850–1914: Industrial Growth, Pollution, and Professionalization*, eds. Ernst Homburg, Anthony S. Travis, and Harm G. Schröter (Dordrecht, Netherlands: Springer, 1998), 305–320.
48. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship; Report on the Disinfection of Vessels by the Clayton System by Dr. A. Calmette, Director of the Pasteur Insitute of Lille, and Dr. Haufeuille Assistant at the Pasteur Insitute of Lille," translated from the *Revue d'Hygiene et de police sanitaire, Paris XXIV*, no. 10 (October 20, 1902): 22–27.
49. *Ibid.*
50. Proust and Faivre, "Rapport sur different procedes de destruction des rats à bord des navires," 356.
51. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship; Report on the Disinfection of Vessels by the Clayton System," 6.

52. Proust and Faivre, "Rapport sur different procedes de destruction des rats à bord des navires," 363.
53. *Ibid.*, 364.
54. *Ibid.*
55. *Ibid.*
56. *Ibid.* 379.
57. *Ibid.*, 380.
58. *ibid.*, 350.
59. M. E. David and G. Duriau, "État actuel de la désinfection des navires. Carbonisation, sulfuration (procédé Clayton)," *Revue d'hygiène et de police sanitaire* 25 (1903), 502.
60. Sanitary Administration of the Ottoman Empire, "Circular No.180. Instructions Concerning Vessels which Have or Have Not Undergone Disinfection in View of Destroying Rats and Mice on Board" (November 20/December 2, 1901), enclosed in Consul-General Constantinople, "Extermination of Rats, July 6 1909"; NARA RG90 Central File 1897–1923 537–544 Box 065.
61. *Ibid.*
62. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ships, 1899–1903, Franck Clemow to de Bunsen, Constantinople, August 16, 1902."
63. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ships, 1899–1903, Communication faite en Séance du Conseil Superieur de Santé, le 16/29 Juillet 1902, par Monsieur le Délégué d'Angleterre."
64. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ships, 1899–1903, Clemow, Constantinople October 12, 1902."
65. *Ibid.*
66. *Ibid.*
67. S. Balilis, *Contribution à l'étude des mesures sanitaires contre la propagation de la peste* (Constantinople: Impr. A. Zellich fils, 1901).
68. *Ibid.*, 4.
69. *Ibid.*, 5.
70. *Ibid.*, 6.
71. *Ibid.*

72. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ships, 1899–1903, Clemow, Constantinople October 12, 1902."

73. *Ibid.*

74. Such as Apéry's machine, which was already mentioned favourably in Balilis, *Contribution à l'étude des mesures sanitaires*.

Chapter 5

1. Anonymous, "The destruction of rats on ship-board," *The British Medical Journal* 1, no. 2144 (February 1, 1902): 294–295.

2. *Ibid.*, 294.

3. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship; W. S. Power to Sir Provis, 18 June 1903."

4. *Ibid.*

5. *Ibid.*

6. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship, Peter Samson, Report 10/06/1903."

7. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship, E. C. Blech to H. R. O'Connor, July 9 1903"; Dr Duca's appointment to the Quarantine Council to replace the retiring Dr. Cozonnis was the subject of considerable controversy. See Spiridion C. Zavitziano, "Turkey. Report from Constantinople," *Public Health Reports (1896–1970)* 16, no. 12 (March 22, 1901): 602–604.

8. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship, E. C. Blech to H. R. O'Connor, July 9 1903."

9. While not clear in existing archival documents, the reason for the choice of Clemow might have been that he had both previously observed fumigation experiments in Istanbul and expressed doubts about the Clayton process (see chapters 3 and 4), which would render him a reliable observer.

10. National Archives (UK), MH 19/274, "Plague Destruction of Rats on Ship, Frank G. Clemow, Report of Experiment on the steamship 'Westmoreland' to test the efficacy of the 'Clayton' Process, July 30 1903, Handwritten note, 13 August 1903."

11. *Ibid.*

12. *Ibid.*

13. *Ibid.* Clemow attributed the unusual killing of the anthrax spores to them being "an old laboratory culture."

14. Ibid.
15. Ibid.
16. Ibid.
17. Frédéric Borel, *Étude d'hygiène internationale. Choléra et peste dans le pèlerinage musulman, 1860–1903* (Paris: Masson, 1904).
18. Borel (“Séance du 4 septembre”) in *XXII Congrès international d'hygiène et de démographie, Copte rendus du Congrès, Tome VII Première Division—Hygiène, Section VI. Hygiène administrative*. Brussels: P. Weissenbruch, 1903, 129.
19. Ibid.
20. Ibid.
21. Calmette in *ibid.*, 134.
22. Nocht in *ibid.*
23. Nocht in *ibid.*, 117.
24. See chapter 3.
25. Langlois in *ibid.*, 130.
26. Actes officiels, “Destruction des rats à bord des navires provenant de pays contaminés de peste, avant déchargement, décret du 21 septembre 1903,” *Recueil des actes officiels et documents intéressant l'hygiène publique (Travaux du Conseil supérieur d'hygiène publique de France)* 33 (1903): 106–107.
27. S. W. Sturdy, “A co-ordinated whole: The life and work of John Scott Haldane” (Ph.D. Thesis, University of Edinburgh, 1987). <https://www.era.lib.ed.ac.uk/handle/1842/6873>.
28. *Ibid.*, 152.
29. “Reports to the Local Government Board on the Destruction of Rats and Disinfection on Shipboard,” by J. S. Haldane, M.D., F.R.S., and John Wade, D.Sc, I. “Observations of the Clayton process as used at Dunkirk,” by Dr. Haldane, British Library, Indian Office, IOR/R/20/A/2596 File 118/7 Plague: Rat destruction, 2.
30. *Ibid.*
31. *Ibid.*
32. *Ibid.*
33. *Ibid.*, 3.
34. *Ibid.*

35. Ibid.
36. Ibid.
37. Ibid.
38. Ibid.
39. "Reports to the Local Government Board on the Destruction of Rats and Disinfection on Shipboard," by J. S. Haldane, M.D., F.R.S., and John Wade, D.Sc, II. "Experiments on the Clayton process and sulphur dioxide as applied in the destruction of rats and in disinfection," by Dr. Wade, British Library, Indian Office, IOR/R/20/A/2596 File 118/7 Plague: Rat destruction, 3.
40. Ibid., 6.
41. Ibid., 6
42. Ibid., 7.
43. Ibid., 10.
44. Ibid., 13.
45. Ibid., 14.
46. Ibid., 18, emphasis in the original.
47. Ibid., 19
48. Ibid.
49. "Reports to the Local Government Board on the Destruction of Rats and Disinfection on Shipboard," by J. S. Haldane, M.D., F.R.S., and John Wade, D.Sc, III. "Discussion of the process for destruction of rats on shipboard," by Drs. Haldane and Wade, British Library, Indian Office, IOR/R/20/A/2596 File 118/7 Plague: Rat destruction, 27.
50. Ibid.
51. Ministère des Affaires étrangère, *Conférence sanitaire internationale de Paris: 10 octobre-3 décembre 1903, procès-verbaux* (Paris: Impr. Nationale, 1904), 24.
52. Ibid., 25.
53. Ibid., 24.
54. Ibid., 45.
55. Ibid., 94.
56. Ibid., 368.
57. Ibid., 369–370.

58. Ibid.

59. Ibid., 372.

60. Ibid., 374.

61. Ibid., 375.

62. Ibid., 375.

63. Anonymous, "Décret concernant la destruction des rats à bord des navires provenant de pays contaminés de peste (4 mai 1906)," *Bulletin officiel du ministère de l'intérieur* 5 (1906): 261–263.

64. Ibid., 262.

65. Ibid.

66. Ibid.

67. Ibid.

68. For an overview of sequential decrees leading to the 1904 decree, see Barthélemy and Dr. Georges Varenne, *Manuel d'hygiène navale: À l'usage des capitaines, des officiers et des élèves de la marine marchande* (Paris: Challamel, 1907).

69. See, for example, Ruth Rogaski's study of how this international antagonism played out in Chinese treaty ports like Tianjin. Ruth Rogaski, *Hygienic Modernity. Meanings of Health and Disease in Treaty-Port China* (Berkeley, CA: University of California Press, 2004).

70. On Zuschlag's rat-related research, see Emil Zuschlag, *Le rat migratoire et sa destruction rationnelle*, trans. M. Pierre Oesterby (Copenhagen, Impr. F. Bagge, 1903).

71. "US Consul General Copenhagen, January 16, 1909, Extermination of Rats in Denmark," NARA RG90 Central File 1897–1923 537–544 Box 065. The Danish state-organized war against rats may here be compared to the one in colonial Hanoi in 1902, as examined in Michael G. Vann, "Of rats, rice, and race: The great Hanoi rat massacre, an episode in French colonial history," *French Colonial History* 4 (2003): 191–203.

72. See, for example, Dorothy Worell, *The Women's Municipal League of Boston: A History of Thirty Five Years of Civic Endeavor* (Boston: Women's Municipal League of Committees Inc., 1943); Mrs. Albert T. Leatherbee and the Women's Municipal League of Boston, *Plague Conditions in Boston*, 1921. [Pamphlet]; Anonymous, "Elimination of the rat," *Boston Medical and Surgical Journal* 174, no. 2 (October 19, 1916): 576; the said article was the following M. W. Richardson, "The rat and infantile paralysis: A theory," *Boston Medical and Surgical Journal* 175 (September 21, 1916): 397–400. Similar campaigns were frequently organized around a Rat Day or

Rat Week theme across the East Coast. For examples, see NARA RG90 Central File, 1897–1923, 544 Box 066.

73. Branwyn Poleykett, “Building out the rat: Animal intimacies and prophylactic settlement in 1920s South Africa,” *Engagement* (February 7, 2017). <https://aesengagement.wordpress.com/2017/02/07/building-out-the-rat-animal-intimacies-and-prophylactic-settlement-in-1920s-south-africa/>.

74. David E. Lanz, *How to Destroy Rats* (Washington, DC: Government Printing Office, 1909). For example, during the September 1915 plague epizootic in New Orleans, premises from 801 to 845 South Fulton Street were subjected to fumigation with hydrocyanic acid gas; “US Public Health Service to The Surgeon-General, Public Health and Marine-Hospital Service, Washington D.C., February 25 1921, Report on Recent Outbreak of Rodent Plague”; NARA RG90 Central File, 1897–1923, 544 Box 066.

75. Anonymous, “Ship rats and plague,” *Public Health Reports (1896–1970)* 29, no. 16 (April 17, 1914): 927–928.

76. “Consul-General Constantinople, Extermination of Rats, July 6, 1909”; NARA RG90 Central File 1897–1923 537–544 Box 065; “Passed Assistant Surgeon, American Consulate Amoy to Public Health and Marine-Hospital Service” (non-dated); NARA RG90 Central File 1897–1923 537–544 Box 065

77. “Report on Extermination of Rats at Foreign Ports, Trieste, Austria, March 4, 1909”; NARA RG90 Central File 1897–1923 537–544 Box 065.

78. Jaime Larry Benchimol, *Dos micróbios aos mosquitos: Febre amarela e a revolução pasteuriana no Brasil*, (Rio de Janeiro: SciELO—Editora FIOCRUZ, 1999).

79. “Consul General Callao Peru to Assistan Secretary of State, February 4. 1909, Extermination of Rats at Foreign Seaports”; NARA RG90 Central File 1897–1923 537–544 Box 065. However, at the same time, other methods and machines for rat destruction onboard ships included not only innovations in the field of fumigation but also in other deratization technologies, such as trapping and poisoning. Examples include the invention and experimentation with the German-made Ratin, “a pasty substance inoculated with a bacillus” in India (1907) (“Calcutta US Consul-General to the Assistant Secretary of State, May 27 1909, Destruction of Rats”; NARA RG90 Central File 1897–1923 537–544 Box 065). Or indeed the application in Vladivostok of “typhus bacillus in jelly” prepared by the Central Laboratory of Milk Industry in Toms, which was mixed with caustic lime so as to be made into “bread balls” (“US Consul Vladivostok, March 24 1909, Extermination of Rats”; NARA RG90 Central File 1897–1923 537–544 Box 065). The result of the latter method was that having eaten the bait, rats became very thirsty and sought to drink water, which reacted with the lime in its stomach, causing death. The method proved unsatisfactory as it was applicable only in buildings, while rats did not really find the bait so attractive.

80. Sokhieng Au, *Mixed Medicines: Health and Culture in French Colonial Cambodia* (Chicago, IL: The University of Chicago Press, 2011); Christos Lynteris, “Vagabond microbes, leaky labs and epidemic mapping: Alexandre Yersin and the 1898 plague epidemic in Nha Trang,” *Social History of Medicine* (2019), <https://doi.org/10.1093/shm/hkz053>.
81. ANOM, INDO GGI 4416, Appareil Clayton.
82. On blaming Chinese junks as spreaders of plague from China to French Indochina, see Lynteris, “Vagabond microbes, leaky labs and epidemic mapping.”
83. Ibid.
84. Ibid.

Chapter 6

1. As a history pertinent to the peculiar space of urban modernity that developed in Buenos Aires at the turn of the twentieth century, this local case also requires differentiation from the health transformation affecting the nation of Argentina and very different trajectories experienced at the same time in rural communities. See María Silvia Di Liscia, “Del brazo civilizador a la defensa nacional: Políticas sanitarias, atención médica y población rural (Argentina, 1900–1930),” *Historia Caribe* 12, no. 31 (2017): 159–93.
2. Marcos Cueto and Steven Palmer, *Medicine and Public Health in Latin America* (Cambridge: Cambridge University Press, 2014), 13.
3. Diego Armus, “Disease in the historiography of modern Latin America,” in *Disease in the History of Modern Latin America: From Malaria to AIDS*, ed. Diego Armus (Durham, N.C.: Duke University Press, 2003), 13; Marcos Cueto, *The Value of Health: A History of the Pan American Health Organization* (Washington, DC: Pan American Health Organization, 2007).
4. José Amador, *Medicine and Nation Building in the Americas, 1890–1940* (Nashville, TN: Vanderbilt University Press, 2015), 5.
5. J. Guilherme Lacorte, “A atuação de Oswaldo Cruz no aparecimento da peste bubônica no Brasil,” *A Folha Médica* 54 (1967): 183–188.
6. Fernanda Rebelo, “Between the Carlo R. and the Orleannais: Public health and maritime prophylaxis in the description of two cases of ships transporting immigrants arriving in the Port of Rio de Janeiro, 1893–1907,” *História, Ciências, Saúde-Manguinhos* 20, no. 3 (2013), 12.
7. Jaime Larry Benchimol, *Dos micróbios aos mosquitos: Febre amarela e a revolução pasteuriana no Brasil* (Rio de Janeiro: SciELO—Editora FIOCRUZ, 1999), 259ff.

8. Alejandro Kohl, *Higienismo Argentino: Historia de una utopía. La salud en el imaginario colectivo de una época* (Buenos Aires: Editorial Dunken, 2006); Kristin Ruggiero, *Modernity in the Flesh: Medicine, Law, and Society in Turn-of-the-Century Argentina* (Stanford, CA: Stanford University Press, 2004); Norma Isabel Sánchez and Alfredo G. Kohn Loncarica, *La higiene y los higienistas en la Argentina: 1880–1943* (Buenos Aires: Sociedad Científica Argentina, 2007).
9. Anne Hardy, *The Epidemic Streets: Infectious Disease and the Rise of Preventive Medicine, 1856–1900* (Wotton-under-Edge, UK: Clarendon Press, 1993); Diego Armus, “Utopías higienicas/utopías urbanas. Buenos Aires 1920,” in *Utopías urbanas: Geopolíticos del deseo en América Latina*, ed. Gisela Heffes (Frankfurt/Madrid: Verveurt, 2013), 115–130.
10. Graham Mooney, *Intrusive Interventions: Public Health, Domestic Space, and Infectious Disease Surveillance in England, 1840–1914* (Woodbridge, UK: Boydell & Brewer, 2015).
11. Adriana Alvarez, “Resignificando los conceptos de la higiene: El surgimiento de una autoridad sanitaria en el Buenos Aires de los años 80,” *História, Ciências, Saúde-Manguinhos* 6, no. 2 (1999): 293–314; Susana Belmartino, *La atención médica argentina en el siglo XX: Instituciones y procesos* (Buenos Aires: Siglo Veintiuno Editores Argentina, 2005).
12. Alvarez, “Resignificando los conceptos de la higiene,” 299.
13. Many scholars have emphasized that the modernization of Buenos Aires, and especially of the impoverished parts of the capital, saw fear of infection, unhygienic living conditions, and the state of morality addressed as deeply associated issues. See Diego Armus, “El descubrimiento de la enfermedad como problema social,” in *El progreso, la modernización y sus límites (1880–1916)*, ed. Mirta Zaida Lobato (Buenos Aires: Editorial Sudamericana, 2002), 515; Alvarez, “Resignificando los conceptos de la higiene”; Belmartino, *La atención médica argentina en el siglo XX*; Adriana Alvarez and Adrián Carbonetti, *Saberes y prácticas médicas en la Argentina: Un recorrido por historias de vida* (Buenos Aires: EUDEM, 2008); Norma Isabel Sánchez and Alfredo G. Kohn Loncarica, *La higiene y los higienistas en la Argentina: 1880–1943* (Buenos Aires: Sociedad Científica Argentina, 2007); Diego Armus, *The Ailing City: Health, Tuberculosis, and Culture in Buenos Aires, 1870–1950* (Durham, NC: Duke University Press, 2011); Kindon Thomas Meik, “Disease and hygiene in the construction of a nation: The Public sphere, public space, and the private domain in Buenos Aires, 1871–1910” (unpublished PhD thesis, Florida International University, 2011).
14. Luis Agote and A. J. Medina, *La peste bubonique dans la République Argentine et au Paraguay: épidémies de 1899–1900* (Buenos Aires: F. Lajouane, 1901); Myron J. Echenberg, *Plague Ports: The Global Urban Impact of Bubonic Plague, 1894–1901* (New York: New York University Press, 2007).

15. Kohl, *Higienismo Argentino*.
16. *Ibid.*, 45.
17. José Penna, *La administración sanitaria y asistencia pública de la ciudad de Buenos Aires* (Buenos Aires: Imp. G. Kraft, 1910).
18. Kohl, *Higienismo Argentino*, 44.
19. Armus, "El descubrimiento de la enfermedad como problem social."
20. Ruggiero, *Modernity in the Flesh*.
21. Julia Rodríguez, *Civilizing Argentina: Science, Medicine, and the Modern State* (Chapel Hill: University of North Carolina Press, 2006).
22. *Ibid.*, 41.
23. Meik, "Disease and hygiene in the construction of a nation," 25.
24. Alvarez and Carbonetti, *Saberes y prácticas médicas en la Argentina*, 62.
25. Cueto and Palmer, *Medicine and Public Health in Latin America*, 76.
26. Ruggiero, *Modernity in the Flesh*, 90.
27. Rodríguez, *Civilizing Argentina*, 42.
28. *Ibid.*, 183.
29. Ruggiero, *Modernity in the Flesh*, 87ff.
30. Meik, "Disease and hygiene in the construction of a nation," 111.
31. Armus, *The Ailing City*, 119.
32. Armus, "Utopias higienicas," 116.
33. Echenberg, *Plague Ports*, 136.
34. Kohl, *Higienismo Argentino*, 72.
35. Penna, *La administración sanitaria*, 55.
36. *Ibid.*
37. *Ibid.*, 92.
38. *Ibid.*, 94.
39. Michael Worboys, *Spreading Germs: Disease Theories and Medical Practice in Britain, 1865–1900* (Cambridge: Cambridge University Press, 2000).
40. Bruno Latour, *The Pasteurization of France*, trans. Alan Sheridan (Cambridge, MA: Harvard University Press, 1988).

41. Penna, *La administración sanitaria*, 165.
42. *Ibid.*, 95.
43. *Ibid.*
44. Armus, "El descubrimiento de la enfermedad como problema social," 533.
45. Rodríguez, *Civilizing Argentina*, 177ff.
46. Meik, "Disease and hygiene in the construction of a nation," 121.
47. Penna, *La administración sanitaria*, 72. All quotes from Penna in this chapter are the authors' translation.
48. Meik, "Disease and hygiene in the construction of a nation," 121.
49. *Ibid.*
50. Alvarez, "Resignificando los conceptos de la higiene."
51. *Ibid.*
52. Agote and Medina, *La peste bubonique*, 105.
53. Echenberg, *Plague Ports*, 137.
54. Maria Antónia Pires de Almeida, "Epidemics in the news: Health and hygiene in the press in periods of crisis," *Public Understanding of Science* 22, no. 7 (2013): 886–902.
55. Carlos Malbrán, *Apuntes sobre salud pública* (Buenos Aires, 1931).
56. Anonymous, "Otra vez la peste del Paraguay y el Departamento Nacional de Higiene," *La Semana médica* 7, no. 26 (1900): 388.
57. Agote and Medina, *La peste bubonique*, 101.
58. Carlos Malbrán, "La Peste Del Rosario," *La Semana médica* 7, no. 7 (1900): 91–94.
59. Echenberg, *Plague Ports*, 143.
60. Agote and Medina, *La peste bubonique*, 77.
61. Paul-Louis Simond, "La propagation de la peste," *Annales de l'Institut Pasteur* 62 (1898): 80–98.
62. M. Netter, "La peste durante esos ultimos anos. Sintomas—Marcha—Diagnostico," *La Semana médica* 6, no. 46 (1899): 423–428.
63. Diogenes Decoud, "La fiebre bubonica. Mecanismo del contagion," *La Semana médica* 6, no. 46 (1899): 429–30.
64. Agote and Medina, *La peste bubonique*, 211.

65. Ibid., 215.
66. Carlos Malbrán, *Apuntes sobre salud pública*.
67. Ibid., 25ff.
68. Agote and Medina, *La peste bubonique*, 99.
69. José Penna, "Consideraciones sobre la etiología de la peste," *La Semana médica* 8, no. 28 (1901): 420.
70. Penna, *La administración sanitaria*, 150.
71. Ibid., 142.
72. Ibid.
73. Ibid.
74. Meik, "Disease and hygiene in the construction of a nation," 15. Concejo Deliberante Buenos Aires, *Memoria de la Intendencia Municipal de la Ciudad de Buenos Aires correspondiente a 1889, presentada al H. Concejo Deliberante por el Intendente Seeber* (Buenos Aires: Kraft, 1891), 129; Concejo Deliberante Buenos Aires, *Memoria presentada al Concejo Deliberante por el Intendente Municipal Señor Emilio V. Bunge; Año 1895* (Buenos Aires: Kraft, 1896), 60; Concejo Deliberante Buenos Aires, *Memoria de la Intendencia Municipal; Año 1905* (Buenos Aires: Kraft, 1906), 75.
75. Kohl, *Higienismo Argentino*, 73.
76. Penna, *La administración sanitaria*, 159.
77. Ibid., 168.
78. A. Chantemesse, "Rapport sur les expériences de destruction des rats à bord des navires au moyen de l'anhydride sulfureux liquide," in *Recueil des actes officiels et documents intéressant l'hygiène publique travaux du comité consultatif d'hygiène publique*, ed. Ministère de l'Intérieur (Paris, 1905), 191–214; Gabriel Magny, *Rats et peste* (Paris: Bonvalet-Jouve, 1907).
79. Magny, *Rats et peste*, 98ff.
80. There were a number of competing machines in place at the time. A comprehensive comparison of the machines in their functionality, efficiency, and economic values is given by J. Chaine in 1932: J. Chaine, "Raport sur la destruction des rats," *Deuxième Conférence internationale et congrès colonial du rat et de la peste: Paris, 7–12 octobre 1931/documents réunis et publiés par . . . Gabriel Petit*. (Paris: Vigot, 1932), 453–463.
81. Penna, *La administración sanitaria*, 161.
82. Ibid., 168.

83. Ibid., 170.
84. Penna, *La administración sanitaria*, 173–193.
85. Penna, quoted in Kohl, *Higienismo Argentino*, 80.
86. Penna, *La administración sanitaria*, 192.
87. Ibid., 263.
88. Ibid., 265.
89. Ibid., 243.
90. Ministerio de Guerra, Inspeccion General de Sanidad, *Instrucciones sobre profilaxia humana y desinfección para el ejército Argentino* (Buenos Aires: Guillermo Kraft, 1908), 9.
91. Ibid., 49.
92. Pedro Rivero, “Saneamiento de la ciudad Buenos Aires. Deratización,” *La Semana médica* 18, no. 1 (1911), 7.
93. Armus, “El descubrimiento de la enfermedad como problem social,” 535.
94. Penna, *La administración sanitaria*, 119.
95. Amador, *Medicine and Nation Building in the Americas*, 8.
96. Ibid., 7ff.
97. Benchimol, *Dos micróbios aos mosquitos*; J. J. Kinyoun, “The prophylaxis of plague,” *Journal of the American Medical Association* XLII, no. 4 (1904): 232–239.
98. Ministerio del Interior, Departamento Nacional de Higiene (ed.), *Tecnica teórico-práctica de la desinfección* (Buenos Aires: Guillermo Kraft, 1912).
99. Armus, “Utopias higienicas,” 125.

Chapter 7

1. Anonymous, *New York Times* (October 30, 1910), 17.
2. NARA Passport Applications, January 2, 1906–March 31, 1925: 1908–1910, Roll 0095—Certificates: 14530–15430, 01 Oct 1909–27 Oct 1909, No.71, NATURALIZED application 8, 1909 14804, Thomas A. Clayton, American Embassy at Paris.
3. Dawn Day Biehler, *Pests in the City: Flies, Bedbugs, Cockroaches, and Rats* (Washington DC: Washington University Press, 2013).
4. David Lantz, “House rats and mice,” *Farmers’ Bulletin* 896, United States Department of Agriculture, (October 1917), 2. The bulletin was largely a reproduction

of the Farmers' Bulletin 369, but with the addition of the precautionary alarmist preface.

5. Ibid.

6. Richard H. Creel, "The rat: A sanitary menace and an economic burden," *Public Health Reports (1896–1970)* 284, no. 27 (July 4, 1913), 1403.

7. Ibid.

8. Ibid.

9. Isadore Dyer, *The Rat, the Flea, and the Plague* (1912 [offprint]. University of Alabama at Birmingham Archives), 1.

10. Creel, "The Rat," 1406.

11. Dyer, *The Rat, the Flea, and the Plague*, 4.

12. Richard H. Creel, "The rat: Its habits and their relation to antiplague measures," *Public Health Reports (1896–1970)* 28, no. 9 (February 28, 1913): 382–386.

13. "Department of Public Health, Cape Town, Cape of Good Hope, Extermination of Rats: Re, January 28, 1909." NARA RG90 Central File 1897–1923 537–544 Box 065.

14. Hannah Brown and Ann Kelly, "Material proximities and hotspots: toward an anthropology of viral hemorrhagic fevers," *Medical Anthropology Quarterly* 28, no. 2 (2014): 280–303.

15. W. J. Simpson, *A Treatise on Plague; Dealing with the Historical, Epidemiological, Clinical, Therapeutic and Preventive Aspects of the Disease* (Cambridge: Cambridge University Press, 1905), 335.

16. William David Henderson Stevenson, *Preliminary Report on the Killing of Rats and Rat Fleas by Hydrocyanic Acid Gas* (Calcutta: Superintendent Government Printing, India, 1910).

17. Ibid., 1.

18. Ibid., 8.

19. Ibid., 13.

20. C. W. Woodworth, *School of Fumigation, University of California: Held at Pomona, California* (Los Angeles: Braun Corp., 1915), 8.

21. Stevenson, *Preliminary Report on the Killing of Rats and Rat Fleas*, 8.

22. Ibid., 8.

23. Ibid., 5.

24. Stevenson mentioned a test, which had been devised by Captain Dickinson, that indicated the remaining density of hydrocyanic acid gas through colorization of a test paste: the deeper the Prussian blue, the higher the concentration of gas. Stevenson, *Preliminary Report on the Killing of Rats and Rat Fleas*, 12.

25. *Ibid.*

26. "US Public Health and Marine-Hospital Service, Angel Island, Cal. to The Surgeon-General, Public Health and Marine-Hospital Service, Washington D.C., Rat Quarantine report for the week ended June 15, 1912, June 20 1912"; NARA RG90 Central File, 1897–1923, 544 Box 066.

27. *Ibid.*

28. *Ibid.*

29. R. H. von Ezdorf, "The occurrence of plague in Habana and the measures adopted for its control and eradication," *Public Health Reports (1896–1970)* 27, no. 42 (October 18, 1912): 1697–1702.

30. *Ibid.*

31. "US Public Health and Marine-Hospital Service, Office of Medical Officer in Command, New Orleans Quarantine Station, 'Annual Report of "Rat Quarantine,"' Port of New Orleans, for the year ending June 30th 1912"; NARA RG90 Central File, 1897–1923, 544 Box 066.

32. "Health Officer, Port of New York to John A. Dix, Albany N.Y. August 3 1912"; NARA RG90 Central File, 1897–1923, 544 Box 066.

33. *Ibid.*

34. *Ibid.*

35. "US Public Health and Marine-Hospital Service, Office of Medical Officer in Command, New Orleans Quarantine Station to Mr E. Ferrer, The New York & Porto Rico Steamship Company, San Juan, Porto Rico, August 3 1912"; NARA RG90 Central File, 1897–1923, 544 Box 066.

36. *Ibid.*

37. "US Public Health and Marine-Hospital Service, Angel Island, Cal., Rat Quarantine to The Surgeon-General, Public Health and Marine-Hospital Service, Washington D.C., July 30 1912"; NARA RG90 Central File, 1897–1923, 544 Box 066.

38. See, for example, "International Mercantile Marine Company Steamship Department J. H. Thomas to Bureau of P.H and M.hS, July 27 1909 Rel. fumigation of ships for the destruction of rats"; NARA RG90 Central File 1897–1923 537–544 Box 065.

39. "Munson Steamship Line, F. C. Munson to Bureau of P.H and M.hS, Relative to the fumigation of ships for the destruction of rats, July 23 1909"; NARA RG90 Central File 1897–1923 537–544 Box 065.
40. Anonymous, "Ship rats and plague," *Public Health Reports (1896–1970)* 29, no. 16 (April 17, 1914): 927–928.
41. "Red 'D'" Line Steamers, Boulto, Bliss & Dallett to Bureau of P.H and M.hS, Relative to the fumigation of ships for the destruction of rats July 22 1909"; NARA RG90 Central File 1897–1923 537–544 Box 065.
42. Richard H. Creel, "Outbreak and suppression of plague in Porto Rico: An account of the course of the epidemic and the measures employed for its suppression by the United States Public Health Service," *Public Health Reports (1896–1970)* 28, no. 22 (May 30, 1913): 1050–1070.
43. S. B. Grubbs, "Fumigation of vessels from plague-infected ports. Observations with especial reference to the necessity for fumigating crates and similar cargo," *Public Health Reports (1896–1970)* 38, no. 2 (January 12, 1923): 59–63.
44. Richard Campanella, "The battle against bubonic plague: 100 years ago, New Orleans waged war on rats," *The Times Picayune* (May 8, 2014). http://www.nola.com/homegarden/index.ssf/2014/08/one_hundred_years_ago_as_war_b.html.
45. Norman Roberts, "Cyanide fumigation of ships: Method used at New Orleans," *Public Health Reports (1896–1970)* 29, no. 50 (December 11, 1914), 3321.
46. *Ibid.*, 3322.
47. *Ibid.*, 3324.
48. Richard H. Creel, F. M. Faget, and W. D. Wrightson, "Hydrocyanic acid gas: Its practical use as a routine fumigant," *Public Health Reports (1896–1970)* 30, no. 49 (December 3, 1915): 3537–3550.
49. *Ibid.*, 3538.
50. *Ibid.*, 3539.
51. *Ibid.*, 3546.
52. *Ibid.*, 3547.
53. Further technical innovations, including the artificial ventilation (for example, with electric fans), after HCN fumigation would be developed in 1917; see: S. B. Grubbs, "Ventilation after fumigation: Artificial ventilation of ships after fumigation with hydrocyanic acid gas," *Public Health Reports (1896–1970)* 32, no. 42 (October 19, 1917): 1757–1761.
54. Creel et al., "Hydrocyanic acid gas," 3547.

55. Richard H. Creel and French Simpson, "Rodent destruction on ships: A report on the relative efficiency of fumigants as determined by subsequent intensive trapping over a period of one year," *Public Health Reports (1896–1970)* 32, no. 36 (September 7, 1917), 1446.
56. *Ibid.*
57. Edmund Russell, *War and Nature: Fighting Humans and Insects with Chemicals from World War I to Silent Spring* (Cambridge: Cambridge University Press, 2001).
58. L. F. Haber, *The Poisonous Cloud: Chemical Warfare in the First World War* (Oxford: Oxford University Press, 1986), 98.
59. *Ibid.*
60. R. C. Roark, *A Bibliography of Chloropicrin 1848–1932* (Washington, DC: US Department of Agriculture, Miscellaneous Publication No. 176, 1934), 2.
61. Abdul-Magid Fayed, *Le dératisation antipesteuse* (Toulouse, France: Impr. des Artes, 1928).
62. G. Bertrand, "Sur la haute toxicité de la chloropicrine vis-à-vis de certains animaux inférieurs et sur la possibilité d'emploi de cette substance comme parasiticide," *Compte rendu Academie des Sciences* 168 (1919), 742.
63. Paul Secques, *La dératisation par la chloropicrine* (Toulouse, France: Impr. P. Julia, 1937).
64. Roark, *A Bibliography of Chloropicrin 1848–1932*, 2.
65. Indicatively, in Marseilles, the Hygiene Council approved the following: S.I.C. du Midi process, February 1923; The Allienne apparatus, January 1926; Santos apparatus, July 1929; Worms apparatus, July 1928; Edde Process, March 1931; François Rech, *La dératisation à Marseille* (Marseille: Société anonyme du sémaphore de Marseille, 1932.)
66. "C. M. Fauntelroy to the Surgeon General US Public Health Service, Sept. 9 1922"; NARA RG90 Central File, 1897–1923, 544 Box 066.
67. Grubbs, "Fumigation of vessels from plague-infected ports." Lighters themselves were deemed to be of great importance as means of transport of rats from ship to the harbor, and thus needing fumigation; on the implementation of this in Hong Kong, see, for example, "C. M. Fauntelroy to the Surgeon General US Public Health Service, October 12 1922"; NARA RG90 Central File, 1897–1923, 544 Box 066.
68. Grubbs, "Fumigation of vessels from plague-infected ports," 61.
69. *Ibid.*
70. *Ibid.*

71. Grubbs to Surgeon General, February 21 1922 Rat Return & Examination of Same at this Station; NARA RG90.

72. Ibid.

73. Grubbs was reprimanded for making this optional.

74. See Clifford Rush Eskey and V. H. Haas, "Plague in the western part of the United States: infection in rodents, experimental transmission by fleas, and inoculation tests for infection," *Public Health Reports (1896–1970)* 54, no. 32 (August 11, 1939): 1467–1481.

75. John D. Long, "A squirrel destructor: An efficient and economical method of destroying ground squirrels," *Public Health Reports (1896–1970)* 27, no. 39 (1912): 1594–1596.

76. W. Allen Daley, "Deratisation and the International Sanitary Convention of 1926," *Perspectives in Public Health* 49, no. 6 (1928), 355.

77. Colombani and Herminier, "Sur la fumigation des navires à l'aide d'anhydride sulfureux-sulfurique ou d'acide cyanhydrique," in *Première conférence internationale du rat, Paris—Le Havre 16–22 Mai 1928*, ed. Gabriel Petit (Paris: Vigot frères, 1928), 186–189.

78. Discussion, M. le Dr. A. Lutratio, in Ibid.

79. The delegates enjoyed a demonstration of this machine and "Gaz Sanos" on the ship *Texas* of the Compagnie Générale Transatlantique showcasing the extraordinary precision of HCN. René Gissy, "La conférence internationale du rat au Havre," in *Première conférence internationale du rat, Paris—Le Havre 16–22 Mai 1928*, ed. Gabriel Petit (Paris: Vigot frères, 1928), 313–324.

80. Gaston Doumergue, "Le décret du 8 aout 1929, relatif à la dératisation des navires (journal officiel du 14 aout 1929)," in *Première conférence internationale du rat, Paris—Le Havre 16–22 Mai 1928*, ed. Gabriel Petit (Paris: Vigot frères, 1928), 352–353.

81. R. Chamailard, "L'emploi de l'acide cyanhydrique pour la dératisation," in *Deuxième conférence internationale et congrès colonial du rat et de la peste, Paris 7–12 Octobre 1931*, ed. Gabriel Petit (Paris: Vigot frères, 1931), 500–511.

82. To give the example of Marseilles, there the following were approved: Sanos process, May 1926; Autran and Galardi apparatus, March 1927; Zyklon process, March 1929; Galardi process, March 1930; Sansone process, March 1930; Vicent process, March 1930; Edde-Hygroma process, December 1930; Rech, *La dératisation à Marseille*.

83. L. F. Hirst, *The Protection of the Interior of Ceylon from Plague with Special Reference to the Fumigation of Plague-Suspect Imports* (Colombo, Sri Lanka: Municipal Printing Office, 1931).

84. *Ibid.*, 29.
85. W. Glen Liston and S. N. Goré, "The fumigation of ships with Liston's cyanide fumigator," *Journal of Hygiene* 21, no. 3 (May 1923), 200.
86. *Ibid.* Other HCN-based machines like the "Hyproma" followed Liston's invention and were discussed in the Second International Rat Conference; Chamaillard, "L'emploi de l'acide cyanhydrique pour la dératisation."
87. Hirst, "The Protection of the Interior of Ceylon from Plague," 30.
88. *Ibid.*
89. Paul Weindling, "The uses and abuses of biological technologies: Zyklon B and gas disinfestation between the First World War and the Holocaust," *History and Technology* 11, no. 2 (1994): 291–298.
90. *Ibid.*, 294.
91. *Ibid.*, 295.
92. C. V. Akin and G. C. Sherrard, "Fumigation with cyanogen products. Report of experiments conducted with cyanogen products used in the fumigation of vessels for quarantine purposes at the New York Quarantine Station, Rosebank, Staten Island, N.Y.," *Public Health Weekly Reports (1896–1970)* 43, no. 41 (October, 12 1928): 2643–2670.
93. *Ibid.*, 2669.
94. *Ibid.*, 2670.
95. Chamaillard, "L'emploi de l'acide cyanhydrique."
96. C. L. Williams, "The air jet hydrocyanic acid sprayer," *Public Health Reports (1896–1970)* 46, no. 30 (July 24, 1931), 1755.
97. On extensive studies of rat harborages and how rats escape fumigation, conducted in New York Quarantine Station. see C. L. Williams, "Notes on the fumigation of vessels. Preliminary inspection, how rats escape, increased periods of exposure, and other miscellaneous notes," *Public Health Reports (1896–1970)* 46, no. 50 (December 11, 1931): 2973–2980.
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99. J. R. Ridlon, "Some aspects of ship fumigation," *Public Health Reports (1896–1970)* 46, no. 27 (July 3, 1931), 1572.
100. Williams, "The air jet hydrocyanic acid sprayer," 1751.

