

VISUAL PLAGUE

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THE EMERGENCE OF EPIDEMIC PHOTOGRAPHY

CHRISTOS LYNTERIS

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For Voula

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THE GLOBAL WAR AGAINST THE RAT

It is almost impossible to find a plague-related news item today that is not accompanied by an image of a rat. The best-known carriers of zoonotic diseases, rats are so closely identified with plague that research articles about the role of other mammals in the spread or maintenance of the disease are met with enthusiasm in the media—and in some cases mistakenly hailed as exonerating rats from the spread of plague.¹ This tautology between rat and plague is articulated in a context of framing an expanding range of non-human animals as hosts or vectors of infectious diseases such as influenza, Ebola, severe acute respiratory syndrome (SARS), and COVID-19.²

Identified for the first time in the 1870s and known as zoonoses (from the Greek *zoon*, for animal, and *nosos*, for disease), diseases that spread from animals to humans have formed a particular source of human anxiety since the rise of the emerging infectious diseases framework in the early 1990s.³ This has come to understand viral spillovers (i.e., interspecies jumps between nonhuman animals to humans) as potential sources of a future global catastrophic pandemic among what would presumably be a “virgin,” nonimmune human population. Historians and anthropologists have dedicated much effort to elucidate and deconstruct the philosophical, epistemological, and biopolitical premises behind this pandemic imaginary, which has transformed animal-human contact into a perilous zone of interaction that could even lead to human extinction.⁴ In this imaginary, the rat plays a backstage role as an ancient foe that, while posing no direct existential risk to humanity, reminds us of the devastation brought about when zoonotic hosts are not scientifically understood and controlled.

The current status of rats should not, however, obscure their historical importance in the emergence of the image of nonhuman animals as epidemic villains and in the rise and dissemination of the notion of the pandemic. Contrary to popular perceptions, before the end of the nineteenth century rats were not believed to be carriers or spreaders of plague or any

other infectious disease.⁵ If rats had long been considered to be “vermin” damaging to property and consuming or spoiling food resources, their only redeeming characteristic was widely believed to be their supposed disease-free nature.⁶ Hence while mid-seventeenth-century plague treatises noted the rat’s destructive impact on clothing and food, no mention of its connection with the disease was made.⁷

Two hundred years later, when in the 1840s British colonial officers in India observed that at the first sight of rat epizootics Garhwali villagers fled to the Himalayan foothills in fear of the “Mahamari” disease, they first dismissed this behavior as superstitious and then deduced that rats, like humans in the region, succumbed to excessively “vitiating” air.⁸ Indeed, the rat was considered to be uniquely able “to ‘clean’ and preserve itself from contamination by the filth and miasma of the sewer.”⁹ Neil Pember-ton notes that, “rather than being correlated with plague, the sewer rat’s appetite for putrefying matter saved human inhabitants from ‘periodical plagues,’ which [James] Rodwell insisted were the ‘result of deadly gases arising out of the putrefaction of animal and vegetable matter.’”¹⁰ Until the final decade of the nineteenth century, in Euro-American and colonial contexts the rat problem was seen not as a source of infection but as an issue of food destruction and of boundaries and their transgression, including the unwarranted nocturnal wonderings of the rat into private and familial spaces and its “invasive,” transnational character.

Scientists only began to study the rat’s ability to carry and spread diseases after the inaugural outbreak of the third plague pandemic in Hong Kong (1894).¹¹ Tacitly mentioned by the discoverer of the plague bacillus, Alexandre Yersin, the potential role of the rat first acquired a central place in epidemiological frameworks of plague in British India.¹² This marked the start of a biopolitical and epistemological transformation of the rat from “vermin” to “host/vector” and, at the same time, from a nuisance to modern history’s paradigmatic epidemic villain. Rather than being a sudden revelation, the transformation of the rat into Public Enemy No. 1 was mediated by intense scientific debate and was facilitated by the rat presenting itself as a quantifiable and universally recognizable object of hygienic intervention.¹³

Over the first half of the twentieth century, an extraordinary effort to study and control rats and their contact with humans was undertaken on a global scale—what the English rat-expert Boetler called “a world’s war

against the rat.”¹⁴ This was a goal that was conceivable only within a pandemic framework and in turn further fostered the idea of the pandemic as a scientifically knowable and actionable threat to humanity. Combining techniques and technologies of epidemic control derived from a number of medical and sanitary traditions and backed by relevant laws and decrees, the global war against the rat focused on its eradication and isolation from humans.¹⁵

This was an effort not confined to cities or ports but also employed in the trenches of World War I and in rural areas where rats spread disease not only to humans but, as epidemiologists were terrified to discover, also to wild rodents, which were in turn transformed into long-term endemic disease reservoirs.¹⁶ Responding to this public-health menace and to the economic losses caused by rats as a result of food destruction (marking a damage of \$200 million in 1917 for the United States alone) as well as by halting trade as a result of quarantines, anti-rat operations rapidly spread across the globe.¹⁷

Often assuming the form of public health “campaigns,” the global war against the rat involved rat-proofing buildings and infrastructures, rat destruction by means of predators, poisons, viruses, and chemical gases, and the deployment of professional and civic bodies of rat-catchers.¹⁸ These operations assumed different guises in different colonial and metropolitan contexts, becoming entangled with class and racial narratives as well as with imperial, national, and local political and economic agendas.¹⁹

Central to scientific studies of rats and public health measures against them were questions regarding the way in which rats harbor and transmit diseases. Most important were questions about the link between disease epidemics among rats (epizootics) and human illness, including the extent to which rats functioned as disease reservoirs and how the migratory or “invasive” behavior of different rat species (especially *Rattus rattus* and *Rattus norvegicus*) impacted the spread of diseases. These questions were developed and debated in hundreds of scientific publications and numerous conferences, including the International Sanitary Conventions between 1903 and 1938, two international conferences on the rat (1928 and 1931), and through on-the-ground experience in the course of practical processes of rat control.²⁰ Investing on long-standing understandings of the interaction between rats and humans but also unsettling these through new medical and epidemiological frameworks of infection, these questions fostered extensive international exchange on the scientific and public health aspects of what the leading Pasteurian Albert Calmette called the “global scourge” of the rat.²¹

Collaboration and antagonism on the subject were developed within and across nations, empires, and scientific schools.²²

THE PHOTOGRAPHIC RAT

The photographic lens was extensively employed in capturing the scientific study of the rat as a zoonotic host and its control as part of the global struggle against the third plague pandemic. These photographs had various purposes: to document the study of the animal, to demonstrate plague-related rat pathology, to identify and record the habitus and nesting environment of different rat species, including structures that allowed and encouraged rat harborage or functioned as entry points for rats into human space, and to record, glorify, encourage, and instruct rat-catching, rat-proofing, and other rat-control practices.

In this chapter I argue that rather than simply *recording* the rat as a disease vector, photography helped institute the particular animal as a global pandemic infrastructure: a species that, spanning the entire globe and connecting remote points on it via maritime travel and trade, both spread and maintained plague not just as an infectious disease but also *as a pandemic*.²³ Rendering the rat not simply into a host or vector of plague but into the culprit of plague pandemics—past, present, and future—gave the particular animal a unique world-historical agency, unprecedented by any other nonhuman animal. While photography did not of course do all this single-handedly, the way in which it visualized rats and the global war against them created a visual field that was indispensable for transforming the rat into a pandemic villain and an epistemic thing that continued to unsettle understandings of how plague was spread and maintained throughout the course of the third pandemic.

The photography of rats during the third plague pandemic revolved around two main subjects: the scientific study of the rat and the control of the animal. Underlying these was a new sanitary hope and confidence that, following scientific principles and methods, diseases transmissible from animals to humans (zoonoses) could be halted by separating one from the other and by mediating the contact between them.²⁴ This hygienic-utopian vision saw the liberation of humanity from zoonotic diseases as based on a universal breaking of the so-called chains of infection; a separation and at the same time unshackling of humans from animals through the application of the

fumigation gases, dichlorodiphenyltrichloroethane (DDT), rat-proofing, and other technologies or techniques. These were methods that were believed to be able to isolate pathogens in their natural reservoirs, which were collectively defined as the animal realm: “As an epidemic disease in man plague is almost a direct expression of man’s inability to dissociate himself from his lowly neighbors.”²⁵

THE RAT IN THE LAB

The identification by Paul-Louis Simond of the rat and its flea as the source of human plague in 1898 is today hailed as an important breakthrough in the epidemiology of infectious diseases.²⁶ And yet the acceptance of the importance of this discovery was much slower and more reluctant than the usual story of the “bacteriological revolution” may suggest.²⁷ The first images relating rats to plague come from late-nineteenth-century British India, but rather than being laboratory photographs these are images of rat-catchers employed by various plague committees.²⁸ In turn, by 1905 images of rat examination in laboratories had become a recurrent motif of plague photography across the globe. Photographs of the scientific study of rats as plague hosts visually integrated the rat with symptoms of the disease among humans or with images of the bacterium and of the flea, creating composite panoramas of plague for lectures, publications, and education purposes.²⁹

Part of this medical presentation of plague was the visual image of the dissected rat, a common theme across scientific literature in the context of the third plague pandemic.³⁰ In some cases, rat-dissection photographs served as a method for visual comparison between plague-infected and non-plague-infected rats. Two photographs would be printed next to each other in a trope common to pathological visualization.³¹ The goal of this visual comparison was to demonstrate plague pathology in the animal and help laboratory researchers in identifying plague-infected rats. Figure 4.1 is an example of this, a colorized photograph published by the Indian Plague Research Commission in 1907 that shows a dissected healthy rat next to a dissected plague-infected rat with a caption noting the differences resulting from plague pathology.³²

Other photographs also focused more directly on the plague pathology of rat organs.³³ In some cases, the portrayal of externally visible buboes, the iconic plague symptom, on captured or killed rats (in fact a rarely visually

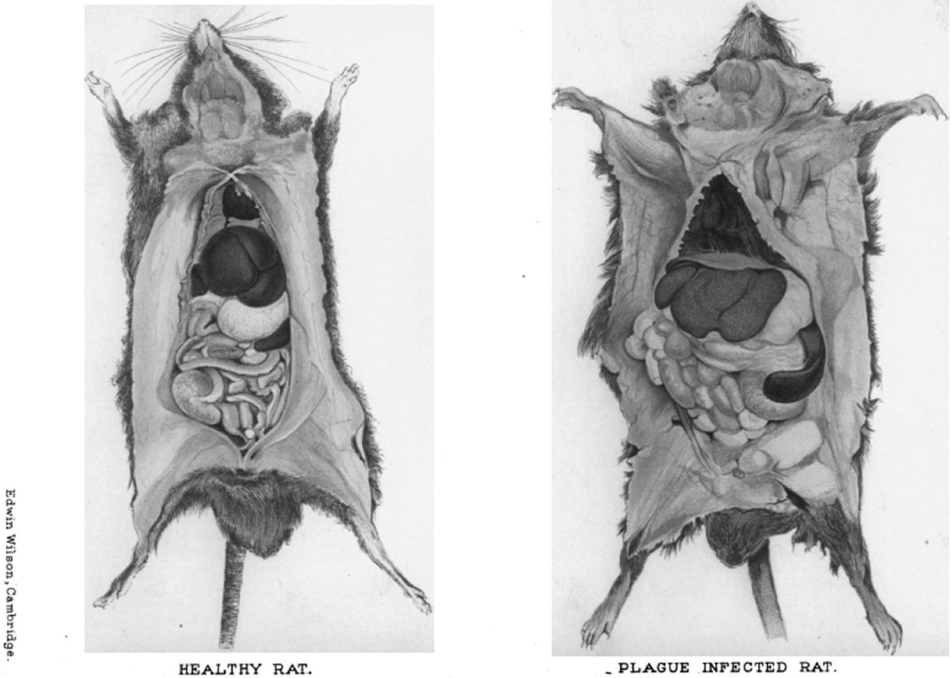


Figure 4.1
Healthy Rat—Plague Infected Rat, illustration by Edwin Wilson. Courtesy of Cambridge University Press.

perceptible symptom on the animal) was also used to underline the continuity with the human disease.³⁴

Rat dissections took mass proportions in British India, necessitating intensive and “tedious” labor in and outside laboratories—something recorded in detail not only in India but in other locations affected by the disease including the United States.³⁵ In this strictly scientific context, rat photography worked as a visual technology in combination with other visual means of determining the relation between plague in rats and plague in humans. These included two principal means of visualization: diagrams and maps.

Diagrams were used, first, to visualize the rat-to-human chain of infection and, second, to show that human epidemics followed rat epizootics. In the first case, diagrams involved the depiction of the spread of the bacillus from rats to humans via fleas, initially in a linear and progressively in more complex ways that also involved other species as hosts and vectors

of the disease. The simpler, earlier diagrams positioned drawings or photographs of the three protagonists (rat, flea, human), sometimes also including microphotographic images of the bacillus, in left-to-right or bottom-to-top sequence, which aimed to show the progression of the bacillus along the transmission pathway.³⁶ As more elaborate models of disease ecology developed, by the 1940s these diagrams were gradually replaced by ones utilizing what I have identified elsewhere as “zoonotic cycles”: diagrams showing the enzootic and epizootic phases of plague transmission and maintenance and their connecting infection “bridges” leading from wild rodents to humans via rats.³⁷ In linear and cyclical diagrams alike, arrows were frequently used to portray transmission and to indicate the interruptibility of the latter were one to use the appropriate, scientific means of rat control.

In the second case, a diagrammatic form used widely at the time employed both linear and cyclical graphs to visualize the correlation between rat epizootics and human epidemics of plague. These showed how plague-derived mortality in humans followed, usually with a short interval, an almost identical curve of rat cases.³⁸ What differentiated these diagrams from the ones discussed previously was that they were supposed to constitute actual proof of rat-to-human infection and of rat epizootics as reliable predictors of human epidemics, something highly contested at the time.

In turn, maps were used as investigative and apodictic tools for epizootic-epidemic correlation. Maps charted human and rat cases on the map of a plague-stricken city like Hong Kong or Bombay, with the use of dots replicating the visual proof method that is today popularly associated with John Snow’s famous cholera map of Soho, London: correlation by proximity.³⁹ Maps were also used to chart the movement of rats in urban space. Using techniques of catching, marking, releasing, and recapturing rats, scientists were able to demonstrate the animal’s living range—a much-contested scientific datum of great importance as it also indicated the range of infectivity by a single plague-carrying rat in a given urban structure.⁴⁰

Like photographs, such maps were not simply statements of “what has been” but part of complex experimental systems regarding the interrelation between plague and the urban environment based on the configuration of the rat as an epistemic thing. They depicted a zone of what, following Hans-Jörg Rheinberger, we may call “unspecified ignorance” where *not precisely knowing what one does not know* about the particular animal and its relation to plague formed the bases of its “operational potential.”⁴¹ Rather than necessarily

(re)producing some sort of epistemic or operational stability, rat cartographies were dynamic systems that challenged, destabilized, and provoked new conceptualizations of the relation between rats, plague, and the city.⁴²

Yet not all visual representations of the scientific study of the rat were meant to carry an epistemic value or to demonstrate the zoonotic mode of transmission of plague. A large number of laboratory rat photographs from Argentina to New Orleans and from Kumasi to Honolulu were instead aimed at depicting scientific labor and scientific modernity, thus instituting the promise of a disease-free future. Take for example the photograph in Figure 4.2, included in the San Francisco Citizens' Health Committee publication already examined in chapter 2, which depicts research on rats in the laboratory of Rupert Blue, the Passed Assistant Surgeon responsible for stamping out plague from the Californian city in 1907.⁴³

Captioned "The Only Good Rat Is a Dead Rat," the photograph shows six men working on rat examination around a laboratory bench. The rats have been tacked on a wooden plank known as a shingle, a technique adopted across the globe, with a label explaining when and where they were captured so that any infected rats could be mapped accordingly. The photograph's caption maintained that over 150,000 rats had been examined in the particular laboratory and that the laboratory workers had become so skilled that they processed up to 500 rats per day per person. The image was part of a large set of photographs included in the publication, which portrayed integrated efforts to rid San Francisco of plague: rat-catching, rat-poisoning, rat-proofing but also disinfection, demolition, and limewashing (see chapter 2).

The opening photograph of this publication is a long landscape bird's-eye view of the city that highlighted its postearthquake skyscrapers and bore the following long caption: "The new San Francisco. One of the healthiest cities of the world. The mortality from contagious diseases for the year 1908 was less than two per thousand of population."⁴⁴ Seen as a prelude to and condition for this sanitary utopia, the photograph of the laboratory where rats were examined by Blue's team partakes in a narrative about a historical rupture that supposedly transformed San Francisco from a city riddled by infectious diseases and, at the same time, from a city suspicious of and hostile to bacteriology into a model of epidemic control and hygiene.⁴⁵

Long gone, the photographs seem to declaim, were the days when San Francisco was the entry point of diseases from the East into the American



THE ONLY GOOD RAT IS A DEAD RAT

Interior Ratatorium. Passed Assistant Surgeon Rupert Blue's headquarters. Here the captured rodents were tacked to shingles, the label showing when, where and by whom caught recorded, the shingle given a number, and then dipped in the antiseptic solution in the white pan. The rats were then opened and prepared for examination by the bacteriologist and pathologist. On the plain, lead-topped tables shown over 150,000 rats have been examined. The men employed in this work reached such a state of skill that it was no uncommon thing for them to prepare for examination 500 rats a day each. Note the sticky fly paper on the wall to capture flies which might be the means of transferring the infection.

Figure 4.2

"The Only Good Rat Is a Dead Rat." Courtesy of San Francisco History Center, San Francisco Public Library.

Pacific states. Also gone, it declared, were the days of scientific ignorance, when prominent sectors of the city had united to ridicule, scapegoat, and expel the harbinger of a bacteriological explanation and solution to its plague problem, Dr. J. J. Kinyoun.⁴⁶ In this context, the photograph of Blue's rat-examination laboratory signaled an epistemological as well as political triumph over the city's insalubrious status and its inhabitants' alleged antisience bias.

At the same time, because the third plague pandemic was a theater not only for scientific discovery and reform but also of colonial, national, and imperial competition for an image of scientific competence, rat-examination photographs could be put to use in more agonistic ways. Photographs could be deployed so as to criticize the scientific status of rival players or to self-criticize the anti-plague operations of one's own country and demand reform. In such cases, photographs of the laboratory examination of rats could be extracted from their original context and be recombined in such a way so as to provide a narrative of scientific modernization or the need for it.

In October 1908, the *Illustrated London News* published a short article accompanied by two pages of photographs praising the "Arrest of Plague in Japan."⁴⁷ Japan had been visited by plague since 1899 when Kobe was struck by the disease which then spread to Osaka and other cities. Several outbreaks followed in 1902, 1903, and 1905–1906, among other places in Tokyo and Yokohama. Japan enjoyed a unique advantage as regards the fight against the disease because it was the home of Dr. Kitasato Shibasaburō, who in 1894 had been the first to identify the plague bacillus in Hong Kong. Whereas this identification was subsequently challenged by Yersin, Kitasato continued to be recognized by many as the true discoverer of the bacillus; in Japan itself, he held a position of unsurpassed authority regarding plague-related matters.⁴⁸ In spite of having faced intense antagonism from Yersin in Hong Kong, Kitasato was an avid supporter of the rat–flea model, which by 1908 had been dissociated from the strict confines of Pasteurianism through the work of British doctors in India, Australia, and Hong Kong.⁴⁹

The *Illustrated London News* article presented plague-control in Kobe as a paragon of efficiency led by scientific principles and liberal economic incentives. Not only did people delivering the carcass of a rat receive 5 sen per dead animal, but they also entered a lottery with a prize of 600 yen.⁵⁰ The article underlined the need to combine anti-rat methods (poisoning, catching, and proofing) with the claim that between 1900 and 1906 4,820,000 rats had been killed in Tokyo alone. The key message of the text and the photographs accompanying it was the industry and professionalism of the Japanese plague-control force: "the thoroughness and care with which the inspection is carried on is evinced by the fact that over a hundred thousand rats may be dissected without finding a trace of infection, yet vigilance is never relaxed.

Never for one instant do the surgeons forget that the very next one may contain microbes enough to depopulate the largest city.”⁵¹

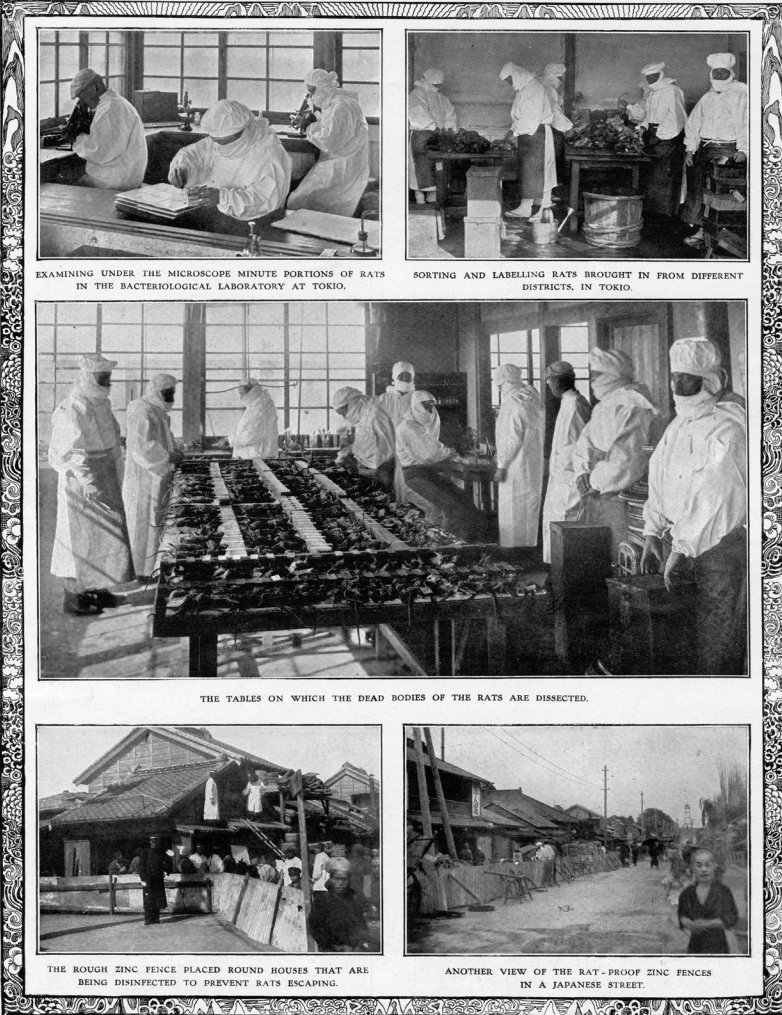
With a heading aimed at castigating the lack of similarly scientifically led procedures in British India, the article showcased the “remarkable precautions taken against the plague in Japan”: “An Example to India: Exterminating the Microbe-Carrying Rat.”⁵² The page carried five photographs (figure 4.3) positioned so that a large photograph in the middle was placed between four smaller ones (two at the top and two at the bottom of the page), with the composition being surrounded by what was probably aimed to be an oriental-looking strip. The main photograph bore the caption “the tables on which the dead bodies of the rats are dissected” and showed in high resolution nine laboratory workers at the Bacteriological Laboratory of the Tokyo Metropolitan Police Board. All of them, with the exception of one, wore personal protection uniforms and headgear that could fold back to cover their mouths and noses while engaged in rat dissection, thus providing a compelling spectacle of medical modernity.

The men were positioned around a large table where we can see, row after row, a large number of dissected rats. They are pictured in the process of dissection, while one is seen working on a microscope. The two images above the central photograph are also of the laboratory, with the right image depicting the “sorting and labelling of rats brought in from different districts in Tokio [*sic*],” and the left image depicting the examination of the rats under the microscope. Two laboratory workers, one in white personal protective equipment and the other wearing a white uniform and jockey hat, are captured looking into microscopes, while a third man is seen preparing petri dishes. The two photographs on the lower end of the page are, by contrast, images of rat-proofing, placing emphasis on the use of zinc fences for surrounding houses undergoing deratization, a term used for rat extermination at the time.

By combining the image of the laboratory and the street, the composition achieved something unintended in the original photographs, which had been taken by Gertrude M. Williams and published in the *Philippine Journal of Science* as illustrations of Kitasato’s paper “Combating Plague in Japan” two years earlier.⁵³ There, the laboratory and the rat-proofing photographs formed part of a larger plates sequence (in total nineteen photographs) that aimed to capture the full visual field of the outbreak: house and warehouse

THE ILLUSTRATED LONDON NEWS, Oct. 3, 1908.—478

AN EXAMPLE TO INDIA: EXTERMINATING THE MICROBE-CARRYING RAT.
REMARKABLE PRECAUTIONS TAKEN AGAINST THE PLAGUE IN JAPAN.



In addition to organizing the compulsory house-cleaning mentioned on our other page dealing with this subject, Japan is waging war against the rat, realizing that it is a great carrier of microbes. Directly this war was decided upon, the price of five sen (about 11d.) was placed on the head of the rat, the whole of which had to be delivered to the authorities. It was also arranged that each man or woman who brought in a rat should receive a numbered ticket which might entitle the holder to a large prize in a special lottery. At the same time it was decided to supply rat-poison gratis; to exterminate every rat found while houses, warehouses, and shops were being cleaned; and to dig any hole that might be found in drains. The zinc fences illustrated are embedded in the ground so that the rats cannot dig their way beneath them, and get away.—(PHOTOGRAPHS BY CHRISTINE M. WILLIAMS.)

(See Article on another Page.)

Figure 4.3
“An Example to India: Exterminating the Microbe-Carrying Rat.” © Illustrated London News Ltd/Mary Evans.

fumigation, contact isolation, rat-proofing, laboratory examination, and four clinical photographs of buboes in victims of the disease. By selecting and recomposing the five previously discussed photographs on a single page, the *Illustrated London News* article accentuated the affinities between the laboratory and the street as a continuity of scientifically led anti-plague work focused on the rat as the true host and spreader of the disease.⁵⁴

Rhyming with later photographs of laboratory research with rats that we are all so familiar with, these rat-research photographs created a narrative about scientific superiority. In this case, the supposed superiority was that of Japan, which since its victorious war against Russia in Manchuria (1905) had been portrayed in the British press as an exception in the accepted world order: an Asian country able to compete with and surpass European ones and thus accepted as an “honorary civilized nation.”⁵⁵ In the *Illustrated London News* article, Japan, unlike British India, was shown as capable and eager to incorporate scientific principles and methods in plague control, setting it as an international example.

Achieved by way of praising what in colonial terms “should have been” a scientifically inferior country, the visual shaming of Britain’s scientific standards in anti-plague work in India in the nation’s most popular illustrated weekly is indicative of the polemic potential of epidemic photography. It shows us how photography was used to establish comparisons in public health efficiency, to illustrate best practice, and to declaim the need for science-led approaches to epidemic control. At the same time, this example shows how photography was used to foster the idea of the pandemic not simply as an event of global infection but also as a field of international competition, where the combination of scientific plague research on rats and scientifically led rat control were raised to a global golden standard that imperatively connected all countries and empires.

RAT-CATCHING

Outside the laboratory, in the first two decades of the twentieth century rat-catching became a prolific field of epidemic photography. Rat-catching was not a phenomenon initially connected with epidemic control. In fact, it was a practice with deep historical roots which in the course of the nineteenth century had come to involve ferrets, dogs, and cats as well as skilled rat-catchers in what Neil Pemberton has called a “multi-species labour of

rat-catching.”⁵⁶ In England, which forms the focus of most histories of this practice, rat-catching involved public spectacles of “ratting”: a blood sport involving specially constructed “rat-pits” that “dramatized the hunting zone at the moment of flushing, but also adapted the spectacle to the temporal order and rhythms of industrial time and production: bets were placed on the ability of different dogs to kill the largest numbers of rats in the quickest time.”⁵⁷ At the same time, rat-catching involved the development of ideas about rat intelligence and intentionality as is famously evident in Henry Mayhew’s 1850s account of the practice.⁵⁸ As Pemberton has noted, “these cultural practices invested rats with a menacing and formidable persona: a species co-existing and co-emerging with civilization, devouring it from within.”⁵⁹

The visual culture fomented through and at the same time fostering these practices and ideas mostly consisted of images of ratting in rat pits (as, for example, illustrated in Mayhew’s account).⁶⁰ These differed significantly from the earlier sixteenth-to-seventeenth-century theme of the rat-catcher, visible, for example, in Christian Wilhelm Ernst Dietrich’s etching *The Mountebank* (1740), Jan Joris van der Vliet’s etching *The Rat-Catcher* (circa 1610), or most famously Rembrandt’s 1632 *The Rat Catcher* (also known as *The Rat Killer or The Rat-Poison Peddler*).⁶¹ For whereas early modern artworks focused on the person or “character” of the rat-catcher, by the mid-nineteenth century etchings had shifted their attention to the *practice* of rat-catching. Already in 1814 we see, for example, in Abraham Cooper’s etching *The Rat Trap* a boy kneeling in front of a rat trap and holding open its door as two dogs await to snatch the rat trapped in it.⁶² This novel emphasis on action is perhaps best exemplified in Ernest Henry Griset’s 1871 engraving *The Terrier and the Rat* (figure 4.4).⁶³ This work by the quintessential animal artist of Victorian England was used to illustrate an article debating the necessity or cruelty of ratting. It shows a close-up of a terrier attacking a rat, presumably in a rat pit. The tension in the image is palpable, as the rat twists around to face the dog who, hackles raised, is about to bite.

If generally less dramatic than Griset’s engraving, the vast majority of photographs of rat-catching related to plague control in the course of the third plague pandemic replicated the action-focused emphasis established in Victorian etchings of ratting. These photographs focused on depicting the work of rat-catchers in diverse contexts across the globe. In Victorian times and earlier on, at least in Europe and the Americas, rat-catching was



Figure 4.4
Ernest Henry Griset's 1871 engraving *The Terrier and the Rat*. Courtesy of Wellcome Collection.

mainly a solitary vocation. By contrast, the urgency of the third pandemic necessitated completely new forms of labor. Schematically we may say that rat-catching took three principal forms.

First, rat-catching was achieved through mass mobilization, as exemplified in the war declared against rats by the Danish king in March 1907. After an aggressive campaign by the president of the Society for the Destruction of Rats, Emil Zuschlag, this involved the participation of all Danish subjects in a massive effort of eradication, resulting between July 1907 and January 1909 in 1,557,656 dead rats, not including those destroyed directly by the government.⁶⁴ Less totalizing but also on a mass scale, in the British and French colonies rat bounties led to the mobilization of colonial subjects in rat-catching.⁶⁵ Second, rat-catching was undertaken by voluntary organizations, such as the Women's Municipal League of Boston, which organized Rat Days and Rat Weeks aimed at eliminating the animal.⁶⁶ Third, rat-catching was led by professional groups of salaried laborers whose job was rat eradication or the procurement of rats for laboratory

tests and examination (figure 4.5). Most forms of rat-catching, including those employing traps, cats, ferrets, or dogs, required the development of a practical knowledge of rats, their habitats, and their sentient behavior but also the exchange and adoption of anti-rat methods circulating internationally across different fields of application (such as shipping or farming).⁶⁷

With the exception of British India, where photographs of the scientific study of rats included some of rat-catching by so-called Indian “coolies” for laboratory use, the vast majority of rat-catching photographs during the pandemic focused on all-male, all-White groups engaged in the practice.⁶⁸ This is in spite of the fact that across the globe colonial subalterns were mobilized in rat-catching, often with disastrous results.⁶⁹ By contrast to these campaigns, which remained mainly outside the photographic gaze, the coverage of White, settler-colonial, male rat-catching stretched from Australia to California and from New Orleans to Argentina and focused on the employment of ratter dogs in the war against rats.



Figure 4.5
Liverpool Port Sanitary Authority rat-catchers dipping rats in buckets of petrol to kill fleas for plague control. Courtesy of Wellcome Collection.

Argentina witnessed the introduction of plague in 1899–1900 with the disease developing into both an urban and rural problem over the following decades.⁷⁰ This led to extensive scientific research on plague and its animal hosts and vectors in the country, which lasted for over three decades. At the same time, by 1906 anti-rat campaigns were in full swing across Argentina and in particular in Buenos Aires where they became entangled with broader sanitary visions of transforming the Argentine capital into “a model hygienic city.”⁷¹ As demonstrated by Lukas Engelmann, this involved a shift of “the government’s epidemiological focus from the entry of plague from foreign countries, to the conditions under which this and other diseases might nest within the fabrics of the urban infrastructure.”⁷² Under the auspices of José Penna, a “vision of the total ‘deratisation’ of Buenos Aires” was mainly driven by novel technological application of fumigation through the Marot apparatus (see chapter 2).⁷³ At the same time less technologically driven solutions to the rat problem persisted, with rat-catching being particularly well represented and endorsed in the popular press.

Over the first two decades of the twentieth century, the popular Argentinean illustrated periodical *Caras y Caretas* hosted numerous articles about plague and its control. In the issue of September 9, 1912, the article “La Bubónica y las Ratas” featured a well-designed header with the caption reading “killing rats in the port of Buenos Aires.”⁷⁴ The header consisted of a photograph cropped into a circle showing four rat-catchers and their dogs in the process of rat eradication (figure 4.6). Surrounding the photograph, on a grey background, four rats were drawn so as to give the impression that they were running to hide behind the photograph or to escape from the operations depicted in it. One of the three rats bore a decisively dead aspect, completing the image of extermination while the “R” in the article’s title “Ratas,” which was written across the photograph, was connected with the final “s” of the word, creating a playful semblance of a rat’s tail that visually rhymed with the tail of a rat scurrying to hide behind the image and its shadow.

The war on rats by means of rat-catching dogs was depicted more extensively in the April 21, 1923 issue of the same illustrated magazine, which hosted a total of fifteen photographs over two pages in its article “Man’s Friend: The Dog. The Struggle against Rats in the Port” (figure 4.7), signed by its author with the pseudonym Argus, referring to Ulysses’s faithful dog in the *Odyssey*.⁷⁵ The illustration consisted of eleven images of digging out and catching rats, with additional large photographs of three rats and a dog



Matando ratas en el puerto de Buenos Aires.

Figure 4.6

“Killing rats in the port of Buenos Aires.” Courtesy of Biblioteca Nacional de España.

cropped and pasted on the page in such a way so as to appear as if the animals are walking on the sheet. This visual effect, which formed a popular trope in the periodical, created a pop-out effect that brought the rival animals to life.

Such images of rat-catching in the course of the third plague pandemic played the role of a visual switch between the past of ratting as a blood sport and the present of rat-catching as a method of epidemic control. They depicted rat-catching in a manner that established civic participation in epidemic control as a modern, science-led, civic duty and glorified White male fraternities as the spearhead of these efforts. Drawing on values and practices of settler societies and giving them scientific legitimacy, the particular framing of rat-catching allowed the practice to acquire the status of a task aimed at protecting one’s city or nation against infection while dissociating

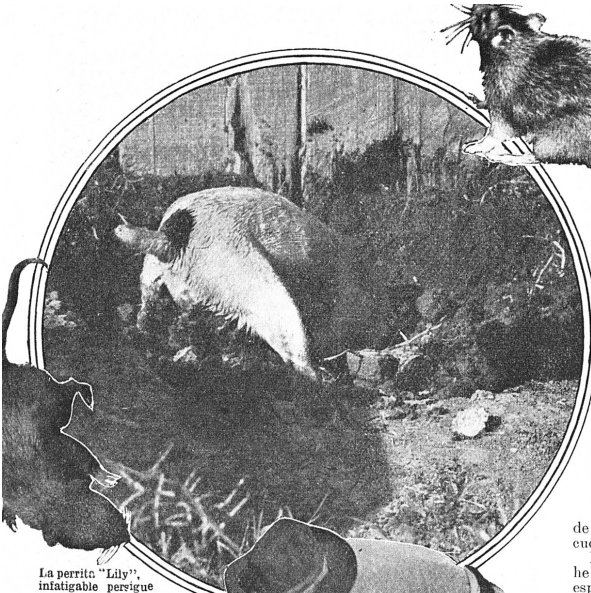
it from similar, supposedly degrading, native-led activities in the colonies such as bounty rat-catching.⁷⁶

RAT-PROOFING

As the pandemic progressed, what became more and more obvious was that the actual eradication of rats was an unreachable dream. Developing in parallel on land and in the field of maritime sanitation, where fumigation had been the preferred vector-control method since the 1890s (see chapter 2), by the 1910s a new method started emerging as the golden standard: rat-proofing. This was a term adopted across the globe to refer to the architectural and engineering methods aimed at the exclusion of the rat from human settlements.⁷⁷ The implementation of rat-proofing took different forms in different parts of the world, carrying with it “infrastructural promise” for an infection-free future.⁷⁸

Increasingly coming to replace rat-catching and other methods of extermination, rat-proofing reached its global apex in the decades after World War I. It involved an array of interventions that combined the destruction or retrofitting of old “faulty” structures and the construction of entirely new rat-proof buildings. While borrowing elements from anti-mosquito campaigns (which were being developed in parallel), rat-proofing quickly developed into an autonomous field of engineering and architectural practice that went beyond the simple application of barriers.⁷⁹ The practice involved a systematic diagnosis of the built environment in terms of its material and engineering properties. Materials and the modes of building came to be problematized in two principal ways. First, they were scrutinized for creating the opportunity for “rat harborage,” or places where rats could nest and hide. Second, they were surveyed as rat passageways, which allowed rats to enter buildings or to pass from one building into another and thus also offered escape routes for animals under attack.

As regards rat harborage and its prevention, rat-proofing depended on an advanced knowledge of nesting and burrowing habits and capacities of different rat species. Intervention on this level involved the development of an understanding of where rats build their nests, where they seek refuge when under threat, and where they go to die when they become ill. As regards the entry points and passageways of rats, rat-proofing focused on structural thresholds but also on rats’ climbing, burrowing, tightrope-walking, and



La perrita "Lily", infatigable persigue en los terrenos del Puerto Nuevo, a su enemigo instintivo: la rata.

UN casal de ratas tiene al año una descendencia asegurada de 1,000 ratas, y si la guerra europea nos hubiera obligado a guardar por dos años más la cosecha en los galpones de la aduana, a estas horas, Buenos Aires no existiría. Las ratas le hubieran devorado, me dice el jefe del servicio de desratización del puerto. Bajo las estibas fabulosas, las ratas habrían establecido sus maternidades. El alimento estaba a pedir de boca. No necesitaban andar mucho y nadie podía ir bajo esas millares de bolsas a buscar al escurrezudo animal que, así como sabe huir a tiempo, también sabe hacer frente a sus perseguidores. Instintivamente hay una raza de perros que es su enemigo insaciable. No come la rata. La mata, tan sólo y es a base de un elemento tan ágil que los servicios naciona-

Mientras uno de los perros, sigue el trayecto de la cueva y los peones la secundan a brevíandole el trabajo de zapa, el compañero vigila atento la posible huida de la rata.



EL AMIGO DEL HOMBRE: EL PERRO

LA LUCHA CONTRA LAS RATAS EN EL PUERTO

les de desratización se aseguran. El bote arsenical, los aparatos de fumigación al azufre Clayton, son incompletos. Mientras se ataca con gases la bodega de un barco, la rata huye por agua a un otro barco ya cargado y continúa el viaje. En una de las bodegas de un buque que va al sur, sacáronse vez pasada 800 ratas. Es decir cerca de 300 kilos de ratas. Hay que cortar la retirada. Y para eso sirve el perro. Mientras uno de ellos acomete francamente la cueva, el otro perro alerta sigue los movimientos de la rata que escaparía a la persecución de un único perseguidor. En los terrenos del puerto nuevo he podido seguir de cerca, en los espigones, en el agua estancada, en los muelles, a la lucha entre la rata y

Figure 4.7
 "Man's Friend: the Dog. The Struggle against Rats in the Harbor." Courtesy of Biblioteca Nacional de España.



El decano de los perros ratoneros, viejo e inválido.



La febrilidad de los perros indica que la rata no está lejos.



Entre los juncos de la orilla, «Lebel» sigue un rastro.



«Mustafá» vuelve con la rata que perseguía, y «Lebel» decide reservarse para otra oportunidad.



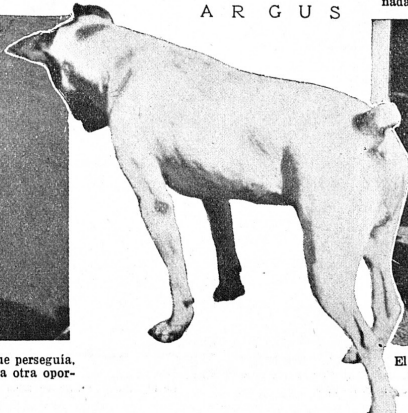
el perro. Es un espectáculo de circo romano. El combate es impresionante y “el amigo del hombre” adquiere verdaderos títulos a nuestro agradecimiento.

Parecerá tal vez paradójica esta pregunta frente a esa plaga que lleva desde la India a todos los vientos la peste bubónica. ¿Conviene extirpar las ratas? En el Congreso de Higiene de París, el delegado por el Egipto aseguró que después de haber conseguido con las ratas, en el Cairo una epidemia de cucarachas se extendió por los mismos lugares con caracteres fatales. La cucaracha era peor que la rata y vive de los mismos desperdicios.

Los servicios de desratización del puerto cuentan con ocho cuadrillas y cuarenta perros. Al fin del día — el trabajo es cruento, pues la rata tiene un campo excelente donde atrincherarse — se cazan unos doscientos ejemplares. Al mes, oscilan entre cinco y ocho mil, las que se toman, fuera de otras muchas que mueren en las cuevas por la acción del arsénico y del azufre. No hay descanso en esta persecución. La avería de la rata puede calcularse anualmente por millones de pesos, fuera de los perjuicios que causan las estibas al caerse en los galpones, minadas sus bases por las ratas. A bordo, la rata concluye, en viajes largos, con gran parte de la mercadería. ¡890 ratas en una bodega sola, royendo quince horas seguidas, lo que consiguen!

Como un comensal correcto, la rata no come todo, pero destruye lo que toca.

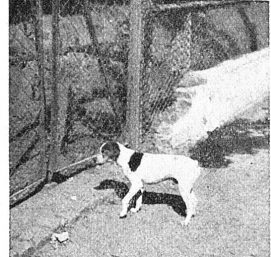
A R G U S



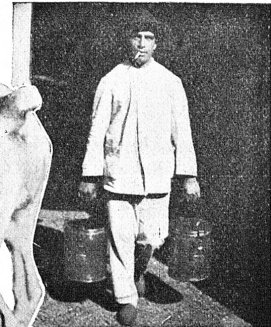
Las piedras del espigón son las terribles murallas que las ratas oponen a los perros.



Así se enseña a los perros la pesquisa de la rata.



De vuelta a casa, después de una larga jornada bajo la tierra detrás de la presa.



El producto de la caza, las ratas, infectadas de peste o no, son conducidas al Instituto Bacteriológico.

FOTOS DE ARROYO.

Figure 4.7
(continued)

jumping abilities. At the same time as behavioral scientists were required to “think like a rat,” “building the rat out of existence” required and led to an unprecedented understanding of rat’s spatial behavior while also contributing to the image of the animal, in the words of a Hawaii Chamber of Commerce anti-rat pamphlet from 1943, as a “super-saboteur” (figure 4.8).⁸⁰

Contributing to a unified vision of pathogenic urbanity (see chapter 2), this diagnostic scrutinization of the built environment in light of the problem of the rat was a process with strong class and racial aspects. In her examination of “building out the rat” in South Africa, Branwyn Poleykett has shown how “anti-rat campaigns were powerful instruments for allying the health of the nation with whiteness and proposing white settlement as a prophylaxis against epidemic disease.”⁸¹ At the same time, rat-proofing involved governmental intervention in spaces where the state had hitherto limited access. By the 1920s, we see a global trend developing: the issuing of standardized guidelines for retrofitting private and public buildings. These practices were systematically visualized in rat-proofing pamphlets and manuals by means of comprehensive diagrams and photographs, and they formed the subject of colonial exhibitions on infectious disease control and hygiene.⁸² The application of this rat-proofing imperative often led to the mass reconstruction of working class, immigrant, and indigenous living spaces or even to their wholesale destruction in the name of national defense against plague.

A most striking example of this comes from Java, where Dutch colonial doctors and public health officers targeted Javanese houses as playing a key role in the transmission of plague, which first struck the island in 1911.⁸³ Dutch colonial doctors and administrators saw these native structures as harbors of rats, focusing in particular on a perennial material of indigenous architecture: bamboo (figure 4.9). Maurits Meerwijk has examined the ways in which this building was medicalized as a passageway, a nesting environment, and a postmortem receptacle of rats, showing how this problematization fostered in turn what, following Graham Mooney, we can call “intrusive interventions” into Javanese social and domestic space.⁸⁴

Terence Hull, in his study of plague in the region, has highlighted the destruction and dependence resulting from Dutch colonial rat-proofing and more broadly anti-rat policies.⁸⁵ This was, however, not simply a material but also a visual operation. Meerwijk explains that colonial officers employed photography to record these interventions (involving, according to Hull, 1.5 million houses up until the 1930s) and to provide

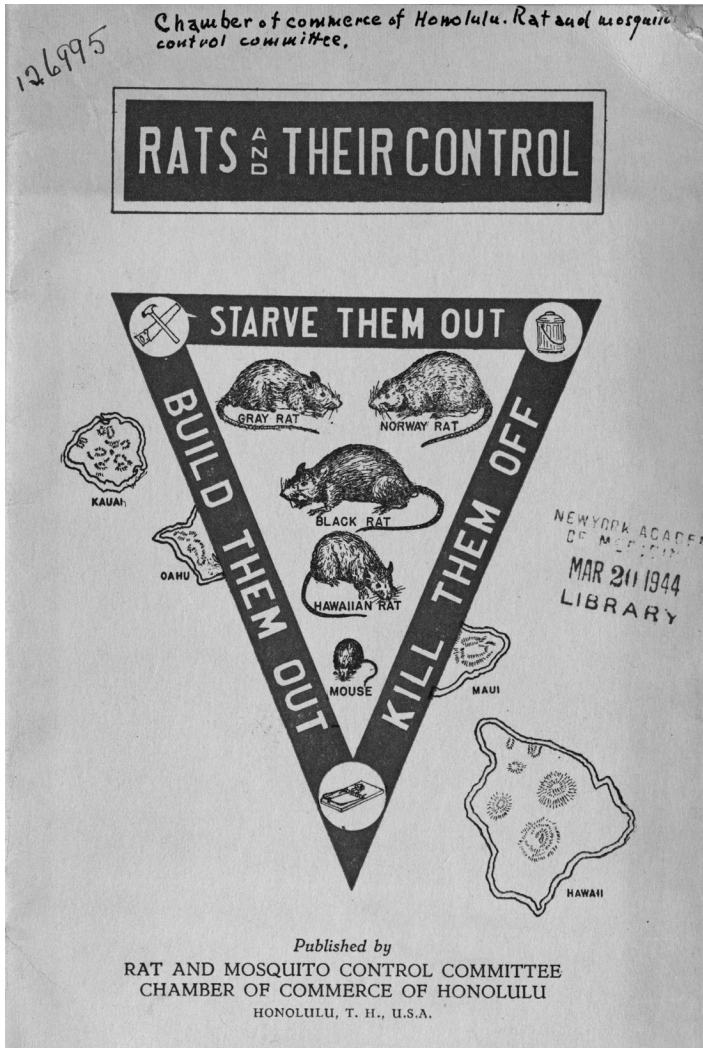


Figure 4.8
Cover page of Hawaii rat control manual. Courtesy of the New York Academy of Medicine Library.



Figure 4.9

“By the plague brigade collected hollow bamboo containing rat nests, obtained from Javanese houses.” Courtesy of the Stichting Nationaal Museum van Wereldculturen.

scientific evidence of the way in which bamboo—and more broadly indigenous ways of home-making and habitation—was implicated in the spread and maintenance of plague in Java. This involved what Meerwijk calls a “quasi-anatomic” or “post-mortem” gaze, which included “peeling away” and “dissecting” built structures.⁸⁶ This visual method photographically pathologized the materiality and design of bamboo house and interpellated the native population to a hygienic modernity mediated by architectural and engineering “improvement.”⁸⁷

Photographing the rat in the context of the third plague pandemic contributed to a colonial “fashion[ing of] human moral responsibility.”⁸⁸ For rather than simply blaming the rat as an epidemic villain, photography also distributed this blame to human actors and in particular to groups seen as prone to allowing and fostering rat infestation and rat-human contact.⁸⁹ Combining sovereign and disciplinary technologies of power, building out the rat was an essential part of projects for hygienic modernity across the globe. In the United States, for example, the method was widely endorsed

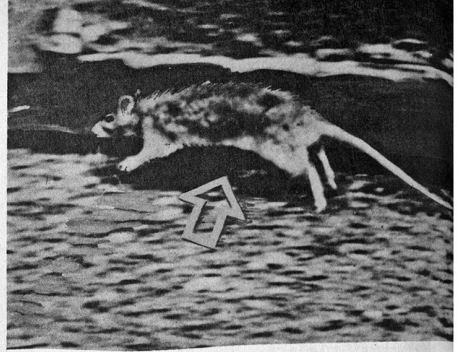
and applied, with photography playing an important role in the process. An excellent example of this is *Rat-Borne Disease Prevention and Control*, published in February 1949 by the US Public Health Service's Communicable Disease Center, the forerunner of the US Centers for Disease Control and Prevention (CDC).⁹⁰

Three hundred and six pages long, the manual was divided in eight parts and made extensive use of a wide range of visual media: photographs, maps, diagrams, graphs, microphotographs, and comics, numbering a total of 139 figures, not including the cartoons (an average of nearly one figure per two pages). Of these, thirty images focused on rat-proofing, and fifteen more, often composed of several photographs, showed evidence of rat burrowing and climbing, typical "rat-runs," and the damage done by rats to building materials such as the "example of rat gnawing of a service pipe."⁹¹ From among these figures, photographs focused not so much on the methods of achieving rat-proofing (this was mainly done through architectural and engineering diagrams) as on the "breaking and entering" agency of rats. The manual stressed: "Behavior is CONSTRUCTIVE and GOAL-ORIENTED. Behavior reflects CHOICES influenced by CONSEQUENCES. Behavior shows VARIABILITY and RESOURCEFULNESS in a problem situation."⁹²

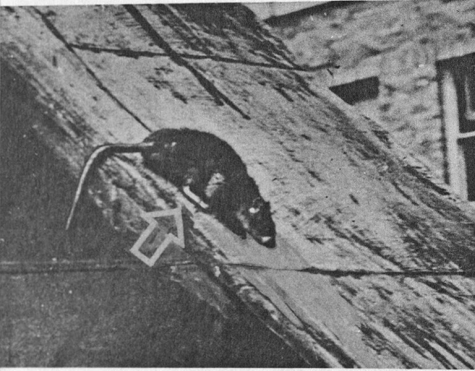
As a consequence of "rat habits" not being "static," the manual warned that "any control effort which has any appreciable effect on the rat population will change the consequences of given acts and thus change the choices."⁹³ Of particular interest was the rat's "agility": "The physical prowess of the rat in terms of reaching and jumping is frequently underestimated. In designing ratproof structures, or in planning the rat-proofing of existing structures, it is imperative that the rat's potential attack be understood . . . and that the necessary protection against such attack be provided."⁹⁴

To demonstrate how one should "NEVER UNDERESTIMATE THE RAT'S ABILITY!," the manual accompanied its analysis of the animal's climbing, jumping, and acrobatic abilities with two large photographic composites.⁹⁵ Captioned "series of photographs illustrating agility of roof rats in wire walking and vertical wall climbing," the manual's figure 16, included six sequential panels over one and a half page, with vertical and horizontal gutters between them, organized in two tiers.⁹⁶ Figure 19 (figure 4.10), in turn, included sixteen sequential panels over three pages, with vertical and horizontal gutters between them, organized in two tiers covering the full length of three pages. An introductory box explained that

Figure 19. This series of photographs taken on the roof of a five-story building, shows the climbing ability of the Norway rat. These pictures parallel the rat. These pictures parallel the CDC motion picture "The Climbing Activity of the Norway Rat." Some of the above photographs were taken by CDC; the others were taken by Mr. John Grennor, Typhus Control Officer of the City of Atlanta.



① The Norway rat runs across the flat roof.



④ Unable to climb the roof, the rat comes back down.



⑤ Crossing the flat roof, the Norway rat seeks a route up the vertical brick wall.

⑧ Having climbed the burglar guard, the rat seeks a means of escaping further.

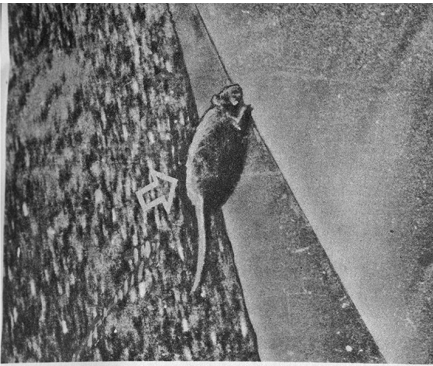


⑨ The rat fails to find an opening at the top of the window.



Figure 4.10

Figure 19 of the Communicable Disease Center's *Rat-Borne Disease Prevention and Control*, first of two pages. Courtesy of the New York Academy of Medicine Library.



2 The Norway rat pauses at the foot of the sheet metal roof having a slope of 45 degrees.



3 Halfway up the sheet metal roof the rat loses momentum and slides backwards.



6 The rat chooses the burglar guard as the easiest approach and shins up one of the bars.



7 It slows down to go around the cross bar.

10 After exploring all other possibilities, the rat turns toward the face of the vertical brick wall.



11 Note the rat's feet as it starts across the vertical wall.

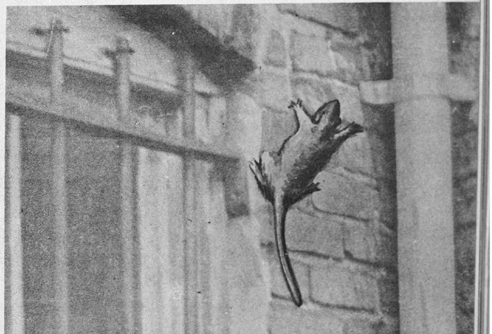
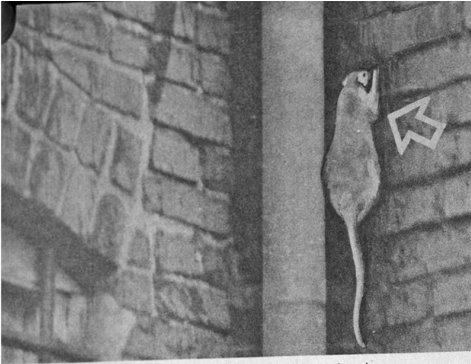
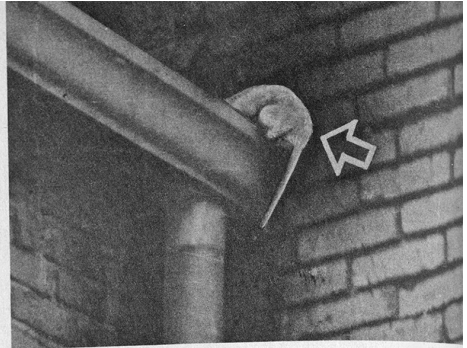


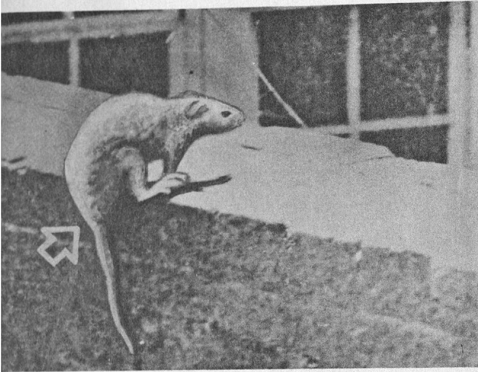
Figure 4.10
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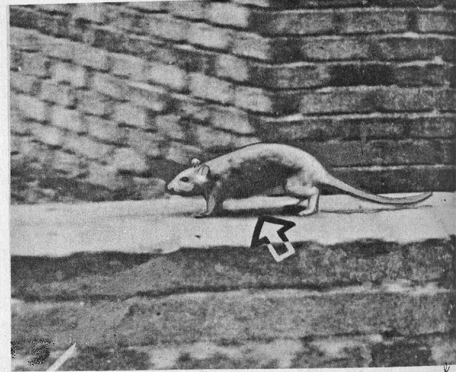
12 Crossing the drain pipe at the hanger strap, the rat starts toward the top of the wall. Note that the rat is not bracing against the gutter drain pipe as it climbs.



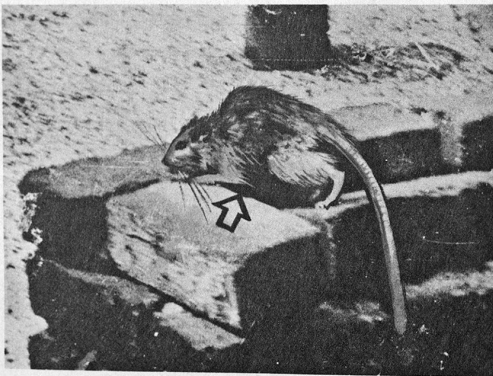
13 Observe the use of the rat's hind feet as it scrambles over the outside edge of the gutter.



14 The rat crosses another flat roof and jumps to the top of a parapet wall. Notice how it pulls itself over the edge.



15 Still seeking escape, the rat runs along the parapet wall.



16 The Norway rat gains safe harborage by going down a former chimney now used as an air shaft.

Figure 4.10
(continued)

“this series of photographs taken on the roof of a five-story building, shows the climbing ability of the Norway rat.”⁹⁷ In both cases, a comic-strip-like visual structure was employed to show the way in which rats move in built space, in particular from public into private space in the city.⁹⁸

The dramatic effect was further fostered by the numbering of the individual photographs per set and by accompanying captions. This is particularly pronounced in the work’s figure 19 (figure 4.10) where suspense was created by the adoption of a sequential narrative with thick arrows used to point at the rat’s position. Here, the rat was portrayed as an individual whose action one could observe on the printed page as if in a motion picture: it runs, it hesitates, it pauses, it loses momentum, and it slides back down the roof; so it seeks another way into the house, tries to cross the iron bars, fails again, and then takes to walking on a vertical wall climbing onto the roof where it finds a way in through a defunct chimney.⁹⁹ The configuration of the rat as an antagonist of sanitary reform and hygienic modernity was thus fostered through the visual dramatization of the animal’s ability and prowess to overcome obstacles and rat-proofing improvements.

HUMAN/NONHUMAN MASTERY

In the course of the third plague pandemic, rats and their interaction with the built environment were photographed from various perspectives and angles, all aimed at generating knowledge about the animal’s habitats and at controlling human-rat interaction and the space where this takes place. However, as understandings of plague came to involve more and more data about the disease’s zoonotic nature, and as the sylvatic and domestic cycles of infection became less and less clearly defined, the rat became not simply the elusive carrier of an elusive disease but also a species whose ubiquity meant that the control of plague and zoonotic diseases more broadly was far from a once-and-for-all achievement of hygienic modernity.

What the examination of the rat’s visualization in the course of the third plague pandemic allows us to see is that epidemic control involved a vision of modernity that, as Walter Benjamin has stressed, entailed not human mastery over the nonhuman but instead human mastery over humanity’s relation with the nonhuman.¹⁰⁰ The distinction may sound philological but is in fact crucial: Benjamin’s perspective allows us to move beyond the usual critique of mastery as domination or control and to assume a more

relational perspective without losing the crucial focus on power as so many contemporary multispecies approaches risk doing.¹⁰¹

Benjamin's critique of modern societies as fueled by a project for mastery that centrally involved their relation with the nonhuman world allows us to appreciate how this was an always already deferred process, where humanity's ability to set itself apart from nonhuman animals as sources of illness became constantly unsettled by new epistemological and biopolitical framings of infection.¹⁰² We thus need to understand the role of epidemic photography in the formation of this pandemic imaginary, where the goal of a disease-free future, while being constantly approached by means of the technoscientific management of human/nonhuman relations, also constantly receded into the future.

The photographic framing of rats as plague hosts fostered a vision of urban multispecies existence that took disease as properly speaking belonging to the nonhuman animal realm and only occasionally or temporarily to the human realm. Partaking in a vision of a future free of zoonotic infection, epidemic photography configured this future as resulting not so much from the total eradication of rats or their diseases but from commitment to a relentless struggle against the animal and to engineering and maintaining sufficient separation between it and humans. This was then not a teleological but an agonistic process involving the regulation of human-rat interaction or the continuous pushing back of zoonotic infection.

Photography was mobilized in rendering rats into humanity's antagonists in four ways. First, it updated old tropes and affects around rats as damaging vermin with new scientific frameworks of them as a disease host. Second, it elaborated on the agency of rats and rendered them scientifically intelligible and actionable through their translation and enclosure in terms of human subjectivity and intent. Third, it visually pathologized social and cultural practices—usually those of colonial subjects, racial others, or the working classes—that supposedly fostered zoonotic infection through animal-human contact; a framing that focused particularly on the spatial aspects of that interspecies relations. And finally, it created an intense, mutual, and fluid metonymy between plague and the rat, where one reflected and amplified the supposed elusive and treacherous nature and agency of the other in a manner that dispelled any distinction between prototype and copy or signifier and signified.

In order for this agonistic relation of mastery to be possible, the rat had to remain a challenge and threat in ways that necessitated renewed effort and ingenuity on the part of its human rivals. Hence, in spite of the enclosure of the rat within an epidemiological and often anthropomorphic framework, it was important for something to always remain at the edge of science's sight and out of reach for technologically mediated mastery. Whether this involved the way the rat moved between buildings, its relation with the soil, its "migratory" patterns, or the relation between plague in rats and in sylvatic rodents, the rat persisted in its role as a pandemic infrastructure precisely because of the "unspecified ignorance" surrounding it.¹⁰³

Genese Marie Sodikoff has identified the interaction between burial practices and rats in the context of Pasteurian epidemiologies of plague in Madagascar as a "multispecies infrastructure of zoonosis."¹⁰⁴ Sodikoff has argued that if "we approach 'infrastructure' through a multispecies ethnographic lens, we see how obstructions to desirable resource flows can stem from non-human bodies and energy expenditures, as much as from unequal (human) social relations of power and privilege."¹⁰⁵ Similarly, Maan Barua has recently suggested that animals usually considered to be "vermin" within colonial and capitalist framings of nonhuman life may be better approached as "infrastructures in a 'minor' key" that "operat[e] against and along the grain of majoritarian imperatives of the state, capital and planning."¹⁰⁶ Here I would like to suggest that, in the broader context of the third plague pandemic, the rat was elevated to the status of a pandemic infrastructure not simply because it became stabilized as plague's *sine qua non* but because its precise role in plague transmission and maintenance retained something irreducibly unknown and elusive.

By 1910 no plague outbreak could become scientifically intelligible and actionable other than through a focus on rodents; at the same time, the rat, as the par excellence plague rodent, eluded epistemic closure. In this way, rats deferred and propelled the project for mastery to develop ever-newer methods, technologies, and techniques in the quest of a zoonosis-free future. Photography contributed to this double configuration of the rat as pandemic infrastructure and epistemic thing: a source of public health anxiety persisting well beyond the development of efficient poisons, traps, gases, or doorstops aimed at its extermination or isolation from humans and their spaces.

Photography did this, on the one hand, by framing the rat as plague's protagonist and anti-rat measures as indispensable methods of epidemic control; and, on the other hand, by placing emphasis on the field of relations between the rat and other components of disease transmissibility and maintenance as an unknown terrain of zoonotic potential. Photogenic and yet elusive, observable but always hiding, something lurking at the edge of sight, the rat may then be said to have embodied the dialectic of visibility and invisibility of epidemic photography but also of epidemiological reasoning, in ever-unsettling and productive ways.

123. Nathan, *Plague in India*, “Report on Sind by Mr. Wingate,” 393. We may assume this to be the liquid used in figure 3.6.

124. For a discussion of the use of this chemical in human disinfection in British India, see Steere-Williams, “‘Coolie’ control.”

125. The lack of depictions of suffering in British India’s plague camps may be here compared to the visualization of suffering in photographs of concentration camps during the Boer War in South Africa; Michael Godby, “Confronting horror: Emily Hobhouse and the concentration camp photographs of the South African War,” *Kronos* 32 (November 2006): 34–48.

126. For a reading of quarantine in terms of “imagining the geo-body of the nation,” see Bashford, *Imperial Hygiene*, chapter 5.

127. Bashford, “Maritime quarantine,” 10.

128. Sivasundaram, “Towards a critical history,” 382.

129. Sivasundaram, “Towards a critical history,” 382.

130. Sivasundaram, “Towards a critical history”; Jane Stevens Crawshaw, “The places and spaces of early modern quarantine,” in *Quarantine: Local and Global Histories*, ed. Alison Bashford, 15–53 (London, UK: Palgrave Macmillan, 2016).

CHAPTER 4

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1. See, for example, Rebecca Morrell, “‘Gerbils replace rats’ as main cause of Black Death,” *BBC News*, February 24, 2015, <https://www.bbc.co.uk/news/science-environment-31588671>. The article is based on a misinterpretation of the following scientific paper: Boris V. Schmid, Ulf Büntgen, W. Ryan Easterday, Christian Ginzler, Lars Walløe, Barbara Bramanti, and Nils Chr. Stenseth, “Climate-driven introduction of the Black Death and successive plague reintroductions into Europe,” *Proceedings of the National Academy of Sciences of the United States of America* 112, no. 10 (2015): 3020–3025. In fact, marmots were identified as carriers of plague as far back as 1894, with scientific literature covering this zoonotic host of the disease pre-dating that covering the rat’s similar role; Christos Lynteris, *Ethnographic Plague: Configuring Disease on the Russian-Chinese Frontier* (London, UK: Palgrave Macmillan, 2016).

2. See chapters in Christos Lynteris, ed., *Framing Animals as Epidemic Villains: Histories of Non-Human Disease Vectors* (London, UK: Palgrave Macmillan, 2019); James Robert Fairhead, “Technology, inclusivity and the rogue: Bats and the war against the ‘invisible enemy,’” *Conservation and Society* 16, no. 2 (2018): 170–180.

3. Nicholas B. King, “The scale politics of emerging diseases,” *Osiris*, 2nd Series, 19, (2004): 62–76.
4. For a review of these approaches in the context of the pandemic imaginary, see Christos Lynteris, *Human Extinction and the Pandemic Imaginary* (London, UK: Routledge, 2019).
5. Neil Pemberton, “The rat-catcher’s prank: Interspecies cunningness and scavenging in Henry Mayhew’s London,” *Journal of Victorian Culture* 19 (2014): 520–535.
6. Mary Fissell, “Imagining vermin in early modern England,” *History Workshop Journal* 47 (1999): 1–29.
7. Carlo M. Cipolla, *Cristofano and the Plague: A Study in the History of Public Health in the Age of Galileo* (Berkeley, CA: University of California Press, 1973).
8. C. R. Francis and Frank Pearson, “Mahamurree, or Indian plague,” *Indian Annals of Medical Science* 2 (1854): 609–645.
9. Pemberton, “Rat-catcher’s prank,” 532.
10. Pemberton, “Rat-catcher’s prank,” 533. Rodwell was the author of a popular treatise: James Rodwell, *The Rat: Its History and Destructive Character* (London, UK: Routledge, 1858).
11. Carol A. Benedict, *Bubonic Plague in Nineteenth-Century China* (Redwood City, CA: Stanford University Press, 1996); Myron J. Echenberg, *Plague Ports: The Global Urban Impact of Bubonic Plague, 1894–1901* (New York, NY: New York University Press, 2007).
12. Nicholas H. Evans, “Blaming the rat? Accounting for plague in colonial Indian medicine,” *Medicine, Anthropology, Theory* 5, no. 3 (2018): 15–42.
13. B. E. Holsendorf, “Rat surveys and rat proofing,” *American Journal of Public Health and the Nation’s Health* 27, no. 9 (1937): 883–888.
14. W. R. Boetler, *The Rat Problem* (London, UK: Bale and Danielsson, 1909). The war metaphor was used in various permutations by a wide range of scientists, journalists, and functionaries at the time; see, for example, Albert Calmette, “Déclarons la guerre aux rats,” *La revue du mois* 3, no. 28 (April 10, 1908): 432–444.
15. In anthropological literature, the term “global war against the rat” was coined in Branwyn Poleykett, “Building out the rat: Animal intimacies and prophylactic settlement in 1920s South Africa,” *American Anthropological Association: Engagement*, February 7, 2017, <https://aesengagement.wordpress.com/2017/02/07/building-out-the-rat-animal-intimacies-and-prophylactic-ssettlement-in-1920s-south-africa/>.
16. Éric Baratay, *Bêtes des tranchées, des vécus oubliés* (Paris, France: CNRS Éditions, 2013); L. C. Murphy and A. D. Alexander, “Significance of the leptospiroses in military medicine,” *Military Medicine* 121, no. 1 (1957): 1–10; Poleykett, “Building

out the rat”; Karen Sayer, “The ‘modern’ management of rats: British agricultural science in farm and field during the twentieth century,” *British Journal for the History of Science* 2 (2017): 235–263.

17. David E. Lantz, *House Rats and Mice*, Farmer’s Bulletin 896, United States Department of Agriculture (Washington, DC: Government Printing Office, 1917). On rats and quarantine, see Birsen Bulmuş, *Plague, Quarantines and Geopolitics in the Ottoman Empire* (Edinburgh, UK: Edinburgh University Press, 2012); Echenberg, *Plague Ports*; Lukas Engelmann and Christos Lynteris, *Sulphuric Utopias: A History of Maritime Fumigation* (Cambridge, MA: MIT Press, 2020); Robert Peckham, “Spaces of quarantine in colonial Hong Kong,” in *Quarantine: Local and Global Histories*, ed. Alison Bashford, 66–84 (London, UK: Palgrave Macmillan, 2017).

18. For an excellent history of the use of the Danysz Virus against rats, see Lukas Engelmann, “An epidemic for sale: Observation, modification, and commercial circulation of the Danysz Virus, 1890–1910,” *Isis* 112, no. 3 (2021): 439–460.

19. Timothy P. Barnard, *Imperial Creatures: Humans and Other Animals in Colonial Singapore, 1819–1942* (Singapore: Singapore University Press, 2019); Lukas Engelmann, “Fumigating the hygienic model city: Bubonic plague and the sulfurozador in early-twentieth-century Buenos Aires,” *Medical History* 62, no. 3 (2018): 360–382; Projit Bihari Mukharji, “Cat and mouse: Animal technologies, trans-imperial networks and public health from below, British India, c. 1907–1918,” *Social History of Medicine* 31, no. 3 (2017): 510–532; Poleykett, “Building out the rat”; Karen Sayer, “Vermin landscapes: Suffolk, England, shaped by plague, rat and flea (1906–1920),” in *Framing Animals as Epidemic Villains: Histories of Non-Human Disease Vectors*, ed. Christos Lynteris, 27–64 (London, UK: Palgrave Macmillan, 2019); Megan Vaughan, *Curing Their Ills: Colonial Power and African Illness* (Redwood City, CA: Stanford University Press, 1991); Ann Zulawski, “Environment, urbanization, and public health: The bubonic plague epidemic of 1912 in San Juan, Puerto Rico,” *Latin American Research Review* 53, no. 3 (2018): 500–516.

20. On rats and the International Sanitary Conferences, see Engelmann and Lynteris, *Sulphuric Utopias*. For the minutes of the two international rat conferences, see Gabriel Petit, ed., *Première conférence internationale du rat, Paris—Le Havre 16–22 Mai 1928* (Paris, France: Vigot Frères, 1928); Gabriel Petit, ed., *Deuxième conférence internationale et congrès colonial du rat et de la peste: Paris, 7–12 octobre 1931* (Paris, France: Vigot Frères, 1932).

21. Koen Beumer, “Catching the rat: Understanding multiple and contradictory human-rat relations as situated practices,” *Society and Animals* 22 (2014): 8–25; Jonathan Burt, *Rat* (London, UK: Reaktion Books, 2006); Maud Ellmann, “Writing like a rat,” *Critical Quarterly* 46, no. 4 (2004): 59–76; Albert Calmette, “Discours (7/10/1931),” in *Deuxième conférence internationale et congrès colonial du rat et de la peste: Paris, 7–12 octobre 1931*, ed. Gabriel Petit, 48 (Paris, France: Vigot Fr. 1932).

22. Mukharji, “Cat and mouse.”

23. I borrow here the idea of the rat as an “infrastructure” from Genese Marie Sodikoff, “The multispecies infrastructure of zoonosis,” in *The Anthropology of Epidemics*, ed. Ann H. Kelly, Frédéric Keck, and Christos Lynteris, 102–120 (London, UK: Routledge, 2019).

24. On the development of sanitary hygienic utopias at the turn of the nineteenth century, see Engelmann and Lynteris, *Sulphuric Utopias*; Mark Harrison, “Towards a sanitary utopia? Professional visions and public health in India, 1880–1914,” *South Asia Research* 10, no. 1 (1990): 19–41.

25. H. J. Sears, “The problem of plague as an epidemic disease,” *Bulletin of the Medical Library Association* 29, no. 1 (October 1940), 10.

26. Paul-Louis Simond, “La propagation de la peste,” *Annales de l’Institut Pasteur* (Paris) 12 (1898): 625–687. In reality, Simond was not the first to make this identification, and the notes of his experiment suggest it may not have been as successful as suggested by the 1898 publication in the *Annales de l’Institut Pasteur*. Simond’s notes and notebooks on his plague research in India (1897–1898) contain a rich trail of visual material but no images of rats or fleas, or of experiments on them; the key notebook here being AIP, Lieu SIM.2, A3/81–84, “Observ. concern. épid. de peste.”

27. Evans, “Blaming the rat?”

28. For what seem to be the first images of rat-catching in British India, see WL, b32162698, *Karachi Plague Committee in 1897* (e.g., Apollo/VR3PP, PhotoID_4045, <https://www.repository.cam.ac.uk/handle/1810/282705>).

29. For example, a lecture slide (85 × 100 mm) from 1900, tagged “Bacille de la peste. Bubon pesteux. Rat et mangouste,” showed the image of a plague bacillus, two photographs of patients with cervical and axillary buboes, respectively, the microphotograph of a flea, and the photograph of a rat and a mongoose; Musée National de l’Éducation (Rouen), 0003.00539.11, Projections Molteni, Radiguet & Massiot, “Prophylaxie des maladies contagieuses. 1ère série. Transmises par les déjections, les matières fécales, l’eau souillée; les sécrétions respiratoire. Bacille de la peste. Bubon pesteux. Rat et mangouste.”

30. For a history of the emergence of systematic images of animal dissection in the seventeenth century, see Anita Guerrini, *The Courtiers’ Anatomists: Animals and Humans in Louis XIV’s Paris* (Chicago, IL: University of Chicago Press, 2015).

31. Domenico Bertoloni Meli, *Visualizing Disease: The Art History of Pathological Illustrations* (Chicago, IL: University of Chicago Press, 2017).

32. Plague Commission, “XI. The diagnosis of natural rat plague,” *Journal of Hygiene* 7, no. 3 (1907): 324–358. For a discussion, see Evans, “Blaming the rat?” See also Katherine Royer, “The blind men and the elephant: Imperial medicine, medieval historians and the role of rates in the historiography of plague,” in *Medicine and Colonialism: Historical Perspectives in India and South Africa*, ed. Poonam Bala, 99–110 (London, UK: Routledge, 2015).

33. For examples of organ pathology, see B. Burnett Ham, *Report on Plague in Queensland, 1900–1907 (26th February, 1900, to 30th June, 1907)* (Brisbane, Australia: Government Printer, 1907), from which the image “Lungs of naturally-infected plague rats, showing general congestion and a few scattered grey nodules” is available at Apollo/VR3PP, PhotoID_3522, <https://www.repository.cam.ac.uk/handle/1810/282405>. For examples of the photography of rats with buboes, or of bubo-related pathology, see Ham, *Report on Plague in Queensland, 1900–1907*, from which the image “Dissections of fore and hind legs of naturally-infected plague rats, showing in No. I. enlarged axillary gland, and in Nos II. and III. enlarged femoral gland,” is available at Apollo/VR3PP, PhotoID_3521, <https://www.repository.cam.ac.uk/handle/1810/282404>.

34. See, for example, BANC PIC 1988.052:037-PIC, “Tumor on Norway rat—open beneath and exceeding in weight the animal’s body. Taken in the heart of Los Angeles,” Available via Online Archive of California, <https://calisphere.org/item/ark:/13030/tf3v19p3d9/>.

35. Evans, “Blaming the rat?”

36. See, for example, J. A. Lopez del Valle and E. B. Barnet, *Plan de campaña sanitaria contra la peste bubonica* (Havana, Cuba: La Moderna Poesia, 1915).

37. For a full discussion of these, see Christos Lynteris, “Zoonotic diagrams: Mastering and unsettling human-animal relations,” *Journal of the Royal Anthropological Institute* 23, no. 3 (2017): 463–485. For the application of such diagrams in the work of Marcel Baltazard, see Lukas Engelmann, Caroline Humphrey, and Christos Lynteris, “Introduction: Diagrams beyond mere tools,” in “Working with Diagrams,” edited by Lukas Engelmann, Caroline Humphrey, and Christos Lynteris, special issue, *Social Analysis* 63, no. 4 (Winter 2019): 1–19.

38. For example, William Hunter, *A Research into Epidemic and Epizootic Plague* (Hong Kong: Noronha & Co., 1904). Another visual device used to demonstrate the same process involved the visualization of plague’s annual cycle by means of a disk representing the solar year in monthly slices, with concentric cycles showing human plague, “chronic rat plague,” “acute rat plague,” and “rat prolificity,” with curves in each cycle showing the rise and fall of cases and correlating these to the monsoon seasons and the harvest of different crops; A. F. Stevens, “The natural history of plague,” *Indian Medical Gazette* (July 1906), 254. For discussion of these diagrams, see Lukas Engelmann, “Making a model plague: Paper technologies and epidemiological casuistry in the early twentieth century,” in *Plague Image and Imagination from Medieval to Modern Times*, ed. Christos Lynteris, 235–266 (London, UK: Palgrave Macmillan, 2021).

39. William J. R. Simpson, *Report on the Causes and Continuance of Plague in Hongkong and Suggestions as to Remedial Measures* (London, UK: Waterlow and Sons, 1903); Anon., “Observations on rat and human plague in Belgaum,” *Journal of Hygiene* 10, no. 3 (1910): 446–482. For a critical discussion of Snow’s map and its uses and

reception, see Tom Koch, “The map as intent: Variations on the theme of John Snow,” *Cartographica* 39, no. 4 (Winter 2004): 1–14.

40. For example, Valle and Barnet, *Plan de campaña sanitaria*.

41. Hans-Jörg Rheinberger, “Difference machines: Time in experimental systems,” *Configurations* 23, no. 2 (Spring 2015): 165–176.

42. For a broader reading of disease cartography in Rheinberger’s terms of an experimental system, see Tom Koch, *Disease Maps: Epidemics on the Ground* (Chicago, IL: University of Chicago Press, 2011). On plague maps as experimental systems, see Lukas Engelmann, “Configurations of plague: Spatial diagrams in early epidemiology,” *Social Analysis* 63, no. 4 (Winter 2019): 89–109.

43. Frank Morton Todd, *Eradicating Plague from San Francisco: Report of the Citizens’ Health Committee and an Account of Its Work* (San Francisco, CA: Press of C. A. Murdock & Co., 1909), 57.

44. Todd, *Eradicating Plague from San Francisco*, frontispiece.

45. Guenter B. Risse, *Plague, Fear, and Politics in San Francisco’s Chinatown* (Baltimore, MD: Johns Hopkins University Press, 2012).

46. Risse, *Plague, Fear, and Politics*. On the visualization of the hostility against Kinyoun in the local press, see Lukas Engelmann, “A Plague of Kinyounism: The caricatures of bacteriology in 1900 San Francisco,” *Social History of Medicine* 33, no. 2 (May 2020): 489–514.

47. Anon., “The arrest of plague in Japan,” *Illustrated London News* 3624 (October 3, 1908): 458.

48. David J. Bibel and T. E. Chen, “Diagnosis of plague: An analysis of the Yersin-Kitasato controversy,” *Bacteriological Reviews* 40, no. 3 (September 1976): 633–651.

49. Evans, “Blaming the rat?”

50. On similar bounty-led rat-catching practices in other parts of the world, see below.

51. Anon., “Arrest of plague in Japan,” 458.

52. Anon., “Arrest of plague in Japan,” 458..

53. Shibasaburō Kitasato, “Combating plague in Japan,” *Philippine Journal of Science* 1 (1906): 465–481, reprinted in K. Mizunoe, ed., *The Collected Papers of Shibasaburo Kitasato* (Tokyo, Japan: Kitasato University, 1977). Whether this was the same person as the famous theosophist and biographer of Madame Blavatsky and Annie Besant is open to speculation. Kitasato’s paper had also appeared translated in French, but carrying no images: Shibasaburō Kitasato, “La lute contre la peste,” *Archives de Medicine Navale* 86 (1906): 289–308.

54. The same visual strategy would be employed, if less elaborately, a month later by the *Adelaide Chronicle* issue of November 7, 1908, where the two top laboratory images

of the *Illustrated London News* article would be combined in a quarter-page composite with one of the images carried from the latter in the second illustrated page of its “Arrest of plague in Japan” article, showing the evacuation of shops in a Japanese city in the process of disinfection. The *Adelaide Chronicle* composite bore the title “Exterminating the Microbe Carrying Rat” and once again visually linked lab research with street-level operations as plague-control processes underscored by the same scientific principles; Anon., “Precautions taken against the plague in Japan,” *Adelaide Chronicle* 51, no. 2620 (November 7, 1908): 30. The second page of the *Illustrated London News* issue contained two photographs on the same subject bearing the title “An Example to Russia: House Cleaning by Law.”

55. Rotem Kowner, “Becoming an honorary civilized nation: Remaking Japan’s military image during the Russo-Japanese War, 1904–1905,” *The Historian* 64, no. 1 (2001): 19–38.

56. Pemberton, “Rat-catcher’s prank,” 526.

57. Pemberton, “Rat-catcher’s prank,” 528.

58. Henry Mayhew, *London Labour and the London Poor* (London, UK: Dover, 1860–1861).

59. Pemberton, “Rat-catcher’s prank,” 523.

60. Mayhew, *London Labour*.

61. WL, 38263i, “A rat-catcher enticing rats in to a tray which is strapped around his shoulder; he also holds a pole with a cage on top of it in which rats are trapped. Etching by Vliet,” <https://wellcomecollection.org/works/ztxzxcxs?wellcomeImagesUrl=/indexplus/image/V0020297.html>; WL, 38321i, “A crowd gathered around a mountebank who points to a banner illustrating various methods of execution; to the left stands a rat-catcher who holds a long stick with a cage on top of it from which rats dangle. Etching by C.W.E. Dietrich, 1740, after A. van Ostade,” <https://wellcomecollection.org/works/ys7fmf6p>; WL, 38254i, “A rat-catcher and his young assistant standing outside a doorway having their services refused by an old man: the rat-catcher holds a long stick with a cage on top of it containing rats, on his right shoulder sits a rat. Etching after Rembrandt van Rijn, c. 1632,” <https://wellcomecollection.org/works/x7sxdsvw>. For discussion of Rembrandt’s drawing, see Stanley M. Aronson, “Rembrandt and the rat catchers,” *Medicine and Health Rhode Island* 87, no. 6 (June 2004): 167.

62. WL, 42250i, “A boy kneeling down opening a rat-trap with two dogs eagerly awaiting the appearance of the rat. Etching by J. Scott after A. Cooper,” <https://wellcomecollection.org/works/mwr87p2g>.

63. WL, 41285i, “A terrier dog has chased a rat into a corner and is about to kill it. Wood engraving by E. Griset,” <https://wellcomecollection.org/works/ujg2b6wh>.

64. NARA, RG90, Central File 1897–1923 537–544, Box 065, “US Consul General Copenhagen, January 16, 1909, Extermination of Rats in Denmark.” On Zuschlag’s

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

65. The Danish state-organized war against rats may here be compared to 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. For works examining campaigns of rat-catching in British colonies in other parts of Southeast Asia, see Barnard, *Imperial Creatures*; Lenore Manderson, *Sickness and the State: Health and Illness in Colonial Malaya, 1870–1940* (Cambridge, UK: Cambridge University Press, 1996).

66. See, for example, Dorothy Worell, *The Women’s Municipal League of Boston: A History of Thirty Five Years of Civic Endeavor* (Boston, MA: Women’s Municipal League of Committees, 1943); Countway Library (Harvard University), P.6679, Mrs. Albert T. Leatherbee and the Women’s Municipal League of Boston, *Plague Conditions in Boston*, 1921 [pamphlet]; Anon., “Elimination of the rat,” *Boston Medical and Surgical Journal* 174, no. 2 (October 19, 1916): 576. 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.

67. Sayer, “‘Modern’ management of rats.”

68. For images of these Indian laborers, see the “Reports on Plague Investigations in India” in the *Journal of Hygiene*.

69. Vann, “Of rats, rice, and race.”

70. Echenberg, *Plague Ports*.

71. Lukas Engelmann, “Fumigating the hygienic model city: Bubonic plague and the sulfurozador in early-twentieth-century Buenos Aires,” *Medical History* 62, no. 3 (2018): 360–382, 364.

72. Engelmann, “Fumigating,” 374.

73. Engelmann, “Fumigating,” 378.

74. Anon., “La bubónica y las ratas,” *Caras y Caretas* 727 (September 7, 1912): 92–93.

75. Anon., “El amigo del hombre: El perro. La lucha contra las ratas en el Puerto,” *Caras y Caretas* 1281 (April 21, 1923): 56–57.

76. On bounty rat-catching, see Vann, “Of rats, rice, and race”; Peter Soppelsa, “Losing France’s imperial war on rats,” *Journal of the Western Society for French History* 47 (2021): 67–87.

77. Poleykett “Building out the rat.”

78. Hannah Appel, Nikhil Anand, and Akhil Gupta, “Temporality, politics and the promise of infrastructure,” in *The Promise of Infrastructure*, ed. Nihil Anand, Akhil Gupta, and Hannah Appel, 1–40 (Durham, NC: Duke University Press, 2018).

79. Uli Beisel, “Markets and mutations: Mosquito nets and the politics of disentanglement in global health,” *Geoforum* 66 (2015): 146–155; Maurice Lagarrigue, *La lutte contre le rat* (Paris, France: Jouve & Cie, 1911); S. W. Lindsay and M. E. Gibson, “Bednets revisited—Old idea, new angle,” *Trends in Parasitology* 4, no. 10 (1988): 270–272.
80. Vinciane Despret, *Penser comme un rat* (Versailles, France: Quae, 2009); Richard H. Harte, *Protect Your Home and Public Health against Rats* (Philadelphia, PA: Bureau of Health, 1941).
81. Poleykett “Building out the rat”; see also R. K. K. Molefi, “Of rats, fleas, and peoples: Towards a history of bubonic plague in Southern Africa, 1890–1950,” *Pula: Botswana Journal of African Studies* 15, no. 2 (2001): 259–267. And for the post-third-pandemic period: Dawn D. Biehler, *Pests in the City: Flies, Bedbugs, Cockroaches, and Rats* (Washington, DC: University of Washington Press, 2013).
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86. Meerwijk, “Bamboo dwellers,” 212, 221, 207.
87. Meerwijk, “Bamboo dwellers,” 217; Ruth Rogaski, *Hygienic Modernity: Meanings of Health and Disease in Treaty-Port China* (Berkeley, CA: University of California Press, 2004). As Eric Stein has discussed, these operations were also captured and reproduced in public health campaign films; Eric A. Stein, “Colonial theatres of proof: Representation and laughter in 1930s Rockefeller Foundation hygienic cinema in Java,” in “Health, Medicine and the Media,” special issue, *Health and History* 8, no. 2 (2006): 14–44.
88. Sayer, “Vermin Landscapes,” 18.
89. On this problem, see Evans, “Blaming the rat?” 34.

90. NYAML, WA 243 U58 1949, *Rat-Borne Disease Prevention and Control* (Atlanta, GA: Communicable Disease Center, Public Health Service, Federal Security Agency, 1949).
91. NYAML, WA 243 U58 1949, *Rat-Borne Disease*, 41, 45.
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93. NYAML, WA 243 U58 1949, *Rat-Borne Disease*, 41.
94. NYAML, WA 243 U58 1949, *Rat-Borne Disease*, 45
95. NYAML, WA 243 U58 1949, *Rat-Borne Disease*, 45, capitalization in the original.
96. NYAML, WA 243 U58 1949, *Rat-Borne Disease*, 46–47.
97. NYAML, WA 243 U58 1949, *Rat-Borne Disease*, Figure 19 is spread across pp. 52–54, quote on p. 42. Following the same boxed text, “These pictures parallel the CDC motion picture ‘The Climbing Activity of the Norway Rat.’” The film referred to is United States Army, “Practical Rat Control: Ratproofing,” T.F. 8-1673. (Atlanta, GA: Communicable Disease Center, United States Health Service, Federal Security Agency, 1950), U.S. National Library of Medicine, *YouTube*, December 20, 2016, <https://www.youtube.com/watch?v=4lgS0X0YfPg>.
98. The manual also contained actual comic strips, which were used in order to punctuate points, in an often reflexive manner. This visual trope centered on a protagonist, Roscoe the Rat-Ridder, who assumed the role of an instructor and commentator. But not all strips in the manual include Roscoe. As the volume progresses, rats also appear as protagonists or antiheroes, in some cases directly confronting their nemesis.
99. Figure 19 is in fact a hybrid composite made of photographs that parallel the CDC motion picture “The Climbing Activity of the Norway Rat” and others “taken by Mr. John Grennor, Typhus Control Officer of the City of Atlanta”; NYAML, WA 243 U58 1949, *Rat-Borne Disease*, 52.
100. Walter Benjamin, *Reflections: Essays, Aphorism, Autobiographical Writings*, ed. Peter Demetz (New York, NY: Schocken, 1986).
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104. Sodikoff, “Multispecies infrastructure,” 103.
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