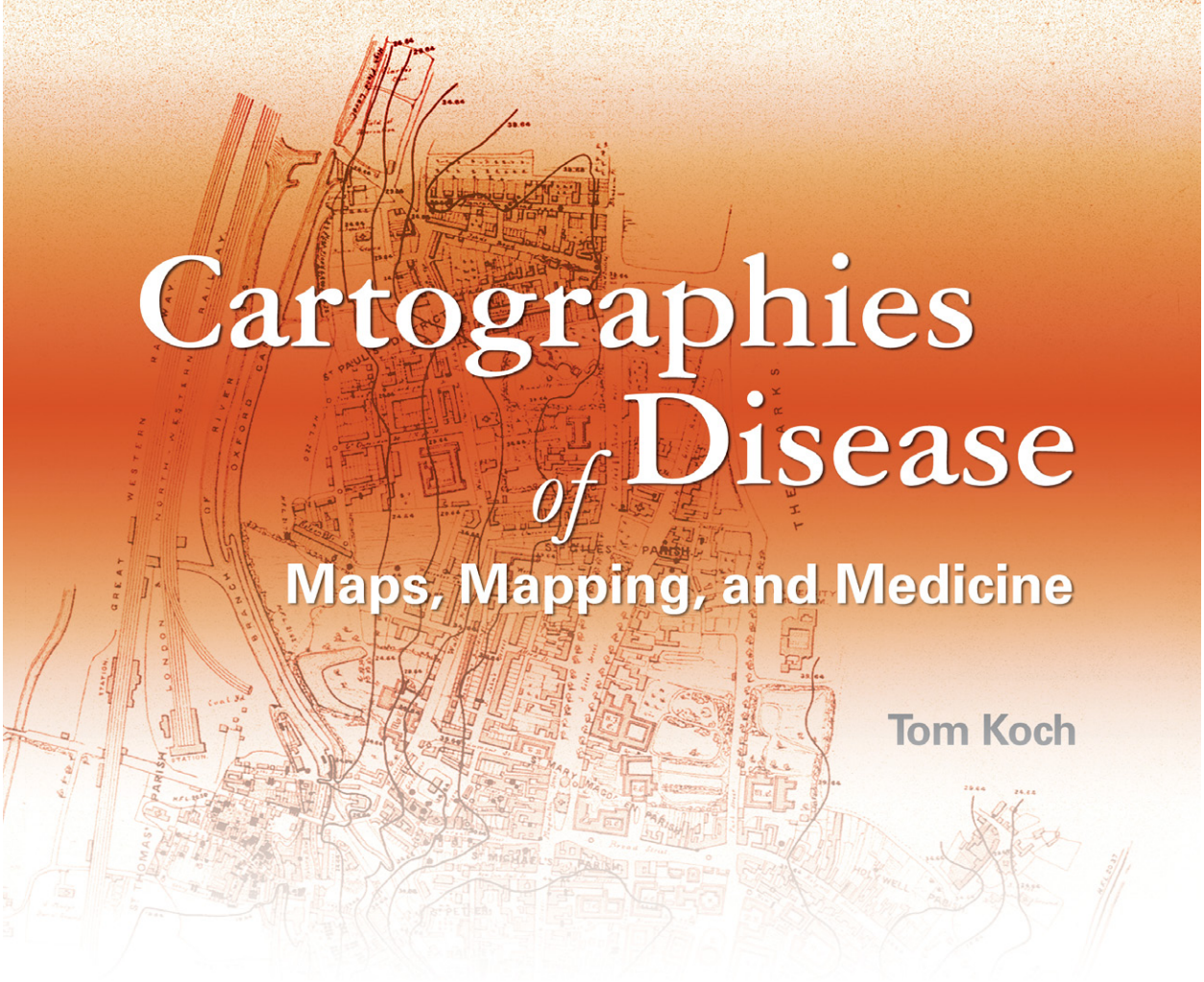


Excerpted from pages 15-19 of *Cartographies of Disease* by Tom Koch, ESRI Press.

## Epidemic disease

We are all double agents in the war against disease, encouraging its propagation while simultaneously fighting its diffusion. The communities we build, the technologies that enable them to function, and the commerce that sustains them assure environments favorable to the advance of our microbial friends and sometimes enemies. In a real way, medical science plays catch-up with the health problems we create in our evolving society; its advances are a response to the diseases we foster through economic, environmental, and social choices. It is no accident that medical mapping blossomed in the nineteenth century during a period of vastly increasing international trade and emigration, or that its renaissance began in the 1990s during a new era of globalization. In the early-to-mid-nineteenth and late twentieth centuries, similar elements coalesced to advance simultaneously a range of epidemic and chronic diseases as well as the mechanisms by which they might be understood. Medical mapping was a part of that process of understanding.

It is not simply that "multitudes of bacteria and viruses occupy our skin, our mucus membranes and our intestinal tracks, and we must learn to live with them in a 'truce' rather than victory" (Lederberg 2003, 20). That is true but insufficient. More centrally, new viruses and bacteria find our bodies habitable because of the lives we lead in cultures whose physical conditions are favorable to their generation, development, and diffusion. "Rarely, if ever, do emerging infections appear without reason" (Morse 1999, 39). What Morse calls the "microbial traffic" by which infectious agents transmit disease from animals to humans, or disseminate it into new populations, is well understood (McNeill 1976). These include a population density sufficient to support their growth, travel vectors permitting the agent to move to new populations, and environmental factors in those population areas that create a hospitable environment for microbial evolution.

"Travel and trade set the stage for mixing diverse genetic pools at rates and in combinations previously unknown" (Wilson 1999). In the late twentieth century, massive emigration and immigration fueled urbanization worldwide during a period of self-consciously intense globalization. Both goods and the people employed to create them traveled internationally at an ever-increasing rate. That exchange of goods and people contributed to a context that encouraged the evolution of a range of diseases for which human environments served as hospitable reservoirs.[1] It is no accident that "since the 1970s, there have been thirty-plus new diseases that have emerged. We also have old diseases that are reappearing where they've been eliminated, or appearing where they've never been before" (Dotto 2003, F7).

Something very similar occurred in the late eighteenth through the mid-nineteenth centuries. Massive migration by agricultural workers to the industrializing city and emigration from industrialized Europe (and later Asia) to the developing New World created an environment that favored the emergence and diffusion of a range of infectious diseases: cholera, syphilis, tuberculosis, typhoid, yellow fever, and others. In what is today called the "Great Migration," more than five million people moved from Europe to the Americas (Guillet 1963). In 1832 alone, decades before the migration peaked, more than fifty thousand emigrants—the majority from Great Britain—crossed the Atlantic to Canada and the United States (Hansen 1961).

It was, in Robert Boyd's memorable title, *The Coming of the Spirit of Pestilence* (Boyd 1999), that expanded the range of then local diseases to a global field of exchange. It was not simply that some ships traveled with people infected with a disease before they left their homeport for another. That happened, and when it did the results for passengers on those vessels were disastrous. As important, however, is the fact that nineteenth-century ships sailed with a cohort of fellow travelers—rats and insects—agents of a host of bacterial and parasitic diseases. Rodents, insects, and mites all found a

Greater and greater numbers of minimally paid workers poured into ever-more densely settled cities to operate the machines and staff the myriad jobs that made the cities work. There, emerging industrial centers typically bereft of even minimal standards of sanitation, protected water supplies, or adequate systems of sewage disposal assured that diseases that might otherwise have died for want of a hospitable environment would flourish. In this way, endemic diseases previously rooted in specific local communities became epidemic and sometimes pandemic.

The history of disease is one in which specific, environmental conditions give rise to reservoirs of evolving bacteria and viruses that diffuse along vectors of animal and human migration. Those reservoirs are typically urban, the unhealthy city where sufficient populations exist to permit a disease to first develop and from which it can then

spread. This is an old story, one older than the maps in this volume, a tale as old as human settlement itself. Porter takes "the era of epidemics" back to 3000 B.C. and its populated cities (Babylon, for example) that rose in Mesopotamia and Egypt, in the Indus Valley, and in China in the valley of the Yangtze, the Yellow River. "Such settlements often maintained huge cattle herds, from which lethal pathogens, including smallpox, spread to humans, while originally zoognostic conditions—diptheria, influenza, chicken-pox, mumps—and other illnesses also had a devastating impact" (Porter, R. 1998, 22).

To take a single example, influenza is believed to have originated among domesticated fowl in China, mutating no later than 1600 B.C. into a strain that affected humans (Lewis 2004). The virus jumped from poultry to humans living in cities—China was the most urbanized nation of that age—and spread from there throughout the world. By 412 B.C. the disease was in the Mediterranean where Hippocrates described an epidemic outbreak. Influenza then slowly diffused with travelers along trade routes to lodge in other cities and towns where the population was sufficient to sustain it as an endemic disease. Over time it has evolved as our civilizations have matured, adapting to the environments we create.

From the start, cities meant density—of humans and the commingled animal species that sustain us—conditions ripe for the evolution of bacteria and viruses whose effect on humankind (and sometimes, animals, as well) could be disastrous. Human trade and travel—to the market, to the Crusades, or simply to another village—were the vectors by which the bacteria and viruses were transported to new populations. In the earliest histories, the diffusion of disease was limited by the paucity of environments sufficiently large to serve as reservoirs, breeding grounds. As city sizes increased, and travel linked them, new opportunities for evolving diseases emerged.

The ate of infection and re-infection for plague in the Middle Ages, for example, was directly proportional to the size of a village or town's population: "Plague could maintain itself in towns but not to any extent in villages unless they were large" (Twigg 1984, 187). The shift from village to town and town to city in the nineteenth century assured that diseases that earlier would have occurred only sporadically, or been locally endemic, became epidemic, and in some cases, pandemic. Trade and migration that tied together the commerce of nations, were the vehicles that carried diseases between communities either by sea in sailing ships or over land by horse and horse-drawn carriage.