Rural Disease Knowledge

Anthropological and Historical Perspectives

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1 Introduction

The Scales, Subjects, and Politics of Rural Disease Knowledge

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1 Introduction

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One snowy night, a doctor arrives at a rural house where a young man lies dying. His family, neighbors, and even horses approach the bedside, wanting to observe and touch the doctor. The priest was replaced by the doctor in rural settings, reasons our hero, as the figure that brings hope and redemption. But, in the end, the doctor's thaumaturgic powers fail: he devises no cure for the sick, and he needs to run away, fearing for his own life.[1] The short novel *A Country Doctor*, written by Franz Kafka in the last years of World War I is a nightmarish account of the struggles between faith and duty.[2] It can also be read as the antithesis of celebratory accounts of science and medicine, grasping both the symbolic and practical powers that physicians gained in a more secularized world, as well as their limits.

Kafka's novel also offers glimpses into the place of the rural in the history of medicine as a different perspective from that offered by urban-focused historiography. While not engaged in literary studies, this book takes its departure from some key points raised by Kafka's novel – animal–human relations, the asymmetries of power between doctors and patients in rural settings – reflecting upon the co-constitution of the rural and infectious diseases over the past 150 years. It asks: how have human interactions with infectious diseases impacted ways of knowing and acting on rural spaces and environments? How has the rural been configured as a space of health and sickness? And, in turn, how have human interactions with the rural impacted ways of knowing and acting against infectious diseases? Moreover, which role did rural landscapes, both as spaces for sanitary interventions and as places of medical knowledge, play in the emergence of microbiology and tropical medicine? What role did rural communities play in the emergence of rural disease knowledge? Was their knowledge on diseases integrated into this new scientific corpus, or did it challenge it? Finally, how have sanitary, microbiological, and epidemiological dynamics taking place in rural settings interacted with and co-participated in global processes such as European imperialism, capitalist expansion, or postcolonial Emerging Infectious Disease concerns and One Health projects?

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Rural Epistemic and Political Subjects

Scientific interest in rural environments and populations has developed into a global phenomenon since at least the mid-nineteenth century. From scientific studies of farming and plantations (agronomy) to national fairs in European countries exposing their rural communities to colonial expeditions in the hinterland of Africa, to scientific missions to the Amazon or the Andes organized by the newly independent Latin American republics, national states and global empires set forth to discover and render visible their rural environments and populations.[3] The reasons for this scientific interest in the rural were diverse, including an ever-expanding extractivist and agrarian capitalism, the need for agrarian and land reforms in different parts of the world, geopolitical strife, the expansion of sovereignty to loosely controlled lands and populations, and quenching social upheaval manifesting outwith and challenging urban centers of power and legitimacy.[4] This global movement of scientifically framing and understanding the rural allowed the expansion of urban-focused political infrastructures and ideologies to rural settings, and the integration of rural societies and their economies to national and global governmental and financial systems, instituting between the urban and the rural an acceleration in the exchange of goods, people, and in some cases diseases.[5]

Medical doctors and public health experts were significant agents of this process of scientifically reconfiguring the rural on local, national, and global scales. Medical experts followed the march of imperial and national armies as well as capitalist corporations, and led scientific missions exploring the hinterland.[6] They also settled in rural areas – either voluntarily, like the fictional Charles Bovary working in early nineteenth-century rural Normandy in Flaubert's masterpiece, or as political exiles, like Carlo Levi in southern Italy under Mussolini's fascist regime; an experience narrated in his memoir-novel *Christ Stopped at Eboli*.[7] Encounters between doctors and rural landscapes or populations produced comparisons between the health status of rural and urban areas, and invested rural environments with particular epidemiologies while also contributing to understandings of disease and illness in rural settings as a result of particular political regimes or political economies. In most cases, medical experts became vocal advocates of sanitizing the countryside in Europe and the Americas, and of enforcing a separation between the countryside and cities in the colonies, to protect the white populations living there.[8]

The epistemological consequences of the encounter between medical doctors and rural landscapes or populations around the world over the last 150 years are variated and complex. Nonetheless, a heuristic periodization may help readers follow the studies presented in this volume. The first period examined in this book, between the 1880s and the 1920s, saw a transformation in the pathologization of the rural informed by the bacteriological revolution.[9] Medical framings of rural settings shifted away from

filth- or miasma-oriented etiologies and towards paradigms relying on the identification of micro-organisms such as the trypanosomiases responsible for sleeping sickness and Chagas disease in South Africa and Brazil respectively or, in the case of veterinary medicine, rinderpest in herds across the globe.[10] Rather than simply transporting an epistemic framework developed in urban centres to the countryside, this was a process of research on and in rural areas, leading to the unsettlement of urban-sited bacteriology and, subsequently, to the rise of new scientific concepts. For example, sustained medical research on diseases in rural areas across the globe led to the emergence and development of the concepts of the disease reservoir and the carrier state as mechanisms of disease maintenance and latency.[11]

The rural became thus a privileged space for microbe-hunters, fostering individual careers and the institutionalization of microbiology, veterinary medicine, and tropical medicine. At the same time, it became the basis for the development of new forms of medical thinking, epidemiological reasoning, and sanitary interventions. In this first period, the rural thus came to be integrated into what medical historians have problematized as the bacteriological-sanitary synthesis that defined medicine, public health, and epidemiology at the turn of the nineteenth century.[12] This was more often than not a synthesis underlined by racialized understandings of infectious diseases and a modern imaginary of the rural as a backward place, which was not only spatially but also temporally distanced from cities – a place where non-modern/pre-modern ways of life and, more precisely, a lack of what Ruth Rogaski terms "hygienic modernity" supposedly led to a proliferation of diseases.[13] The identification of new diseases or the reconfiguration of old ones as "rural", coupled with the framing of their imagined social or even civilizational causes, transformed the rural into a space for hygienic intervention controlled and directed by elites based in urban areas across the globe. These interventions took the form of sanitizing rural areas by means of a range of "intrusive interventions" such as the use of vermifuges, the "improvement" of housing and sewage systems, and human and animal vaccination – interventions that often involved violence and the destruction of local and Indigenous ways of life.[14]

During the second heuristic period, between the 1920s and the 1960s, the sanitization of the rural continued in several parts of the world, yet the scientific drive for discovery of new micro-organisms in rural areas gradually gave way to another scientific passion: discovering and describing therein the unique ecologies of diseases that may or may not also be present in cities. This was particularly true in the case of yellow fever and plague, diseases that had been studied intensively by microbiologists and tropical medicine-informed scholars since the end of the nineteenth century. Up until the 1920s, research conducted mainly in cities pointed out that rats and their fleas were responsible for spreading plague, and that the *Aedes aegypti* mosquito was the vector of yellow fever.[15] However, studies conducted on rural areas worldwide in the 1920s and 1930s showed that,

alongside their urban forms, both yellow fever and plague were involved in another epidemiology, where the disease circulated among wild animals.[16] In the case of plague, this alternative form was referred as "veld", "rural", "wild rodent", or more commonly "sylvatic plague", while in the case of yellow fever it was named "jungle" or "sylvatic" yellow fever.[17] Sylvatic yellow fever was found among primates and marsupials in tropical rainforests areas of South America and Africa, whereas sylvatic plague was commonly identified among wild rodents in steppe- or desert-like areas around the world.[18] The discovery of sylvatic diseases and the broader disease-ecological approach called for an intensification of the sanitation of the rural areas adjacent to the regions where zoonotic and insect-borne diseases in particular were considered prevalent. This was achieved by new forms of sanitation, including a more systematic separation between urban and rural spaces – for example, by means of the creation of rodent-free belts in South Africa and the separation of the rural from "wildlife" by means to house-improvement in the backlands of Brazil in the 1940s or in Java in the 1920s and 1930s.[19]

Finally, from the 1970s until the third decade of the twenty-first century, a new period has taken shape, leading to the framing of the rural through the lens of Emerging Infectious Diseases.[20] In this new phase, the rural again became the space where new micro-organisms came to be discovered and, more importantly, where they first "spilled over" to human populations – such as, most iconically, in the case of Ebola. Imagined to be located "elsewhere", particularly in East/Southeast Asia or Sub-Saharan Africa, the rural was situated between "nature" as a vast, primeval microbial reservoir, and "culture" (that is, cities) as the site of civilization, thus becoming the perilous threshold of disease emergence and, ultimately, of the "next pandemic".[21] No longer part of imaginaries of bucolic Arcadia or of a space whose sanitary conditions were only a threat to the communities living within it, the rural was by the end of the 1990s transfigured into the ground zero of an always approaching and always deferred human extinction.[22] This pandemic imaginary was well represented in the blockbuster film *Outbreak* (1995). In its first scenes, an Ebola-like virus jumps from monkeys to humans in a small African village in the middle of the "tropical jungle". Profiting from several networks of globalization, the virus quickly arrives at what the culture industry assumes to be the seat of modern civilization, the United States, causing an outbreak whose destructive potential is eventually halted thanks to the timely intervention of the Centers for Disease Control and Prevention (CDC).[23] In this manner, the exotic and pathogenic rural space of bush meat markets in Africa and wet markets in China comes to be juxtaposed to the sanitized rural space of farmers' markets in Provence or in the Cotswolds. Whereas the latter represent a glocal space where disease has been conquered, the former represent a glocal space where diseases continue to emerge, due to social practices and interspecies relations that are imagined to be neither traditional nor modern.[24]

This heuristic periodization showcases two key tensions explored in this edited volume: the first related to the place of the rural within the global production of medical and epidemiological knowledge, and the second concerned with the role of rural communities in the emergence and negotiation of this knowledge.

At the turn of the twentieth century, a new historiography of science, and more recently of knowledge, has convincingly argued for the need to overcome Europocentric and diffusionist approaches to give way to analyses paying attention to the circulation of experts, scientific objects, and ideas, and to the global construction of science.[25] This historiography has argued that cities, and in particular global metropoles such as Amsterdam, Kolkata, London, and Mexico City, were the locus *par excellence* of intercultural exchanges, and therefore where new scientific knowledge emerged.[26] In these historical accounts, the rural is almost always absent.[27] Nonetheless, as the chapters of this book show, the rural was in fact a vital space for the encounter between experts and those they saw as non-experts. These interactions, both violent and collaborative, produced new medical and epidemiological knowledge and knowhow. Although the importance of cities, their institutions, and actors is beyond doubt, this volume highlights the emergence of the rural not simply as an object of medical and epidemiological research or public health intervention, but also as a place where new knowledge emerged, became negotiated, and assumed global proportions and consequences.

The historiography of science and knowledge has also become more attentive to local or Indigenous knowledge, which has been the subject of anthropological studies since the nineteenth century.[28] Fostered by a broader drive for decolonization, the bourgeoning interest in the role of the subaltern and the colonized, particularly in the production of science, has placed renewed emphasis on both the autonomy of non-Western medical knowledge and the role played by non-Western systems of knowledge in the emergence of modern science and medicine.[29] From botanical and healing knowledge and practices among slaves in plantations in Brazil or the Caribbean, to knowledge of animal diseases among pastoralists in East Africa, analytically bold and historiographically pathbreaking studies have come to highlight rural spaces and rural communities, as well as multispecies entanglements in rural settings, as key to the emergence and negotiation of biomedical knowledge.[30] At the same time, anthropologists have shown that the adoption of local or Indigenous corpuses of knowledge by medical doctors has often involved processes of epistemological enclosure and, in some cases, has resulted in increased biopolitical violence against local and Indigenous lifeways.[31] As a result, while it is important to examine how local and Indigenous knowledge has impacted and shaped medical science, we should remember that its impact has always occurred within a context of hierarchies of power and knowledge, which have more often than not involved a significant degree of physical violence used or in reserve on the part of the representatives of science. This is something about which we need to be mindful, not only in the case of

Indigenous–colonizer relations, but also in the case of rural-urban relations, even when these take place in non-colonial contexts. While rural epistemic agency is something that deserves more attention, and that is examined in detail in a number of chapters in this volume, we must not lose sight of the historically instituted epistemic and political asymmetries between the urban and the rural, which have resulted in the rural being seen as a milieu that needs to be scientifically known and governed.

The Chapters

Rural Disease Knowledge consists of nine chapters in addition to this Introduction, showing both the production of rural disease knowledge by doctors, epidemiologists, veterinarians, and other medical experts, and the ways in which rural communities have played a central role in the emergence of this knowledge in different contexts and chronologies. Employing historical and anthropological methods, but also exploring analytical crossovers between the two, these chapters were first presented as papers at the "Rural and Agrarian Disease Knowledge: Historical and Ethnographic Perspectives" workshop held on 4 November 2022 at CRASSH, The University of Cambridge. The workshop was co-organized by the Wellcome-funded project "The Global War Against the Rat and the Epistemic Emergence of Zoonosis" (University of St Andrews) and the ERC-funded project "The Global as Artefact" and the Centre for Global Knowledge Studies (*gloknos*, University of Cambridge).

The first three chapters of the book delineate what we heuristically call the first period of configuring rural disease knowledge, characterized by the discovery of new pathogens in the rural and by attempts to sanitize rural areas – two processes intellectually informed by hygiene, bacteriology, and tropical medicine. In Chapter 2, Jacob Steere-Williams explores the historical development of field epidemiology and the meanings of the qualitative "field" in the discipline. Shifting the focus away from the locus classicus of John Snow's investigation on cholera in London or studies on infectious diseases outbreaks in British colonies, Steere-Williams argues that field epidemiology became a scientific "field" in Britain. This, he argues, was mainly thanks to outbreak investigations of diseases such as sheeppox or typhoid carried out in the British countryside, which put British doctors and British rural communities into contact. Steere-Williams thus shows that these rural outbreak investigations were central to the disciplinary formation and boundary defence of field epidemiology, while at the same time highlighting tensions about whether epidemiologists are experts due to their outsider status or to their intimacy with the places where outbreaks occur and the people who live there.

In Chapter 3, Jules Skotnes-Brown examines the question of the encounter between diverse forms of expertise in a rural area through a different angle, focusing on a colonial context: late nineteenth-century Zululand, South Africa. The chapter examines meticulously the discovery of the causes of nagana, a

disease provoking emaciation and death in cattle and other animals, which the Bruces identified to be a trypanosome commonly living among wild game transmitted to domestic animals by the tsetse fly. Commonly seen as a landmark in the early history of tropical medicine and bacteriology, Skotnes-Brown argues that this discovery was only possible thanks to the exchanges between David Bruce and his wife Mary Bruce with Zulu farmers and white settlers in Zululand, who provided the Bruces with epidemiological theories, experimental animals, and manual labor. However, despite making major strides, Sktones-Brown concludes that the Bruces' work offered almost no relief for the farmers of Zululand, while the scientific contributions provided by local farmers were racialized and eventually forgotten.

In Chapter 4, Maurits Bastian Meerwijk introduces readers to a far less studied or known colonial context, the Dutch East Indies. He examines the political uses of the treatment against yaws, a disease considered to be endemic among rural communities in tropical areas. Differently from the case examined in Chapter 2, Dutch colonists had a solution to yaws in rural Java: salvarsan, a drug initially invented to treat syphilis. As discussed by Meerwijk, in Java salvarsan played the role of a "tool of empire" – but not as one would expect.[32] Indeed, instead of protecting European colonizers, as the distribution of quinine aimed to do in the case of malaria, salvarsan was used to treat patients from local communities in rural Java. Drawing upon a rich visual material and archive, Meerwijk argues that yaws and the stunning effects of its treatment by salvarsan were used as propaganda by Dutch colonial doctors targeting rural communities, aiming to make the local populations of Java recognize the advantages of biomedicine and accept Dutch colonial rule.

Focusing on South America and Africa, the next four chapters discuss how different rural settings became the scene of investigations on disease ecology, the main distinctive characteristic of the second heuristic period on the development of rural disease knowledge. In Chapter 5, Juan Pablo Zabala shifts the focus of colonial contexts as examined in the previous chapters, introducing the reader to Argentina. Focusing on Salvador Mazza and his investigations on Chagas disease in rural areas of Argentina, Zabala showcases the epistemological and social tensions that can arise from the encounter between urban-trained experts and the rural communities of their countries. Chagas disease, first described by the physician Carlos Chagas in the Brazilian hinterland in 1909, was believed to be absent from Argentina until the late 1920s, despite some indices in the opposite direction. Thanks to cognitive and social strategies developed by Mazza, and not without controversies, Argentina eventually recognized the existence of Chagas disease among rural communities in the north of the country. The identification of Chagas disease in Argentina, argues Zabala, led to an increased pathologization of rural communities and their habitations, which were framed by Mazza as the main habitat for Chagas disease's vector, the Triatoma bug, also known as the *vichucha*.

Examining a different episode of rural disease knowledge production, in Chapter 6 Christos Lynteris follows plague to the Argentine hinterland, and in particular the Northwest regions of the country, where by the 1920s the disease was believed to have taken a rural form. Lynteris examines the shift of epidemiological attention on plague from urban to rural settings in the South American country, and how this necessitates new methods and forms of knowing the disease. Following the emergence and transformations of the notion of "rural plague" and its gradual epistemic distinction from sylvatic plague, the chapter pays particular attention to how rats, wild rodents, forms of habitation, agricultural ecologies, and agrarian economies were brought together to epidemiologically reason about a regional manifestation of plague that seems to escape urban-led and urban-situated framings of the disease.

In Chapter 7, Gregg Mitman examines the reframing of yellow fever and its ecologies from an urban disease into a sylvatic one, a process connecting research carried out in North and South America and West Africa with physicians, rural communities, and primates found to be the reservoir of the sylvatic form of yellow fever. Mitman shows how the crafting of "jungle" or "sylvatic yellow fever" by Rockefeller Foundation scientists turned the Guinean Forests of West Africa into a zone of endangerment and a resource frontier in advancing the careers of Western scientists. In the search for sylvatic yellow fever, concludes Mitman, knowledge and ways of being collided in a struggle over who had access to and control of the forest and its rich resources.

Chapter 8 brings the reader to the Brazilian backlands, a semi-arid region where plague became endemic from the 1930s. Matheus Alves Duarte da Silva follows the construction of opposing explanations for plague endemicity in this region by the Chilean doctor Atilio Macchiavello in 1939 and 1940, and José Maria de la Barrera in 1957 and 1958. The chapter argues that both experts considered the backlands' semi-arid characteristics as partially explaining plague endemicity: in Macchiavello's explanation, recurrent droughts forced interactions between rural communities and rats; for de la Barrera, the interactions were between rats and wild rodents. Silva argues that Macchiavello's and de la Barrera's epidemiological explanations were constructed only due to interactions between them and Brazilian doctors, as well as backlands rural communities that provided the experts with information about rodents and their behavior. By showing the backlands and their rural communities as central to produce rural disease knowledge, this chapter helps to defuse a pervasive perception seeing this region as backward and isolated from Brazil and the rest of the world – a position that gained force after the publication of Euclides da Cunha's 1902 book *Rebellion in the Backlands*.

Drawing upon ethnographic investigations, the last two chapters present contemporaneous ethnographic studies in which the rural is both a space of production of knowledge and a location of tensions between diverse systems

of knowledge. In Chapter 9, Lina Beatriz Pinto-Garcia examines explanations for cutaneous leishmaniasis etiology and practices of treatment against it mobilized by Indigenous people, *mestizo* communities, and physicians in a context of civil war and later fragile peace in Colombia. Leishmaniasis is a common, and in most cases benign, disease in rural forested areas. These areas have also been the epicenter of conflicts between the state and guerrillas, which led leishmaniases to be considered a "guerrilla disease". Pinto-Garcia's chapter criticizes this prejudicial notion and shows that a wide variety of non-biomedical knowledges and practices address the needs of combatants and civilians with leishmaniasis in these rural areas, despite an official public health approach centered on injections of Glucantime, a highly toxic pharmaceutical. Therefore, concludes Pinto-Garcia, rather than being a cultural barrier to biomedical approaches to the disease, rural disease knowledge – in this case, alternative treatments – can contribute to less-hostile ways of managing a mostly benign pathology in the still violent, post-conflict context of Colombia.

Providing several points of dialogue with Chapter 9, in Chapter 10 Caroline Mwihaki Mburu and Kathrin Heitz-Tokpa examine the tensions between experts and agropastoralist communities in the context of brucellosis management in Tanzania. Mburu and Heitz-Tokpa show that agropastoralists are usually seen by veterinarians and other experts as most at risk of contracting brucellosis due to their proximity to livestock. Moreover, the knowledge of these rural communities is regarded by these experts as a barrier to the effective uptake of technoscientific advances to brucellosis control. However, Mburu and Heitz-Tokpa demonstrate that agropastoralist communities' knowledge is rooted in their socioecological context and in a social identity based on cattle–human relations. They argue that knowledge of the rural communities and their way of life must thus be integrated into official politics of disease management.

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Notes

1 Kafka, "A Country Doctor".
2 Manson, "A Theology of Illness".
3 Clark, "Bugs in the System"; Overton, *Agricultural Revolution in England*; Ross, "The Plantation Paradigm: Colonial Agronomy", Hecht, *The Scramble for the Amazon*; Diogo and Laak, *Europeans Globalizing*; Capocci and Cozzoli, "The Global Dimensions of the Rome Zoological Garden and Italian Colonialism in Africa"; Poole, *Vision, Race, and Modernity*; Tilley, *Africa as a Living Laboratory*; Beinart, *The Rise of Conservation in South Africa*.
4 Clark, *The Roots of Rural Capitalism*; Cunha, *Os Sertões*. Hecht, *The Scramble for the Amazon*; Kulikoff, *The Agrarian Origins of American Capitalism*; Nugent, *The Rise and Fall of the Amazon Rubber Industry*; Summerhill, *Harvest of Dissent*; Darrow, *Tsardom of Sufficiency, Empire of Norms*; Zhan, *The Land Question in China*.
5 Klein, "Plague, Policy and Popular Unrest in British India"; Benchimol and Silva, "Ferrovias, Doenças e Medicina Tropical no Brasil da Primeira República".
6 Anderson, *Colonial Pathologies*; Cukierman, *Yes, Nós Temos Pasteur:* Lachenal, *Le médicament qui devait sauver l'Afrique*.
7 Flaubert, *Madame Bovary*; Levi, *Cristo si è fermato a Eboli*.
8 Cueto, *El Regreso de las Epidémias*; Hochman, *A Era do Saneamento*; Karen Sayer, "The 'Modern' Management of Rats"; Coghe, "Reordering Colonial Society"; Vaughan, *Curing Their Ills*; Seeley, "Cattle, Viral Invasions, and State-Society Relations in a Colonial Korean Borderland"; Aloni, *The League of Nations and the Protection of the Environment*, chapter 3.
9 Chakrabarti, *Bacteriology in British India*; Steere-Williams, *The Filth Disease*; Hooker and Bashford, "Diphtheria and Australian Public Health"; Ford, "Keeping the Country Clean"; Cueto, "Tropical Medicine and Bacteriology in Boston and Peru"; Atkins, "The Pasteurisation of England"; Lowy, *Virus, moustiques et modernité*".
10 Kropf, *Doença de Chagas, doença do Brasil*; Waller, "'Clean' and 'Dirty'"; Moussier (ed.), *Les animaux malades*; Vallat, *Les bœufs malades de la peste*; Woods et al., *Animals and the Shaping of Modern Medicine*.
11 Gradmann, "Robert Koch and the Invention of the Carrier State"; Silva et al., "Introduction: Disease Reservoirs".
12 Barnes, *The Great Stink of Paris*; Lynteris, "A 'Suitable Soil'"; Worboys, *Spreading Germs*.
13 Rogaski, *Hygienic Modernity*; Angela Leung and C. Furth (eds.), *Health and Hygiene in Chinese East* Asia; Packard, *A History of Global Health*; Sergent and Sergent, "Etudes épidémiologiques et prophylactiques du paludisme en Algerie"; Palmer, *Launching Global Health*.
14 Mooney, *Intrusive Interventions*; Palmer, *Launching Global Health;* Woods et al., *Animals and the Shaping of Modern Medicine*.
15 See, among others, Benchimol, *Dos Micróbios aos Mosquitos:* Löwy, *Virus, moustiques et modernité*; Echenberg, *Plague Ports:* Engelmann and Lynteris, *Sulphuric Utopias*.
16 Jorge, "Les faunes régionales des rongeurs et des puces dans leurs rapports avec la peste"; Soper, "The Newer Epidemiology of Yellow Fever".

17 On plague, see Teh, "Investigations into the Relationship of the Tarbagan (Mongolian Marmot) to Plague"; Pirie, "Plague on the Veld"; Jorge, "Les faunes régionales des rongeurs et des puces dans leurs rapports avec la peste"; Meyer, "The Sylvatic Plague Committee". For context, see Silva, "Between Deserts and Jungles"; Lynteris, *Ethnographic Plague*. On yellow fever, see Soper et al., "Yellow Fever without Aëdes Aegypti"; Soper, "The Newer Epidemiology of Yellow Fever". For context, see Quevedo et al., "Knowledge and Power": Magalhães, *A erradicação do Aedes aegypti*.
18 Jorge, "Les faunes régionales des rongeurs et des puces dans leurs rapports avec la peste"; Soper, "Jungle Yellow Fever"; Pan American Health Organization, *Plague in the Americas*.
19 Skotnes-Brown, "Preventing Plague, Bringing Balance"; Silva, "A Global War against Wild Rodents," 193–197; Meerwijk, *A History of Plague in Java*.
20 King, "The Scale Politics of Emerging Diseases".
21 Caduff, "Pandemic Prophecy"; Lynteris, "Zoonotic Diagrams"; Sodikoff, "The Multispecies Infrastructure of Zoonosis".
22 Lynteris, *Human Extinction and the Pandemic Imaginary*.
23 For an analysis of this and other "outbreak narratives", see Wald, *Contagious*.
24 Lynteris, *The Pandemic Imaginary and Human Extinction*; Keck, *Avian Reservoirs*; Fearnley, *Virulent Zones*; Roth, "Researching the Ebola Reservoir with the Heuristic of the Fetish in Guinea".
25 Secord, "Knowledge in Transit"; Sivasundaram, "Sciences and the Global"; Raj, "Beyond Postcolonialism … and Postpositivism"; Silva, Haddad, and Raj, "Science and Empire".
26 Gruzinski, *Les quatre parties du monde:* Romano and Van Damme, "Science and World Cities"; Raj, *Relocating Modern Science*.
27 An outstanding exception is Laveaga, *Jungle Laboratories*.
28 Dubald and Madruga, "Introduction: Situated Nature".
29 Schaffer et al (eds.), *The Brokered World*; Boumediene, *La colonisation du savoir*.
30 Kaori Kodama et al., "Mortalidade escrava durante a epidemia de cólera no Rio de Janeiro"; Gómez, *The Experiential Caribbean*; Mavhunga, *The Mobile Workshop*.
31 Lynteris, *Ethnographic Plague*; Brown, Ainslie and Beinart, "Animal Disease and the Limits of Local Knowledge"; Hinchliffe, "More than One World, More than One Health"; Lynteris, "The Figure of the Staggering Rat".
32 Headrick, *The Tools of Empire*.

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