

University of Cambridge
Department of Social Anthropology

The ‘truth about Ebola’: Insecure epistemologies in post-outbreak Forest Guinea

This thesis is submitted for the degree of Doctor of Philosophy.

by

Emmanuelle Roth

King’s College

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Abstract:

This dissertation examines the ways in which the ‘truth’ about an outbreak of zoonotic disease stabilises through the labour of sampling animals. While scarcely any case of Ebola had ever been reported in West Africa, the deadliest epidemic to date started in 2013 in the southeastern region of Guinea called ‘Forest Guinea’. Since then, ecologists and virologists from Africa, America and Europe have been conducting the largest investigation into what some frame as the origins of Ebola: they are trying to establish a fuller picture of the processes by which the disease is maintained and infects humans in a place that has become known as one of its ‘hotspots’. During 16 months of ethnographic fieldwork, I closely tracked the Guinean staff of one of those foreign projects – local vets who professionally defined their role as *préleveurs* (‘samplers’ in English) – while they captured animals, took, and dispatched fluid samples, communicated about the risks of contact with bats, and disclosed the finding of a new species of Ebola virus in bat species. The social sciences have dismantled the idea of singular, hegemonic epidemic origins, and indicated that complex sociospatial conditions allow for epidemics to emerge. This dissertation adopts a different analytical angle and outlines the technological, epistemological, and affective consequences of framing microbiological research as a search for the origin of epidemics. It focuses on the economy of knowledge, epistemological labour, and ethical aspirations of animal *préleveurs*, whose work is to make a hotspot exist in Forest Guinea. By combining attention to history, the scientific literature and ethnographic fieldwork, I resituate animal sampling within a West African genealogy of asymmetrical extraction and conservation, which crosscuts the colonial sciences, interwar disease ecology, global health, outbreak preparedness, and the newer One Health agenda. At the core of this multifaceted sampling enterprise is an interdependence between anticipatory practices and forms of insecurity – political, economic, environmental. The thesis suggests that insecurity is normalised by hotspot investigations, and that associated social hierarchies, causalities and moralities inflect the local notion of responsibility for the epidemic. Ultimately, insecurity configures the production of evidence about the so-called reservoir of Ebola and leads the hypothesis of a bat origin to gain strength in Guinea. The dissertation chapters foreground the controversies, dissimulation practices, fear, and cynicism that the quest for epidemic origins elicits locally, even as it contributes to imposing a single narrative for disease causality. In so doing, I challenge a social science view that scientific claims become authoritative when the institutions and practices that manufacture them are socially recognised as trustworthy and legitimate, i.e., secure. Instead, insecurity is entangled in the material performances and ethos of *préleveurs*. Far from only producing scientific evidence for experts, their activity generates clues about Ebola’s origins for many people in Guinea and Africa more generally – with significant consequences for research priorities and prevention policies.

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Introduction

It was in 2017, they told me, at the end of the dry season. A team of *préleveurs* came for the first time to Koropara, a subprefecture capital in the southeastern region of Guinea known as Forest Guinea. A year had passed since the Ebola disease unexpectedly resurfaced in the subprefecture, a few months after the country declared the end of the outbreak for the first time. In May 2016, a heavy response was co-ordinated from Koropara itself, involving doctors, epidemiologists, logisticians, military escorts, and anthropologists. The Minister of Health, a Forest Guinea native, had been flown in by helicopter, but the inhabitants of Koropara ran away when hearing the engine, allegedly because they feared that planes were coming to bombard them. Because PREDICT *préleveurs* knew that ‘foreigners’ (anyone not a native of Forest Guinea) who came with medical projects and four-wheel drives were still not very welcome in the region, they stayed on their guard while unloading crates of hazmat suits, lab equipment, mice traps, and nets. They informed the inhabitants of their activities in the municipal meeting room, local elders gave them kola nuts as a token of hospitality, and the local authorities authorised them to capture rodents and bats on their land and extract samples from them.

The next day in full daylight, the sampling team set to work and brought rats to the field laboratory they had organised behind their guest house and encircled with barricade tape. One *préleveur*, after donning a hazmat suit, transferred a mouse from a trap to a plastic bag and on to a sampling tray cluttered with pipettes, cryotubes, scissors, and a hazardous waste container. Another one dexterously inserted cotton swabs in the animal’s mouth and anus. They then cut off the tip of its tail to collect a few drops of blood. Finally, they laid the mouse on the table, gently patting its head with a gloved hand.

Versions differ as to what happened next. Either the mouse woke up and swiftly escaped into the tall grasses. Or it was released a few metres away from the field lab by a *préleveur*. Either way, the animal’s flight seemingly caused the crowd of bystanders to rustle, as curiosity gave in to animosity. A boy shouted in Kpelle: ‘Did you see them, did you see them? They injected the virus! They freed the mouse!’

~

This dissertation is an ethnography of Guinean animal *préleveurs*, teams of professionals who sample mostly animals considered wild for research on emergent viruses. It closely tracks the

field agents working for a US scientific consortium called PREDICT, in their quest for what they see as the origin of Ebola in their country, where the West African outbreak began in 2013. The chapters follow their steps as they successively ponder on locations adequate for capturing animals, painstakingly convince local residents to place traps on their property, take off their gloves to manipulate bats without hurting them, implement a communication campaign about the risks of eating bushmeat, and debate the sensitivity of disclosing the finding of a new species of Ebola virus. Meanwhile, they reflect upon, question, and act on what caused and who is responsible for the disease that killed more than 11,000 out of close to 30,000 cases between 2013 and 2016. The dissertation investigates the technological, epistemological, and affective consequences of framing microbiological research as a search for the origin of epidemics and reservoirs of infectious diseases. Through exploring the tensions among *préleveurs*, and between them and bystanders, as well as the ethics of secrecy that pervade their practices and their avowals of powerlessness at preventing future outbreaks, I examine what the discourse of origins does locally, and what it elides. What does it mean to live and work in a disease ‘hotspot’ for those whose work is to make that ‘hotspot’ exist? What does the way of knowing, or rather the way of questioning, entailed by research into disease origins enable and foreclose? My research asks why and how this kind of knowledge has gained prominence over others in Forest Guinea, and how it depends on the particular ways that people have historically developed to deal with insecurity.

A. Ebola stories

Biomedical experts deem Ebola virus disease (formerly known as Ebola haemorrhagic fever) as a viral infection that symptomatically manifests through fever, body aches, vomiting, diarrhoea, and occasionally internal and external bleeding (Feldmann, Wahl-Jensen, Jones & Ströher 2020; Jacob *et al.* 2020). For the virologist, Ebola is caused by an RNA virus of the genus *Ebolavirus*, a genus which falls within the filamentous-looking family of filoviruses.¹ The virus is transmitted to humans by contact with the body fluids of infected humans or other animals. After an incubation period of up to twenty-one days, the disease starts as the virus replicates and impairs the immune system and the liver and kidney function. It may ultimately

¹ According to taxonomy conventions, the name of the genus *Ebolavirus*, which six known species of ebolaviruses belong to, is written capitalised and italicised. In the rest of the dissertation, I use ‘Ebola virus’ to refer to the genus, and to species names without adding their genus. ‘Bombali virus’ thus corresponds to what scientific publications designate as *Bombali ebolavirus*.

cause death by shock from fluid loss or multiple organ failure: typically, 25% to 90% of those infected die, with an average rate of about 50%.

This exceptionally high fatality rate, and a popular imagery of zombie-like patients bleeding to death (Preston 1995), have conferred on the pathogen the status of ‘emerging infectious disease’ (EID), emblematic of global health politics from the 1990s onwards. It is in the United States that a report by the National Academy of Science’s Institute of Medicine, followed by international meetings, the creation of scientific journals, and popular publications, founded what historians have termed the ‘EID worldview’ (King 2002; 2004; see also Méthot & Fantini 2015; Weir & Mykhalovskiy 2012). Ebola, or rather the hypothesis of an ‘airborne Ebola’, directed a US outbreak simulation exercise in Honolulu in 1989. The media coverage on Ebola outbreaks in the Democratic Republic of the Congo in 1995 enshrined the idea that, due to always-mutating viruses and human activity, infectious diseases, inevitably surging, presented a key threat to the global economy and to American security (Lakoff 2008). It was foremost feared that these threats could be weaponised for terrorist purposes. In the summer of 2014, the spectre of Ebola as a global catastrophe was resurrected by the West African epidemic, when international and national health agencies lobbied for an intensive and co-ordinated response to what had become a global health emergency.

The geographic and temporal origins of this emergency were traced back to December 2013 in Méliandou, a smaller village of Forest Guinea close to the country’s border with Sierra Leone, Liberia, and Côte d’Ivoire. A two-year old boy named Émile Ouendeno is said to have been playing near a hollow tree on a warm afternoon while his mother washed clothes in the nearby river. He died one week later after a bout of fever and bloody diarrhoea and would be identified as the index case of the first recorded outbreak of Ebola in West Africa, historically the largest Ebola epidemic (Baize *et al.* 2014).² As scientists assumed that the epidemic had a zoonotic source, meaning that the first victim had become infected by an animal, the Robert Koch Institute sent veterinary epidemiologists to conduct a retrospective study of the outbreak’s source in Méliandou (Sáez *et al.* 2015). They concluded that the boy had probably contracted the disease after consuming a fruit bat, occasionally consumed by local people. Or, and they judged this second hypothesis more probable, he had been exposed to the dejections of insectivorous bats that happened to roost in the hollow tree. The story, in various iterations, was

² It seems nevertheless that haemorrhagic fever viruses have been circulating in the region for a longer time, as indicated by serological studies performed in the area in the 1980s already (Boiro *et al.* 1987, Schoepp *et al.* 2014).

consecrated by multiple reports in the international media as the ‘origin of the Ebola epidemic’ (Chonghaile 2014; Coen & Henck 2014; Sack, Fink, Belluck & Nossiter 2014).

Ebola’s origin is not only geographically associated with Méliandou: Forest Guinea became identified as a breeding ground of the disease, next to certain parts of Central Africa. The disease intensively circulated in Forest Guinea during the first months of the epidemic in 2014. The humanitarian NGO Médecins Sans Frontières set up a first Ebola Treatment Centre in the prefecture capital of Guéckédou in March, close to Méliandou; two centres more were later erected in the other Forest capitals of Macenta and N’Zérékoré. Cross-border movements were prohibited, and a hold was placed on customary burials, seen by specialists of Ebola to be disease-spreading events. Villages with case clusters were quarantined and monitored by internationally supported health workers; many villages without cases barricaded themselves against these workers. Violent confrontations with the response professionals were not rare: in September 2014 in Womey, for example, a village not too far from Koropara, eight health administrators and humanitarian workers were murdered, their bodies chopped up and thrown in a well. After spreading to Sierra Leone and Liberia, the epidemic subsided over the course of 2015, with pockets of cases persisting in Guinée Maritime until December, when health authorities declared the end of the outbreak for the first time. The virus flared up in Koropara only three months later. The end of the outbreak was celebrated a second and final time in June 2016, but the authorities and the World Health Organization (WHO) warned that a resurgence could not be excluded. Guinea was subjected to a period of heightened epidemic surveillance. Bureaucracy and biotechnologies conspired to prolong the event, a threat which long loomed over health structures and the relatives of Ebola survivors – an assemblage to which the PREDICT Ebola research, which began in 2017, belonged.

The agents of the outbreak response – Guinean health workers, European emergency co-ordinators, African WHO representatives, etc. – worried greatly about episodes such as the Womey killings, which they blamed for the protracted epidemic. This episode and other acts of violence, ranging from stoning the response vehicles, burning treatment centres, and attacking health workers, to the more generalised silent tactics of evasion, such as disrespect of quarantine by contacts and refusal to let the dead be buried by the Red Cross, were categorised by epidemic response workers as acts of ‘resistance’. Objectified through databases and mapping, the concept of resistance was employed, in 2014-5, to describe and count the incidents targeting health workers and response administrators (Calain & Poncin 2015; Pellechia 2017). Guinea and the Forest region in particular were singled out as the areas where incidents were most

severe and frequent (ACAPS 2015; Wilkinson & Fairhead 2017). ‘Resistance’ has a long history in such context: the term is part of the discursive formation of public health in the nineteenth century, which devalued, culturalised and blamed ‘non-compliance’ with biomedical prescriptions (Bulled 2017: 13). After WHO decreed the Ebola epidemic a public health emergency of international concern on 8 August 2014 and concerns for global biosecurity increased, reactions such as hiding the sick or secretly burying the dead were depicted in the media, and not infrequently in political discourses, as evidence that ‘unreason’ was driving the epidemic (Abramowitz 2017: 427). Acts that seemed at odds with public health prescriptions were seen as manifesting exotic ‘beliefs’. Epidemiologists (Jalloh *et al.* 2017; Yamanis, Nolan & Shepler 2016) undertook studies of the ‘Knowledge, Attitudes and Practices’ (abbreviated into KAP studies) in the affected countries, a genre common since the HIV/AIDS epidemic. They notably established that people’s ‘false beliefs’ about epidemic origins cause mistrust and non-observance of public health orders (Richardson, McGinnis & Frankfurter 2019; Roth & Raab 2020).

That epidemics activate processes of ‘othering’ is a phenomenon which has been excavated by historical and anthropological analyses in past epidemics (Farmer 1992; Cohn 2018), during the Ebola outbreak (McGovern 2014; Thys 2019) and in the current COVID-19 pandemic (Dionne & Turkmen 2020). In 2014-5, difference, seen as cultural or even racial, was blamed for the disease emergence (consumption of bushmeat, proximity with wild animals, and deforestation would have caused the outbreak) and epidemic spread (funerary rituals would contribute to the disease spread). ‘False beliefs’ also apparently obstructed epidemic containment: the ‘knowledge’ focus of KAP studies suggests that the difference – if difference there was – was cognitive. The origin narratives that circulated in Méliandou, where Émile was supposedly the first to fall sick, were derided as irrational by response workers, the media, and decision-makers. According to anthropologists who conducted research during the outbreak, the disease was indeed initially understood and acted upon as the effect of a malediction: serial deaths within a family unit were interpreted as the effect of a curse, or of transgressive contact with a ‘fetish’ that belonged to a sick person (Fribault 2015; Thys 2019). As the disease spread beyond the family unit, people began to speculate about other causes of instability, which they seemed to attribute to ‘the capriciousness of outsiders’ (Fairhead & Millimouno 2017). It was said that ‘white people’ had introduced Ebola to kill Africans, possibly through a measles vaccination campaign. In Méliandou, and elsewhere in West Africa, many epidemic origins stories pointed to the interest of powerful foreigners (Fairhead 2016: 21; Gomez-Temesio & Le

Marcis 2017: 81) – such as billionaire businessman Benny Steinmetz, who had just lost an iron ore mining licence in Forest Guinea on account of alleged bribery, or former humanitarian and French Minister of Health Bernard Kouchner, a long-time friend of President Alpha Condé. Some suggested that Ebola was a plot of the pharmaceutical industry to experiment and sell vaccines, and that the virus had escaped the laboratory of Kenema hospital, in Sierra Leone, where an American research consortium had been researching diagnoses for haemorrhagic fevers since the 1990s (Wilkinson 2017: 379). These conspiracies were said to feed the greed of the national elite and foreign industry, whose wealth increased through ‘Ebola business’ at the cost of what was sometimes denounced as a genocide of Africans.

A number of administrators and officials involved in the outbreak response read a causal relation between belief systems and health decision-making. They called for anthropologists to troubleshoot ‘resistance’ as cultural mediators by ‘deconstructing rumours’ amongst other tasks (Abramowitz 2017; Somparé 2020). Quite a few anthropologists contested this singling out of Ebola – its supposed breeding in exotic funerary rituals and irrational beliefs – which apparently required anthropological expertise in the ‘savage slot’ (Trouillot in Benton 2017: 501; M. Leach 2008). Some however did join the response and acted to translate and humanise its mechanics. Others sought to elucidate the reasons for distrust, and the rumours about epidemic origins and ‘Ebola business’. In his discussion of this body of anthropological work, anthropologist James Fairhead (2016) has emphasised two types of discourse. Evading the rhetoric of culture, one strand of anthropological analysis has highlighted the common sense, practical logic, and material scarcity that underpinned acts of apparent resistance (Faye 2015; Richards 2016). West Africans were only ‘rational’ when they accused response teams of spreading the disease, since conspicuous teams of outsiders took away their kin to Ebola Treatment Centres, where they died and were buried without being seen. Another anthropological stance has been to historically contextualise people’s reactions in a region where the physical landscape, religious practices, and existential fears were shaped by a violent history (Fairhead 2016). From this perspective, rumours about trade in body parts and ETCs stealing blood are imbricated in an extractive experience of encounters with the global, through slavery, colonisation, and depredation. This scholarly debate, which displays continuities with the anthropological critique of the notion of rationality since the 1970s (Tambiah 1990; Good 1994), proved relevant to elucidate the sense of actions which international and national response agents failed to grasp, and locally improve the quality of relationships between these agents and local people.

Nevertheless, I find that, past the emergency, these interpretative frameworks lose traction to elucidate everyday engagements – epistemological, political, and affective – with outbreak narratives and origin stories, and their mutation over time. Writing during the outbreak, anthropologist Adia Benton (2016) has commented on the proliferation of origin stories in West Africa and their intersections with issues of race, class, the political economy, and scientific knowledge production. Others have similarly noted the ‘semiotic excess’ inherent in Ebola (Kelly & Nading 2019; Herrick 2019) – that is, the pathogenic charisma of the disease, its capacity to generate an abundance of forms and fantasies. But in Méliandou, a few months after the village was affected by the disease, anthropologists James Fairhead and Dominique Millimouno (2017) noticed an exhaustion in the explanatory frameworks available for making sense of the disease. Émile’s father had been frequently asked by scientists to accompany them to the bush to trap wild animals. His neighbours and he had been interviewed several times about deforestation and the migrations of bat colonies. The anthropologists noted that ‘every aspect of the landscape ha[d] become tainted’ and the source of a diffuse anxiety.³ The two anthropological approaches highlighted above intersect in their rejection of disseminating scientific framings of disease origins as a solution to halt the outbreak (see also Chandler *et al.* 2015). But many Forest Guineans I met during fieldwork held that establishing the ‘truth’ about Ebola’s origins through enquiries such as in Méliandou would provide guarantees against a resurgence of the disease. In the immediate aftermath of the outbreak, environmental investigations in Forest Guinea would multiply, interlace with, and alter, this dissertation suggests, the stories that circulated about where Ebola originated, and crucially, where it had gone.

B. Situating PREDICT

Scientific investigations in Méliandou have not yielded strong conclusions about the source of the outbreak (Sáez *et al.* 2015). Epidemiological evidence about when and where a two-year old may have encountered a wild animal was sparse. The researchers had also undertaken an exploratory survey of local bat populations and collected ashes and soil samples around the tree, since burnt, that was reported to have housed a large colony of insectivorous bats. Since they found no antibodies or genetic material (RNA) in the collected animal and earth samples,

³ This stands in contrast with the post-Ebola situation in Northern Uganda, where anthropologist Sung-Joon Park (2021) noted that connections between the disease and soldiers coming back from the DRC were a ‘public secret’, a causality known in silence and obscured by the narrative of human-animal transmission.

the researchers ‘reiterate[d] the importance of broader sampling efforts for understanding Ebola virus ecology’ (ibid., 17). This declaration paved the way for broader investigations, which began almost simultaneously. Over the next five years, the French Development Research Institute, the World Organization for Animal Health with the French Agricultural Research Centre for International Development, the Russian Central Research Institute of Epidemiology, and the PREDICT project sent teams to scour Guinea, Sierra Leone and Liberia, and sample animals, primarily bat populations, in order to find the ‘origins’ of Ebola. They tried to establish a fuller picture of the processes by which the disease is maintained and infects humans in a region that has become known as one of its ‘hotspots.’ My thesis excavates the consequences of this costly international deployment of lab technologies, communication material, salaries, and people clad in biosecure equipment; and what its framing as a search for origins leaves out of the picture.

That outbreaks have an origin (variously referred to as a reservoir, a transmission event, or an index case) is a fundamental premise and epistemological hallmark of epidemiology, one that is congruent with what philosopher Michel Foucault termed a passion for origins, by necessity primordial and singular (2003 [1977]). Since the nineteenth century, scientists have been trying to reconstruct the immediate context of epidemic beginnings to find evidence of infection in the environment or activities of the supposed first victims of outbreaks (Steere-Williams 2014; Worboys 2011). They do not only seek to identify germs in laboratories: knowledge production about infectious diseases starts with investigations in the ‘field’ (Lynteris 2016a; Lyons 2002). Accordingly, an array of lab and field-based practices have been deployed since the first recorded epidemic of Ebola in the Democratic Republic of the Congo in 1976 (Arata & Johnson 1978; Leirs *et al.* 1999). Scientists have conducted large campaigns and sampled all sorts of mammals, birds, and arthropods in the vicinity of outbreak areas, mostly to no avail. Investigations progressively extended, outside epidemic times, to spaces yet unaffected by outbreaks but thought to display a comparable ‘ecology’ (Pourrut *et al.* 2009). This development operated a shift in research focus, from the epidemiological analysis of given outbreaks to the study of a disease ecology. The notion of disease ecology, in the early twentieth century, came to refer to integrative frameworks that purport to describe the medium- to long-term interrelations between populations that maintain a disease under specific environmental conditions (Anderson 2004; Méthot & Mason Dentinger 2016). By 2014 yet, infectious disease specialists still deplored that ‘knowledge of Ebola ecology [was] still limited’ (Caron, Cappelle, Cumming, de Garine-Wichatitsky & Gaidet 2015: 7; Goldstein 2016). Sampling efforts have

certainly narrowed down on bats since the finding of Ebola virus RNA in fruit bats collected in 2003 at the border between Gabon and the Republic of the Congo (Leroy *et al.* 2005). But the pattern of seropositive bat populations found since is patchy. Moreover, no fruit bat hunter has ever been epidemiologically identified as a patient zero in outbreaks, and crucially, live Ebola virus has never been isolated in bats. Thus, many scientists are not convinced that one or some species of bats act indeed as a reservoir of Ebola (Leendertz, Gogarten, Düx, Calvignac-Spencer & Leendertz 2016). Investigations during the 2013-6 Ebola outbreak have failed to give a fuller picture, and to disease ecologists, Ebola largely remains the ‘continuing mystery’ that it was before its unpredicted appearance in West Africa (Feldmann *et al.* 2004). But outbreaks recur (there have been seven more since 2013, the largest one in the DRC from 2018 to 2020), even though their seasonal, ecological, and sociohistorical patterns are a matter of debate. Consequently, many recent scientific articles conclude with prophetic calls and pleas for sustaining research efforts: because knowing better the ‘ecology of ebolavirus ... could help to predict future outbreaks, direct monitoring efforts and focus research attention on risky or vulnerable ecosystems’ (Ohimain 2016: 12).⁴ Insights into Ebola’s ecology have come to play an evidentiary role in the global health regime of attention.

One of the largest projects acting on that call has been PREDICT, a consortium project initiated by the American aid agency USAID in 2009 as a component of its Emerging Pandemic Threats (EPT) programme. The programme built on the agency’s investment in influenza research, a priority extended to the identification and surveillance of emerging zoonoses at the end of the 2000s (Morse *et al.* 2012), and supported PREDICT for a decade, until 2020. The project defined its goal as to ‘detect and discover zoonotic viruses with pandemic potential’ by establishing a comprehensive database of viral genomes and their animal reservoirs. PREDICT was presented to the public as pushing the field of ‘virus forecasting’ forward with new modelling strategies and open-source tools. In the end, the consortium sampled more than 160,000 animals (and, secondarily, people) in a decade, detecting 1,173 viruses ‘at their source’. It also investigated the ‘behavioural factors’ said to drive disease emergence and spread. In 2014, the West African Ebola outbreak coincided with a second phase of the programme. US President Obama launched the international Global Health Security Agenda (GHSA), a global health security move to accelerate the implementation of WHO international health regulations, in particular in countries targeted as disease ‘hotspots’ – at-risk locations. Millions of dollars

⁴ The ecosystem concept – the idea that flora and fauna interact with the environment to form a complex system – has been central to ecological thinking since the 1930s (Golley 1996).

earmarked for outbreak management were allocated by the GHSA to USAID and poured into what was named the Ebola Host Project, whose agents worked in Koropara in 2017.

From an institutional perspective, PREDICT participated in the displacement of global health priorities, away from controlling and segregating diseases at their geographical source, towards integrating these places in the surveillance networks that underpin the ‘emerging disease worldview’. Anthropologists have analysed the rise of technologies of outbreak preparedness since the 1990s, and the reliance of their anticipatory politics on the uncertainty, indeterminacy, and unpredictability of emerging viruses (Caduff 2015; Fearnley 2012; Lakoff 2010). Vigilant monitoring of viruses through what anthropologist Frédéric Keck (2020) calls ‘sentinel devices’ (passage points at which a pathogenic change may be detected, such as migratory birds, or syndromic disease surveillance systems) does not aim to trigger intervention, but to send early warning signals before viruses mutate or diseases spread. PREDICT fully endorsed this rhetoric when it began, in 2007, as a start-up known as the Global Viral Forecasting Initiative, founded by American virologist Nathan Wolfe. The project quickly became a multimillion-dollar venture with investments from Google, the US Department of Defense, and National Institutes of Health. It split into a philanthropic initiative and a profit-driven business, called Metabiota, which teamed up in 2016 with a German insurance company to provide analytics to investors on pandemic risk. Metabiota readily embraced the future-oriented predicament of contemporary global health and foregrounded the discourse of ‘viral forecasting’, a language which renders it attractive to insurance markets (Golomski 2013). PREDICT communication kept the emphasis on a ‘proactive’ rather than ‘reactive’ approach to pandemic prevention: its goal was ‘to reduce the spillover rate of virus into humans, rather than mitigate spread within the human population’ (PREDICT Consortium 2016b). In its presentation to policymakers, the media, and the industry, the project consistently emphasised its embeddedness in systems of global health security and epidemic preparedness, and adopted their anticipatory rationality.

But the Ebola Host Project was indebted to another genealogy: that of ecology research and zoonotic disease surveillance, which have increasingly turned to mathematical tools for modelling since the 1970s (S. D. Jones 2017). After the end of an Ebola outbreak, as scientists from the PREDICT consortium wrote (Olson *et al.* 2012), it is oftentimes too late to identify the epidemiological source of the outbreak as the evidence has vanished: animals are already dead or decomposed. But it would be the ideal time for sampling live animals and gaining knowledge about Ebola’s sylvatic cycle, i.e., circulation in wildlife. PREDICT scientists wished

to build on the GHSA momentum and not only employ the funding to detect novel viruses: they designed the Ebola Host Project to try and identify ‘EBOV spillover species’ and ‘natural cycles of EBOV in free-ranging wildlife during non-outbreak situations’ (ibid., 8). Since bats are thought to be asymptomatic carriers of Ebola, surveillance and research is carried out through the active and costly method of blindly sampling live healthy animals (Rhyan & Spraker 2010). Animal sampling is a historical practice in the study of natural history, that has been promoted by microbiologists for enquiring into the ecology of influenza since the 1970s (Keck 2020). It was scaled up for studying the ecology of Ebola following the 1995 Kikwit outbreak. Consequently, PREDICT did not only test samples from West Africa for filoviruses such as Ebola, and those that came from areas of previous outbreaks, but also those that came from Bangladesh, Kenya, Cambodia, Indonesia, Myanmar, because these areas were ‘known zoonotic virus hot spots’ (PREDICT Consortium 2020a: 75). The notion of ‘hotspots’ travelled to infectious disease mapping from conservation science, where it was coined in the 1990s to designate regions with a high concentration of endemic plant and animal species threatened by human activity (Myers 1988). It was central to PREDICT’s rationale for its research, since ‘biodiversity hotspots’ mapping directed the geography of PREDICT sampling efforts (Allen *et al.* 2017; K. E. Jones *et al.* 2008). This may have been due to the composition of the project consortium. While headquartered in the One Health Institute of the University of California, Davis, PREDICT brought together powerful US conservation institutions: the EcoHealth Alliance, the Wildlife Conservation Society, and the Smithsonian Institution. These institutions were implicated because the risk of zoonotic disease has been associated with environmental destruction, habitat loss, and exploitation of wildlife – characteristics of ‘hotspots’. This nexus was furthermore recently strengthened by the ‘One Health’ framework (Bardosh 2016; Cassidy 2018), an institutional agenda for the integrated consideration of human, animal, and environmental health. PREDICT thus partook in an evolution of the institutional rhetoric and policy constellation concerned with risk of EID: it contributed to moving it away from its precedent focus on bioterrorism, and towards a convergence with environmental conservation.

The notion of a ‘hotspot’ nevertheless does not only refer to ecological precarity: it includes a political and economic dimension, and largely reflects global power asymmetries. When scientists from the EcoHealth Alliance established geographic priorities for PREDICT sampling, they reweighed a first model which indicated areas of high ‘predicted distribution of zoonotic EID events’, primarily situated in Europe and the Eastern United States (Allen *et al.* 2017). They factored in what they call a ‘reporting bias’, and took into account a country’s

health expenditure, GDP, urbanisation, and disability-adjusted life years rate (ibid., 8). Once weighted, areas of high ‘EID risk relative to reporting effort’ were now located in sub-Saharan Africa, South America, and Southeast Asia. When the One Health approach indicts urbanisation and deforestation, it thus particularly targets locations situated in what it frames as the global South – an echo to early critiques of colonisation and its impact on human health. This parallel brings forward another historical background to PREDICT: that of the colonial history of sciences such as medicine and ecology. Historians have shown that medical scientists such as Pastorian in the colonies embraced field research and acknowledged the role that vectors and animals play in the pathologies they studied: they went beyond the germ matrix (Dozon 1985; Moulin 1995; 1996). Beyond epistemological questions, the genealogy between colonial scientific practices and contemporary animal sampling is first and foremost material. In the 1940s already, novel methods for mass sampling were being developed on the Guinean side of Mounts Nimba, a mountain range east of Méliandou (Lachenal 2005). French ecologist Maxime Lamotte sought to characterise the milieu’s ‘biogeography’ (a precursor to the notion of ‘ecosystem’) and hired dozens of workers from surrounding villages. These were asked to systematically comb sections of land, square by square, and ended up collecting thousands, if not tens of thousands, of animal specimens. Historians have emphasised the reliance of field experiments and specimen extraction, in disciplines such as ecology, medicine, demography, and ethnology, on auxiliaries from the colonies (Schumaker 2001; Tilley & Gordon 2007). Tropical medicine specialists from colonial powers, in particular, laid the ground for international research networks such as PREDICT, and recruited and trained local staff (at a time when no one talked of ‘capacity-building’) to accompany them in their bush expeditions (Geissler & Molyneux 2011; Tilley 2004; Way 2015). Postcolonial studies of such forms of scientific research have highlighted their embeddedness in systems of extraction and exchange (Anderson 2002). The economy of knowledge and the expeditionary ethos of past sampling missions rhyme with contemporary wildlife sampling in formerly colonised regions, where conservation interests align with infectious disease geography.

Viral forecasting has been provocatively examined by historian Guillaume Lachenal (2015) in the postcolonial context of Cameroon’s collapsing health sector, and the advent of experimental interventions in Africa. His discussion centres on the figure of self-made ‘virus hunter’ and founder of Metabiota Nathan Wolfe, a start-up scientist who carried out sampling expeditions to study the circulation of retroviruses among apes, claiming to look for the origin of HIV/AIDS. Lachenal offers a trenchant political critique of viral forecasting, the ‘nihilism’

of which would deter collaborations to improve healthcare, an accusation often made by infectious disease specialists themselves against such initiatives (Holmes, Rambaut & Anderson 2018). Mounting a critical genealogy of initiatives such as PREDICT, in a Foucauldian vein, is necessary in order to abandon the ontological premise that there is such a thing as an ‘original identity’ (1977: 142), for the virus or its ecology. But this dissertation does not trace material connections between the research apparatus, its provenance, and the conditions of possibility for epidemic emergence, or for thinking about epidemic emergence. In that respect, the approach taken here differs from recent social science publications on the origins of COVID-19 (Wallace 2020; Zhang 2021), which attempt to uncover the ‘larger forces’ – of capitalism, commercial food production and environmental degradation – that are seen to have paved the way for the pandemic.⁵ By situating the animal sampling enterprise within a genealogy that crosscuts the colonial sciences, interwar disease ecology, conservation mapping, disease preparedness, but also Guinea’s own history of insecurity and anticipatory mechanisms, this dissertation adopts another angle to look ethnographically at how a search for disease origins comparable to Wolfe’s reverberates in the local society and economy. I interrogate to what extent and with which consequences the PREDICT genealogies outlined above are sensed and critiqued by the agents of a microbiological quest that is overwhelmingly (or solely, in the case of PREDICT) carried out by local professionals. What epistemologies, what practices, and what moralities do these connections further? How do they become entangled with local ideas of disease causality? The material of this dissertation does not map viral ontologies as ‘placeless’ constructs elaborated in networks connecting Californian laboratories and Washington’s corridors to Méliandou; instead, it is an ethnography of post-Ebola animal sampling as it is understood, practised, feared, and dreamed by its Guinean labour force.

C. Fieldwork in N’Zérékoré

I met PREDICT agents, most of them professional vet doctors who normally lived in other Guinean cities, in N’Zérékoré, the administrative capital of Forest Guinea. Many friends asked me: ‘Why study the origins of Ebola in N’Zérékoré? Why not go to the source of the outbreak, to Méliandou and the Guéckédou prefecture, where it killed most people?’ I could have answered by critiquing the notion that epidemics have a clearly defined spatial and temporal origin, as certain social scientists have done, and that the impact of the idea of origins can be

⁵ On the structural origins of the Ebola outbreak, see Wilkinson and Leach 2015; Marouf 2016; Wallace & Wallace 2016; Abdullah & Rashid 2017.

studied elsewhere. But there were also certain practical reasons behind my choice. I already knew the city and the N'Zérékoré prefecture, having lived there for four months while doing qualitative research on child malnutrition for a French rural development organisation in 2013. I returned afterwards as an anthropology graduate to document the clinical trial of an Ebola antiviral in N'Zérékoré ETC during the outbreak (Roth 2019). For my doctoral fieldwork, it did not seem as necessary to 'go to the source of the outbreak' as to stay in a place where many professionals, institutions, and businesses precisely depended and economically thrived on that geography. After the end of the outbreak, and even though it was only a secondary epidemic centre in 2014-5, N'Zérékoré acted indeed as a launching board for preparing Guinea for future catastrophes.

N'Zérékoré, a cross-border trade platform since the 2000s, is the second biggest city in Guinea after the capital of Conakry, with more than 300,000 inhabitants (Roth 2021a). A thriving urban centre, it has been a site of political protests and intercommunal conflict since the 1990s, a situation which national observers explain through the diversity of religious and ethnic groups, exceptionally high for Guinea. N'Zérékoré is seen as having the capacity to amplify the disturbances and tensions that originate in the Forest region, and simultaneously serves as a nerve centre for addressing these crises. The city was affected by the repercussions of the civil wars in Sierra Leone, Liberia, and Côte d'Ivoire in the 1990s and early 2000s, when Guinea hosted between 300,000 and 500,000 refugees; N'Zérékoré became a hub for humanitarian operations. International organisations feared that regional conflicts would spread to Guinea in 2000-1. From 1993 onwards, interethnic conflicts have been recurring in the city and the prefecture, and peacebuilding and disarmament projects quickly set up their headquarters in N'Zérékoré after the height of the refugee crisis. During the Ebola outbreak, medical NGOs and the WHO regional office ran their operations from N'Zérékoré, a foreign presence extended in the epidemic aftermath by renewed EU and US investment in the health sector and outbreak preparedness. Ebola survivors were included in a follow-up programme of 'sentinel sites', which monitored their health and infectivity while offering them some financial support. Teams of health practitioners were formed and trained for rapid outbreak investigations at various levels of the health administration. Simulation exercises were sponsored and performed at regular intervals. The surveillance system integrated human and animal health in its reporting mechanism, and a 'One Health platform' was convoked every month to exchange information across the local Departments of Health, Animal Farming, and Environment. In 2017, while the region was being visited by French, German, and Russian animal sampling

expeditions, PREDICT elected the city as their headquarters for their two-year-long programme. N'Zérékoré was a 'site of global health experimentation', and increasingly of One Health experimentation, which anthropologist Natalie Porter (2019: 3) defined as 'a place where the agents and subjects of disease control are redefining how to live with each other in an age of pandemic risks'.



Figure 1. Map of Guinea, with localities referred to in the dissertation (by M. Schillinger)



Figure 2. Map of Forest Guinea, with localities referred to in the dissertation (by M. Schillinger)

This dissertation reflects sixteen months of fieldwork in N’Zérékoré and the Forest region, conducted between 2017 and 2019. In a first phase, I explored the different facets of outbreak surveillance and preparedness in the area, which formed what could be described as a ‘parastatal’ landscape of healthcare and science, following scholars in the anthropology of global health (Geissler 2015a). I rekindled relations with Ebola survivors met in 2015, took part in measles outbreak investigation missions, attended hour-long surveillance meetings at the Prefectural Department of Health (*Direction Préfectorale de la Santé*), and acted as a secretary during sampling missions with the state-paid scientists of N’Zérékoré International Centre for Tropical Infections Research (CIRIT). One of the few important things I learnt then was to sit in the back of a four-wheel drive without knocking my head on the car’s headliner, a body technique that would prove useful during the next year I spent roaming the roads of Forest Guinea with PREDICT’s *préleveurs*. As I had decided to join PREDICT’s sampling campaign, my partner, my child, and I drove about 7,500 miles over that period, in our second-hand Toyota RAV4 or in the project’s big white Land Cruiser. The sampling effort was nearing its end in 2018, and PREDICT agents started a communication campaign on zoonotic disease risk. Together we travelled on the bumpy roads of four prefectures of Forest Guinea, slept in guest houses and shoddy motels, and ate rice. I was trained in biosecurity, risk communication, and learned about One Health with them. In N’Zérékoré, and to a lesser degree all the other towns that we visited, I met, spoke with, and interviewed medical and veterinarian doctors, authorities from the local Departments of Health, Animal Farming, and Environment, journalists, fieldworkers in other sampling projects, and anyone interested in talking about bats and where diseases come from.

I was repeatedly reminded by those with whom I built friendships and work relationships, that fieldwork in Forest Guinea was hazardous and arduous, and together we dreamt of driving back to N’Zérékoré where better food, sleep and safety awaited us. Forest Guinea, in the southeast of the Republic of Guinea, is a region approximately the size of the Netherlands.¹ Together with neighbouring Sierra Leone and Liberia, it forms an historical area known to social scientists as the Upper Guinea Coast (Knörr & Kohl 2016; Rodney 1970; Sarró 2009), a region subjected to large-scale wars and slave trade since the sixteenth century. This past partly explains, for historians, high population mobility across extended cross-border kin networks.

¹ On the Forest region, see the ethnographies and histories of Paulme 1954; Fairhead and Leach 1996; Højbjerg 2007; Straker 2009; Iffono 2010; 2011; McGovern 2012b; 2018; Engeler 2020. On the Upper Guinea Coast, see Jackson 1977; Bledsoe 1980; Bellman 1984; Richards 1996; Ferme 2001; Shaw 2002.

Consequently, autonomous chiefdoms and flexible social institutions evolved until the nineteenth century to connect people: ethnic differentiation became a malleable process, interethnic marriages came to cement social obligations, and various forms of clientship tied people to various patrons. Thus, protection was ensured against predation from the Mande empire to the north, and from colonial armies at the turn of the twentieth century. Guinea became a French colony in the 1900s, and N'Zérékoré the capital of a 'military circle' in the Forest region, the last to be conquered by French soldiers and their Mande allies.

French colonisation has manufactured Forest Guinea's identity: the place is even today defined by its dense vegetation, a mosaic of unruly ethnic groups and unfinished conversion to Christianity in a predominantly Muslim country.^{2,3} Since then, the region has had a fraught relationship to the national power, mostly exerted by Muslim Mande elites. Guinea was the first French colony to obtain independence by referendum in 1958. After decolonisation, the authoritarian socialist regime of Sékou Touré found in the remote, 'backward' Forest region a primary site for the aggressive staging of state power. The region's cults were primarily targeted by a large 'demystification' campaign against initiation societies, when the government encouraged villagers to destroy their 'fetishes' and archaic hierarchies, move out of 'the mystified obscurity' of their forest traditions and into the 'clarity' associated with the Mande savannah. The biopolitical work of French colonisation and Touré's cultural policies contributed to dissociating Forest Guineans (simply known as *Forestiers* in French, or 'foresters') from their northern neighbours in the twentieth century, a difference which hardened as a hurdle to national integration and progress in the state narrative. The economy was liberalised in the 1990s, and Alpha Condé, was democratically elected president in 2013 (until another coup deposed him in September 2021). But the rift between Forest Guinea and the rest of the country – symbolised by the poor state of the road that connects them – has been impacting the economic activities of international conglomerates. These prospected and started extracting iron ore from Forest Guinea, thought to own the biggest untapped deposit in the world. Lack of infrastructural benefits and employment for local populations, as well as

² The Kpelle, Kissi, Loma and Mano would be the true 'autochthons', while the Konianké have been recently claiming their kinship with the northern Mande group known in Guinea as Maninka (Knörr, Højbjerg, Schroven, Kohl, Rudolf & Filho 2012; McGovern 2012b).

³ Forest Guinea (*Guinée forestière* in French, one of six national languages and the administrative lingua franca) is a 'natural region' of Guinea, invented by French colonisation based on its supposed geographic and ethnic unity (Goerg 2011). The region's administrative name is the 'N'Zérékoré region', but 'Forest Guinea' remains a convenient label, often used in the administration. The PREDICT project explicitly covered 'Forest Guinea' (which has a slightly different geographic configuration) and not the N'Zérékoré region. In the rest of the dissertation, I consistently use 'Forest Guinea' unless explicitly referring to an administrative subdivision.

enduring political grievances tainted by ethnic claims, have fuelled numerous acts of violence: against Liberian and Sierra Leonean refugees in the 2000s, foreign-owned businesses, places of worship, and the elders of ethnic communities in the 2010s, as well as during the run-up to Condé's re-election for a contested third mandate in 2020-1.

A historical experience of insecurity – political, religious, economic – in Forest Guinea has generated fraught relationships with a range of forces and actors seen as invasive. This context strongly influenced the questions that directed my research and deeply shaped my ethnographic approach. Drawing on the prolific anthropological scholarship on how people navigate insecurity in Africa (Cooper & Pratten 2015; Vigh 2006) and the Upper Guinea Coast particularly (Coulter 2009; Jackson 2005; Knörr & Filho 2010; Shaw 2002), I build on the important premise that, for PREDICT *préleveurs* and Forest Guineans, the Ebola outbreak was embedded in a routinised uncertainty. This insecurity has generated ways of knowing, being, and coping with a pervasive sense of vulnerability, fear, but also engendered a sense of possibility. This is to say that insecurity is not only an assumption of virological research in hotspots, by definition threatened by ecological and epidemic crises underlain by political fragility. My research investigates how insecurity, a normalised structure of feeling in the lives of *préleveurs*, reverberates in ideas about the source of misfortune and 'epidemic origins', and how it creates causal and moral inferences in the process.

The significance of such a recursive relationship between insecurity and thinking about epidemic causality was laid bare by the negotiations that enabled my fieldwork. When I expressed my wish to focus my research on their work, PREDICT country and field coordinators welcomed me enthusiastically. Like their US managers, they took anthropologists' interest in activities involving 'community engagement' for granted. But as they later told me, they also did not oppose my participant observation because they felt that they had 'nothing to hide'. This avowal resonates with what could be analysed as an historical habitus of dissimulation in Guinea, powered by the spying state of postcolonial socialism and the enduring rhetoric of foreign conspiracies (McGovern 2017). This recent past elucidates why my integration was, however, not unproblematic for PREDICT's fourteen field agents. My status as a young English-speaking French PhD student generated worries among them that I could disclose information that they thought better concealed. Through negotiations and renegotiations over time, as is customary in anthropological practice (ASA 2011), but also through reining in my curiosity and cultivating the skill of discretion, I worked hard to be

accepted and not compound the vulnerability and feelings of insecurity that plagued them, as foreign-contracted workers in a notoriously labile region.



Figure 3. View of N'Zérékoré's main road, leading to the market (video still by M. Raab)

D. Outline of chapters

In one way, this thesis is a 'research on research' (Biruk 2018). It is an ethnography of the social networks, relationships, materialities, politics, and rituals that constitute the world of Guinean wildlife *préleveurs* in their quest for the origins of Ebola. My broader aim, however, is more ambitious: by analysing the entanglements of scientific discourse, unruly animals, and laboratory equipment, I experiment with an alternative form of inquiry into the relation between science and truth in global health. The routine operations of global health have been excavated by social scientists (Biehl & Petryna 2013; Geissler 2015a; Graboyes 2015; Lachenal 2020; Prince & Marsland 2013), who highlight a twilight zone between governance, moralities, and evidentiary practices. Enquiring into animal sampling for epidemic forecasting means opening another window onto the intimate workings of epidemiological obfuscation, lacunary communication, diplomatic secrecy, and inequalities between workers. These processes are, the literature suggests, as constitutive of global health as global health is dependent upon a certain world order, structured by postcolonial asymmetries. Considering these mechanisms locally, in their practice and their hermeneutic, allows us to let go of the dichotomy between truth and

untruth that structures a normative way of thinking about science. What if diseases are not the natural ills that humans must discover and combat? What if outbreak preparedness accelerates the return of Ebola? What if secrecy were to displace transparency as the foundation for an ethical science? The dissertation asks to what extent such conditions configure the production of evidence about Ebola's source, and lead the hypothesis of a bat reservoir to harden, with significant consequences for research priorities and prevention policies. I consider the economy of knowledge and professional ethos of animal *préleveurs*, and look at the confusion and controversies they elicit while they contribute to imposing a single narrative for disease causality. In doing this, I challenge a social science view that scientific claims become authoritative when the institutions and practices that manufacture them are socially recognised as trustworthy and legitimate, i.e., secure (Shapin 1995). Inverting this relation, I seek to understand the inadvertent role that scientific performances play, entangled as they are with insecurity, not only in producing scientific evidence for the few experts, but in generating clues about Ebola's origins for many people in Guinea and Africa more generally – with significant consequences for research priorities and prevention policies.

The chapters are intended to immerse the reader in the everyday practices, reflections, and affects of PREDICT *préleveurs*. They follow the chronological implementation of the Ebola Host Project in Forest Guinea, which came to structure staff activities and concerns. Chapter 1 sets the scene by further clarifying the processes through which knowledge about Ebola and its causality is put together on the site of the 2013-6 epidemic. It introduces the argument that following the outbreak, bats have become very capacious in their epistemological traction for thinking about Ebola's origins, as they bridge two divergent ways of studying Ebola in space: where it is, and where it comes from. Chapter 2 presents PREDICT *préleveurs* carrying out the work of locating wild animals to be sampled and tested for Ebola. It suggests that uncertainty and feelings of insecurity encouraged *préleveurs* to resort to longstanding techniques of camouflage in their relations with local authorities, the residents of sampled sites, and US managers. The aesthetics and socialities of camouflage are imbricated in the truth of the disease that they claimed to search for, in ways largely congruent with the bat hypothesis. Chapter 3 describes the complex choreographies of care through which *préleveurs* negotiated their vulnerability and that of the bats they sampled. Although their relationship to the animals was being transformed by their activity, I suggest that *préleveurs* felt threatened by aspects of the One Health-influenced sampling protocol, and reinforced interspecies boundaries. Chapter 4 looks at PREDICT communication campaign on the zoonotic disease risk borne by bats, and

the different kinds of evidence that *préleveurs* acting as *sensibilisateurs* assembled to understand Ebola's origins in the terms of a 'disease reservoir' and 'contact with wildlife'. I emphasise the epistemological labour, including ironies and scepticism, that went into making a 'hotspot' and its biopolitical consequences. Chapter 5 focuses on the disclosure of a crucial finding of the PREDICT Ebola Host Project: a new species of Ebola virus in a bat species. I indicate that the idea that bats act as a spatial bridge for Ebola was hardly communicated to the local population because of the information control politics that weigh on revelations in Forest Guinea: if viral discoveries remade the meaning of place for *préleveurs*, they failed to connect with the social landscape of Forest Guineans and clarify the role of the bat in maintaining the disease. Chapter 6 finally excavates the professional ethos of Guinean *préleveurs*. It elucidates their predicament – epistemological and temporal – as 'future scientists' whose personal progress depended on the epidemic doom convoked by the 'scientific future' of programmes such as PREDICT. It is political and economic insecurity, ultimately, that manifested in their understandings of what caused Ebola, and of why their professional fate depended on the notion that bats are the origins of the disease.

Chapter 1: The bat bridge

It was a December evening, some time before dusk, in a rural locality close to Soulouta, a subprefecture seat north of N'Zérékoré, in Forest Guinea. After returning from the fields, women were mincing potato leaves for the dinner sauce, while rice cooked on a charcoal stove. A family watched a generator-powered television inside a living room. Teenagers had swapped their school uniforms for jerseys and played football on the town field. Suddenly, a Land Cruiser drove by at full pelt, dodged a wandering goat, and halted in front of the district chief's house. Six people wearing brown overalls pulled themselves out of the vehicle. One of the teenagers, looking up to the crates strapped to the car top, asked the foreigners whether they had come to connect the village to the electrical grid. Children ventured to touch the four-wheel drive. This was an auspicious sign to the newcomers: 'nobody held their nose' when seeing their car here. Such gestures were still common as they started their work in 2017, more than one year after the end of the Ebola outbreak, when people feared that foreigners in white four-wheel drives came to spray the virus in their midst.

The day before in Soulouta, the district chief had given his approval to the PREDICT project team intervening in his municipality. The subprefect himself had signed the team's mission order after customary greetings and introductions. The 'missionaries', as the members of outsiders' delegations are called in Guinean localities, had been introduced to an assembly of elected representatives and personalities. They had all gathered in the town's *permanence*, a hall erected during Sékou Touré's regime for mandatory party meetings. The subprefect gave a speech, introducing the missionaries in vague terms: 'they have come so that what took us by surprise does not happen again'. When given the floor, Dr Bilis, N'Zérékoré's retired Regional Director of Animal Farming, an energetic man with outspoken manners and a trimmed grey beard who acted as the PREDICT project manager in Guinea, clarified the goal of their enterprise.¹ They wanted to elucidate the 'origin of Ebola' to prevent a recurrence of the disease. 'A lot of animals were accused of carrying the disease during the outbreak', he said. 'What did they forbid you to eat?' Many answers came back: monkey, bat, cane rat, mice, 'even pork!' Dr Bilis – whose name was an abbreviated version of his original name in Loma, a Forest ethnic group – nodded as participants recalled a time when wild animals, and foodstuff produced in Forest Guinea in general, were indistinguishably incriminated for carrying the terrible disease.

¹ The names of all the people referred to in this dissertation are pseudonyms.

‘Up until now, we do not know if what they said was true or false’, Dr Bilis resumed. ‘Even scientists cannot tell us where Ebola comes from. But we have come to verify these hypotheses and see whether one animal really has the virus. What is the truth about Ebola?’ While an attendance sheet was circulated among the guests and cash envelopes were distributed, he succinctly explained PREDICT’s work process: bats and rodents would be captured, their blood taken and sent to a ‘laboratory in America’. Results would be transmitted to the government, which would communicate about steps to be taken: ‘we will uncover the truth about Ebola’s origin’.

In 2017, as post-epidemic surveillance was being organised in Guinea and the health system was being supported by foreign funding, PREDICT launched its intervention in a large number of Guinean localities. The surveillance system centred on monitoring human populations and focused on the health and bodies of survivors, as according to WHO’s declaration of June 2016, ‘the risk of additional outbreaks from exposure to the infected body fluids of survivors remains’ (WHO 2016a). But PREDICT’s discourse and practices located the danger somewhere other than in the individuals who recovered and a failing health system: they tied it to a landscape where people and animals cohabit and are connected by foodways. PREDICT and other surveillance and research initiatives could be said to form a post-outbreak assemblage in Guinea, as governmental as it was experimental, which alluded to the possibility that Ebola may be latent and resurface, especially if what Dr Bilis and many others conceptualised as ‘origins’ were not clarified. This chapter parses some of the processes – scientific, social, technological, and institutional – through which knowledge about Ebola and its causality were put together, contested, and accommodated on the site of the 2013-6 epidemic.

With ongoing efforts to elucidate the dynamics by which the disease may endure in certain configurations – whether zoonotic, environmental, immunological, or epidemiological – Ebola remains an elusive entity to scientists. Like, in the height of their spread, kuru, the fatal neurodegenerative disease that affected thousands of Papua New Guineans over a period of fifty years (Anderson 2008; Lindenbaum 2001), or the epidemic of rabies that killed dozens of children in the Venezuelan rainforest in 2007-8 (Briggs & Mantini-Briggs 2016), Ebola has not been associated with a conclusive aetiology. The disease has generated countless uncertainties and speculations, as unresolved epidemic investigations generally do. I follow anthropologist Charles Briggs (2016: 151) in his contention that ‘epidemics in which the production of evidence resists transformation into a diagnosis are particularly interesting for exploring ecologies of evidence ethnographically’. It is these ecologies of evidence, complex contexts of

producing and circulating various types of evidence, that this chapter analyses. Unlike Briggs, who centres on the role of what he calls ‘health/communicative inequities’ in structuring causal narratives, I do not suggest that unequal access to scientific knowledge forms a rift between the dominant discourses of experts and the vernacular stories told by other people. Rather, when seen from the vantage point of the Guinean countryside where PREDICT intervenes, the sites, events, and processes through which different scientific communities of practice come to articulate Ebola appear intimately imbricated with local ways of knowing and blaming.² The dissertation brings these evidentiary, social, and moral articulations together in a single analytical field. In so doing, it suggests that, in Guinea, *préleveurs*, i.e., the individuals who capture and sample animals, consolidate in unexpected ways, and with important consequences for collectives of humans and nonhumans, what are but hypotheses for scientists.

In 2017 when I started fieldwork, the biosurveillance and scientific discourses that constitute Ebola were being dramatically reconfigured. Historian Mark Honigsbaum (2017), who looked at ‘shifting constructions of the virus’ and the disease from the perspective of triage procedures at WHO since 1976, has indicated that successive shifts, from the register of biosecurity to that of neglected tropical disease and back to biosecurity, have influenced the governance of Ebola up to 2014 (see also Lakoff 2014). While Ebola was an iconic biowarfare agent in the early 1990s, political attention and funding gradually waned and worked to configure the disease as a rare and manageable illness confined to the isolated forests of Central Africa. The West African Ebola outbreak resurrected the spectre of Ebola as a security threat when it crossed continents and spread through major cities. Since 2013-6, the development of diagnostics and vaccines, together with the recurrence of outbreaks and long-term research with survivors, have been transfiguring the disease entity. While there appears to have been no decrease in the case fatality rate of the disease over time (Rugarabamu *et al.* 2020), technological innovations and a response and preparedness protocol now routinised over parts of West and Central Africa have seemingly turned Ebola into yet another endemic disease, one that was made palatable to the pharmaceutical industry and financial markets (Kelly 2018). Crucial to this ontological transformation are understandings of Ebola’s ‘origins’ beyond its aetiology, strictly speaking. While the disease has been understood as a zoonosis from the

² This analytical position is indebted to histories of scientific practice that refute the notion that there is something like a unique science that diffuses from centres to peripheral areas (e.g., Gruzinski 2002; Raj 2007). It heeds instead the example of historians such as Rohan Deb Roy (2017) in tracing the saga of circulations, coming together and collisions of objects, living beings and artefacts that make, extend, and reconfigure Ebola in the plural, and their implications in postcolonial Guinea.

beginning, it is being primarily refigured – not only for scientists, but also for decision-makers and a wide range of state employees across Africa – as an emerging zoonosis to be pre-empted by the rising constellation of institutions concerned with One Health, a vision which singularly locates disease origins in situated entanglements with nonhuman animals and human responsibilities. This chapter excavates such an evolution by tracing its course in West Africa.³ I point to the role of animals, in particular bats, as bridges across two complementary ecologies of evidence: one that sustains Ebola as a disease of place, and one that configures it as a contagion. I illuminate a third, ontologically autonomous framework: that of Ebola as a virus. I conclude on the partial interrelation of these assemblages in Guinea, which has historically become what anthropologists Hannah Brown and Ann Kelly call a ‘hotspot’ of disease and knowledge encounters (2014). These three Ebolas revolve around bats and survivors, relatively independent mythological figures. Their independence is, I propose, not due to the impeded circulation of knowledge, as implied by Briggs’ work on ecologies of evidence. It is rather owing to historical partitions – disciplinary, institutional, and social – between assemblages of Ebola.

A. A disease of place

PREDICT *préleveurs* had recommended I meet Dr Boniface, an agronomist by training who studied nursing and was the health centre director in Koulé, a village on the *Route nationale* to N’Zérékoré. Since he was at the head of Womey’s health centre during the September 2014 killings, they likely assumed he would offer me a truthful first-hand account of the reasons why villagers assaulted and executed eight outbreak response officers. But Dr Boniface, who received me on the front porch of his private room, littered with medical supplies that he probably sold for secondary income, wished to discuss medical literature and scientific research on zoonoses. After I introduced my interests in broad strokes, he opened our conversation by saying in a learned tone: ‘it has been proven that many diseases of bacterial or viral origin come from animals’, animals who themselves come from forests, such as those in southeastern Guinea, northern Sierra Leone, or the DRC. He had an explanation for this: ‘climatic conditions favour the development of these germs’. Distinguishing the climate of Guinean regions by their

³ Like Honigsbaum, who understands this evolution as a compound transfiguration of epistemic, political, and biological matters, I do not prejudge the directionality of the relationship between scientific knowledge and public health practices. Assuming ‘correspondence between politics and prophylaxis’ (Baldwin 1999: 563), or between science and public health policies, has been a criticised position in the history of medicine.

temperature, the winds, and the presence of the sea, he asserted that Forest Guinea, being moderately warm, humid, and forested, provides a habitat conducive to a variety of germ-carrying animals (excluding ‘germs by dehydration’, such as the meningococcus which causes meningitis in ‘Lapeyssonie’s belt’, he specified). He concluded what sounded like a specialist presentation by explaining that, if Ebola had emerged in Guinea in 2014, it was not only because of favourable climatic conditions, but also because population migrations, demographic density, and a ‘precarious medical hygiene’ made the place auspicious to the emergence and spread of diseases. So much he had gathered from the internet and the documentation in his possession at least. But in Womey, no one asked him about this: people blamed him as the nurse who had sent the disease, and he had to quickly flee away from their wrath, losing many of his belongings in his haste.

PREDICT launched the Ebola Host Project at the end of 2017, more than one year after the official end of the outbreak. Choosing Guinea, Sierra Leone, and Liberia for investigations into the Ebola virus disease tied it to a certain place as if by necessity, much with the same effect as when Dr Boniface interpolated climatic and demographic characteristics in the disease aetiology. The role of place in disease aetiology as a predisposing milieu, encompassing various modalities such as vegetation, habitation, sanitation, topography, squalor, etc., has been extensively studied by historians of medicine (Arnold 1996; Kidambi 2004; Sutphen 1997). By ‘disease of place’, I refer to a phenomenon whose generation is broadly defined by its ‘where’ rather than ‘what’, in the words of Mary P. Sutphen (1997). Such an interest could be traced back to what some scientists see as the Hippocratic tradition, which has informed the colonial formation of disciplines such as medical geography, medical topography, tropical medicine, and disease ecology (Anderson 2004; Rupke 2000). The view that diseases are integrative processes that link pathogens, hosts, and a given place, with a new focus on complex spatial relationalities, would become the leading orthodoxy of early-twenty-first-century American global health politics and the viral forecasting enterprise through the ‘emerging infectious diseases’ (EID) paradigm, introduced earlier. But Dr Boniface’s reference to French military doctor and sleeping sickness specialist Leon Lapeyssonie hints at continuities between the EID perspective, the colonial science of medical geography, and the institutional network of tropical medicine, which have cemented around similar (colonised or decolonised) places. I will outline here in particular the epistemic dimension of the entanglements that have come to constitute Ebola as an infection of place, and the perceived role of bats as an interface between what could be seen as the environmental and sanitary elements of this idea.

One of the central aims of the Ebola Host Project in Guinea and the two other countries targeted was ‘to better understand the disease ecology of [Ebola and other] filoviruses in the wild’ and identify the populations and settings at high risk of zoonotic disease spillover, defined as ‘hotspots’ (PREDICT 2020a: 333). A PREDICT list of ‘risk factors considered so far’ for identifying sampling places clarified what was meant by the notion of hotspot ‘so far’: ‘wildlife-domestic animal-human interfaces, e.g. encroachment and deforestation areas, national parks, live animal/bushmeat markets etc’, ‘geographic areas with previous Ebola outbreaks’, ‘high density of species at risk, e.g. ape habitats, bat congregation sites, pigs, dogs’, and ‘live animal congregation sites, e.g. markets, slaughterhouses’. The same document featured a map ‘modelling ecological risk’, which represented the ‘potential distribution of Ebola virus in populations of 10 species of fruit bats’, using a scale colour-coded from green to red. The epidemiological premises that coalesce in this constellation of risk and their practical consequences for PREDICT field lab will be elucidated in chapter 2; we are concerned here with the ways in which they index a complex imbroglio of people, animals, technologies, goods, and policies, and embed it in space along a gradient of pathogeny, i.e., susceptibility to disease.

In the late 2000s, computer algorithms started being used to predict the distribution of Ebola disease events.⁴ The technique relies on the state-of-the-art technology of ‘remote-sensing’: satellite observations of vegetation, altitude, temperature, etc., combine with predicted species distributions and the fairly limited series of Ebola outbreaks (about thirty from the first recorded in 1976 until today) to inform mathematical models. Calculations lead to spatial visualisations of what a WHO report ‘mapping the risk and distribution of epidemics in Africa’ frames as ‘Ebola virus ecological zones’ (2016b), or other authors see as the ‘potential zoonotic transmission niche’ of Ebola beyond Africa and into Southeast Asia. These visualisations, which rely on high-resolution satellite imagery and global positioning (GPS) technologies crucial to the military industry (Peckham & Sinha 2017), testify to the continuous merging of EID science with the defence agenda in the twenty-first century, past 1990s concerns with preparing for biowarfare. Pathogenic relationalities are newly modelled by combinations of ecological influences with portmanteau names, such as ‘enviroclimatic factors’ (rainfall, temperature, and vegetation) (Buceta & Johnson 2017; Pinzon *et al.* 2004), ‘zoogeographic determinants’ such as mammalian ‘biogeography’ (Olivero *et al.* 2017), and more recently ‘anthropogenic effects’, which embrace ‘habitat fragmentation’, ‘human

⁴ See for example Peterson 2004; Pigott *et al.* 2014; 2016; Pinzon *et al.* 2004; Tucker *et al.* 2002.

encroachment’, ‘forest loss’ and ‘human activities’ (Olivero *et al.* 2020; Rulli, Santini, Hayman & D’Odorico 2017). These hybrid denominations indicate the capaciousness of place – socio-economic, zoological, climatic, etc. – in forming a disease aetiology, or rather a milieu’s susceptibility to disease. A recent risk map of Ebola virus spillover in Forest Guinea for example combines geographical data layers to produce a coloured visualisation of risk ‘at the landscape scale’ of 1 km², where factors such as distance to rivers, human density and bushmeat commercialisation are interlaced (Lee Cruz *et al.* 2021).

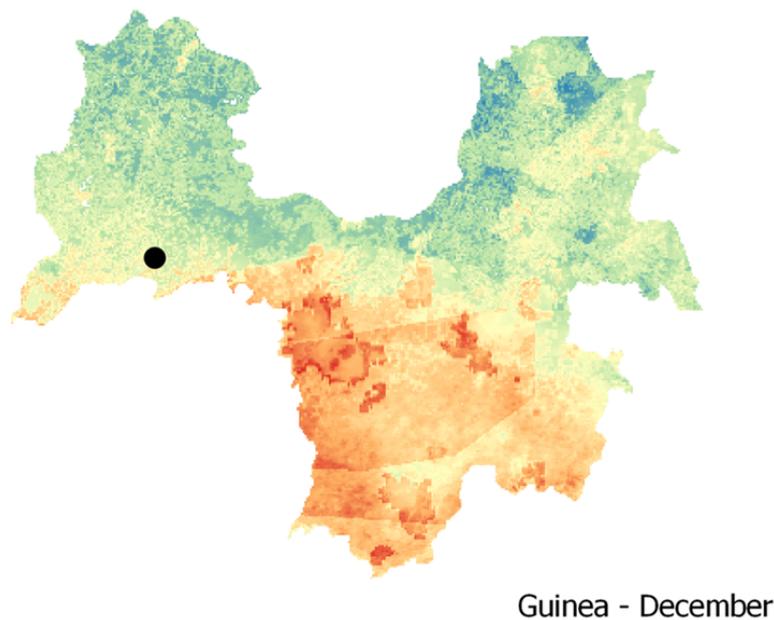


Figure 4. ‘Suitability map for Ebola spillover’ in Forest Guinea, established by Larisa Lee-Cruz *et al.* 2021 (the dot indicates Méliandou)

But statistical analyses backed by satellite data not only deliver high-resolution global maps where risk is colourfully reduced to a question of degree, based on correlations that do not solve interrogations about causality. They were also used by disease ecologists to offer a multicausal and place-specific explanation for why the West African outbreak originated in Forest Guinea. According to some of them (Alexander *et al.* 2015; Bausch & Schwarz 2014; Wallace *et al.* 2014), a ‘triggering event’ of drier ecological conditions in December 2014 had a dramatic impact on the local ‘epizootology’, weakened by extreme deforestation for palm oil monoculture, clear-cut logging, and mining since the 2000s, against a background of decades of socioeconomic duress and inefficient public health. Dr Boniface similarly entangled Forest Guinea’s climate and animal population with the region’s (relative) demographic boom and the poor state of health amenities to rationalise the outbreak’s beginning. Ebola, when understood

as a disease of place, is founded on a complex ecological picture, entailing what historians of science see as environmental and sanitary elements (Harrison 2000), such as the climate on the one hand, and hygiene on the other. Such elements are both statistical correlates and entangled in causal narratives of the disease ‘origins.’

Dr Boniface did not articulate the two clusters of factors, environmental and sanitary, as accounting for, respectively, disease emergence versus disease spread. Likewise, many publications in ecology do not oppose the two parameters. To relate them, Dr Boniface resorted instead to the figure of the hunter, which in Ebola research stands as the ‘cut hunter’. According to him, when bats, chimpanzees, and rodents, which to his knowledge harbour the disease, are hunted, the ‘germ’ in the blood of the wounded animal penetrates the hunter’s body and makes them ill. ‘And since in Africa, solidarity reigns’, he suggestively added, the disease then transmits to other people through body contact or the sharing of uncooked contaminated food beyond the hunter’s family. Such a linear, epidemiological model of zoonotic infection interpolates sanitary and environmental elements. It has dominated aetiological theories of Ebola for infectious disease specialists parallel to developments in ecological modelling and continues to reverberate in contemporary reflections. Theorised and popularised by Nathan Wolfe, the ‘cut hunter theory’ holds that hunting and the processing of bushmeat, particularly from nonhuman primates, is the dominant explanation for the cross-species transmission of the Ebola virus, as well as of HIV and a few other pathogens: basically, index cases would become infected through small wounds while handling bushmeat (Wolfe, Daszak, Kilpatrick & Burke 2005). The theory assumes that logging, road building, and the urban demand for bushmeat have increased hunting and contact between humans and nonhuman primates in African tropical environments. Pathogens once restricted to non-human species would repeatedly transmit to humans, without resulting in human-to-human transmission in most cases. This process, which Wolfe dubbed ‘viral chatter’, increases the diversity of virus variants and the likelihood that a human-adapted virus will ‘spill over’ into human populations (ibid.; Quammen 2012). The cut hunter theory embeds ecological modelling and its causal implications at the scale of human beings. The formation of disease ‘hotspots’ seems driven by ‘modern drivers of viral emergence’ like the ‘anthropogenic effects’ studied by disease ecologists, which Wolfe *et al.* (2000) see in hunting and deforestation. The narrative of the ‘cut hunter’ gives epidemiological legitimacy to ecology views in positing that sanitary localised practices such as ‘human hunting behaviour’ cause diseases to emerge (and not only to spread).

Ebola appears, in this reading, bound to a locality defined by the intimacy of human-animal contact, itself the product of recent and large-scale neoliberal and postcolonial extractive industries. The idea that a recent history shapes the practices of Guinean hunters was not explicitly put forward by Dr Boniface. But it nevertheless resonates with the disease framings and sensory experiences of many of the *préleveurs* I met. Most were loath to conclude that Ebola had always circulated in their region and were adamant that the disease was new. ‘Otherwise, given how people live, it would have happened earlier’. Deforestation was often brought up as a likely cause of Ebola’s recent emergence in Forest Guinea. Michel, a *préleveur* who grew up in a rural village of the N’Zérékoré prefecture, noticed that the impenetrable forest of his childhood, which marked the border with the neighbouring town, had been cut down by private loggers in the last decade. ‘Trees used to curb the winds that go into pores and give diseases, but we cut them all down!’ He associated this process with a rise in temperature and dryness in his native village, as well as with changes in the geography of animal populations. Fruit bats had allegedly vanished from the forest-edge, and insect bats now pullulated in the village granary and other houses. During one of his visits to his home village, he had even seen children playing with dead bats, a view which deeply shocked him.

Social scientists have criticised the terms of the ‘cut hunter’ hypothesis (Herrick 2019; Hinchliffe, Bingham, Allen & Carter 2016: 9-10; M. Leach, Scoones & Stirling 2010). It would pin diseases to the edge of forests, in a prototypical ‘out of Africa’ narrative of human encroachment onto the environment, which blames impoverished rural communities for failing to uphold boundaries with their pathogenic environment. Moreover, some of its assumptions, such that Africans lived isolated and sedentary lives prior to colonisation, were shown to be unfounded by historical epidemiology (Giles-Vernick, Gondola, Lachenal & Schneider 2013; Rupp, Ambata, Narat & Giles-Vernick 2016). One could welcome, like geographer Stephen Hinchliffe *et al.* (2016), the shift operated from the archaic notion of the ‘disease site’, epitomised by the Ebola-infected African hunter, to ‘disease situations’ such as the hotspots investigated by PREDICT, where disease is driven by a broader set of relations with non-human animals, situated and acting upon environmental, social, economic, and political processes. However, examining scientific narratives and their epistemological entanglements in the discourse of Guinean graduates in the sciences shows the fusion of a ‘disease site’ and a ‘disease situation’ in a localist conception of disease aetiology. The idea of climatic determinism, the vernacular disease aetiology of air currents, and the notion of a zoonotic reservoir merge with an indictment of private interests and blame on uncivilised lifestyles in the very place where

the largest Ebola outbreak took off. Environmental, sanitary, and culturalist conceptions are imbricated in this epistemological synthesis, as hinted at by Dr Boniface's lamenting that Womey's '90% illiterate' inhabitants turned against him as a representative of the medical institution and potentially allowed the disease to spread. Ecology and epidemiology concur to establish Ebola as a disease of places intrinsically tropical, poor, and threatened by neoliberalism, which climate change threatens to stretch beyond their confines. The bridge between these two disciplinary views (ecology and epidemiology) is enacted by the figure of the hunted animal, more precisely the fruit bat, a node at which ecological modelling and epidemiological sanitarianism congeal.

B. A contagion

The material and social life of PREDICT enacted Ebola as a disease of locality as much as it did Ebola as a contagion. This is made evident by the visual coverage of the project featured on its website, reports, and communication material (PREDICT Consortium 2020a; 2020b). In the abundant photographs, sampling agents, usually anonymised by personal protective equipment (PPE), stand against the lush background of a jungle and display rodents in transparent bags or quartered bats to the camera's flashlight (Roth 2021b). Such a hazmat suit imagery, prevalent in the media coverage of Ebola outbreaks since 1994, was commented on by sociologists (Gerlach 2019; Ungar 1998). They proposed that the hazmat suit 'bears the metaphoric burden of making Ebola a visible and affective presence' (Gerlach 2019: 197), one that revolves around the contagious pole of 'diseasable' Africans, and the containment pole of prepared Northern biosecurity systems. One could similarly read PREDICT pictures as superimposing the depiction of Ebola as a disease of place, inherent to the environmental conditions and unsanitary encounters of the 'jungle', with its depiction as a contagion, a foreign threat kept at bay by technologies such as PPE. In the following, I show how the bat also acts as a vector, in a spatial sense, and not only as a 'breeding ground' of Ebola, thus encompassing the provenance and not only the place of the disease. The bat has thereby become a further bridge with contagionistic theories, policies, and practices of disease containment in West Africa.

The term 'contagion', strictly speaking, refers to the interhuman transmission of diseases through the single cause of physical contact (Rosenberg 1992: 285). In nineteenth-century public health debates, a debate polarised between 'contagionist' and a so-called

‘anticontagionist’ understanding of diseases, integrating social and environmental influences on health (Ackerknecht 1948; Baldwin 1999; Stern & Markel 2009), comparable to that underpinning a place-based aetiology of disease. The fine-grained developments of medical thinking and public health policies in Europe belie the dichotomy and its gross opposition of prophylactic measures, which would equate quarantine with contagionism, and sanitarianism with anticontagionism. Theories of disease transmission, such as that of contingent contagionism (Pelling 1978), have proved more subtle in the way they refract the environmental background of the disease onto its transmissibility between humans. Many non-scientists similarly understand disease aetiologies in nuanced ways, such as a N’Zérékoré neighbourhood mayor I met who supposed that Ebola patients who died in the bush might infect animals and pollute their surroundings (see Lynteris & Evans 2018 for a critique of the notion of epidemic corpse). But ‘contagion’, even though it was dropped from the biomedical lexicon where it has been superseded by a bacteriological focus on pathogens (Grøn & Meinert 2017; Pernick 2002: 860), has remained an analytical term in the social sciences for analysing the politics of ascribing blame to certain social groups for a disease spread. ‘Contagion’ translates a concern with the permeability of boundaries – between nations, people, and social practices – which, scholars have suggested (Ostherr 2005; Wald 2007), conflates the danger of bacterial transmission and ‘foreign’ contamination in epidemics. I use ‘contagion’ here as a lens that foregrounds the threat represented by connections across spatial contexts, one that loads difference – national, racial, or ‘cultural’ – with the moral discourse of purity and blame (Lynteris & Evans 2018: 3-8). Seeing people as vectors of contagion in this way means focusing on prophylaxis since contagion is seen to be halted by a range of technologies meant to sever connections and contact, such as quarantine, school and border closings, disinfection, masking, etc. Those techniques and their supporting discourses, we will see, are increasingly extending to research on Ebola’s wildlife dynamics and bat populations control.

For the biomedical sciences, Ebola disease is transmitted through direct contact with blood, the bodily fluids, or skin of patients with – or who died of – Ebola virus disease, and contact with surfaces and materials covered by such fluids (Rewar & Mirdha 2014). After their initial transmission event, human outbreaks have been overwhelmingly driven, for epidemiologists, by person-to-person transmission, i.e., contagion. These specialists actually substantiated the view that Ebola is a disease of care, for caring for the sick proved to be the first transmission pathway in the three countries affected during the West African outbreak, before even caring for the dead or participating in their funeral (Tiffany *et al.* 2017). Nevertheless, the institutional

response to the outbreak has long mainly aimed to police ‘superspreading events’ (burials deemed unsafe, infected people travelling to and staying in hospitals, etc.) by a panoply of measures, analytically concerned with contagion. In 2014, borders were closed: Senegal banned the passage to Guinea in August, and Guinea closed its own border with Liberia and Sierra Leone. Many airlines suspended their flights to affected countries. Although hospitals never shut down state-wide in Guinea, many health institutions stopped being operational in October 2014 following the desertion and deaths of health personnel (Diakite 2014). Schools were closed for six to eight months in the three countries. But the most contested measure against transmission, which enacted the power relation entailed by a contagion framework, was the suspension of traditional burial ceremonies in the three countries (Fairhead 2018; Lipton 2017). In Guinea, the bodies of people who died in ETCs were not cleaned of their fluids post-mortem nor tended to by thanatopractitioners; they were disinfected, sealed in plastic bags, and inhumed in cemeteries without always being identified (Le Marcis 2015). Moreover, from October 2014 until the end of the outbreak was declared a first time in December 2015, all ‘community deaths’ over the territory of Guinea, i.e., people who died outside ETCs and health structures (including stillborn babies and drowning victims), were to be inhumed by Red Cross volunteers according to a protocol of ‘safe and dignified burial’ (Caremél, Faye & Ouedraogo 2017; Faye 2015). These anti-epidemic measures (Lynteris & Poleykett 2018), of different historical provenance in Guinea, aimed at controlling epidemic spread.

Dynamics of contagion were a posteriori mapped by epidemiologists (Gleason *et al.* 2017; Rico *et al.* 2016; Valencia *et al.* 2016). Through fine-grained spatial analyses, they located ‘clusters of infection’, ‘networks’ and ‘chains of transmission’ in relation to sources of exposure such as ‘hospitals’, ‘households’, and ‘burials’. Such research resorts to geographic information systems similar in kind to those employed by disease ecologists. But the role of space in configuring contagion is very different from its role in infections of locality. The focus in contagion framework is on spatial infrastructures of connectivity, which anthropologist Vinh-Kim Nguyen suggests produce something like viral speed (2017). In that respect, epidemiologists experimented, during the Ebola outbreak, with phylogenetics, i.e., the study of viral DNA sequences by way of PCR machines. Phylogenetic trees have come to populate epidemiological publications (for examples in Guinea, Carroll *et al.* 2015; Simon-Lorier *et al.* 2015), where they act as a proxy for reconstructing the evolutionary timeline of epidemic emergence. Comparisons across genetic sequences and calculations based on the mutation rate of the virus observed reproduce medical geography’s intent of connecting pathogens to distant

times and places (MacPhail 2014), of finding the mythical ‘origin’ of the disease. But data layers are not overlaid to form a surface view of a risky milieu, as for diseases of place. The disease is rather vectorialised, in that viral information and the speed of viral mutations are tracked in space. A network of contagion is materialised in terms as much founded on space as on social connections. It is the same conception of a space of contagion that underlies an alternative story for Ebola’s emergence in Méliandou. Villagers met by anthropologists after the departure of Robert Koch Institute’s epidemiologists (Ouattara and Århem 2021) explained that a sick elderly woman from Sierra Leone had stayed in the village to seek treatment from a well-known healer a few months before the start of the outbreak. Rumours in Meliandou had it that the woman had family in the mining region of Sierra Leone (Fairhead 2019), although I also heard, through *préleveurs* who worked there in 2017-8, that she may have been a friend of an employee of Kenema’s haemorrhagic fever lab. Some place-based elements certainly characterise the provenance of the woman, and thus the origin of the disease, but they are expressed through the language of social communicability and overwritten by spatial movement, key features of contagion.

Since the end of the epidemic, this conception of transmission and its provenance has extended from humans to bats. This is exemplified by a question, asked by PREDICT in their final project report (2021: 73): ‘Was [Zaire ebolavirus] always there, hidden in an unknown host and spilling over for the first time in 2013?’ Or ‘how did [it] travel from Central Africa to West Africa?’ During the 2013-6 outbreak, phylogenetics revitalised exegetical debates over the spread of the virus. Virologists successively suggested that ‘it is possible that EBOV has circulated undetected in this region for some time’ (Baize *et al.* 2014: 1424), or that the Guinea strain of Zaire ebolavirus diverged from Central African lineages around 2004 (Gire *et al.* 2014). The two positions confront the two spatial imaginaries of origins highlighted above. In the undetected circulation model, the virus is maintained by a reservoir, and emergence is possibly due to increased contact between intermediary hosts and reservoir host through ‘habitat disturbance’ (Walsh, Biek & Real 2005: 1946). In the out-of-Central Africa model however, epidemics pass between reservoir populations through transient ‘pulses’ or ‘waves’ and spread in space (Walsh *et al.* 2005). Anthropologist Stefan Helmreich and epidemiologist David S. Jones (2020) have showed how epidemic ‘waves’ became a device of data visualisation, an object of mathematical modelling, and finally a tool for causal investigation and prediction. In the case of Ebola, the epidemic ‘wave’ ontology has so far functioned as a text rather than an imagery (with a few exceptions such as in Fiorillo, Bocchini & Buceta 2018,

who graphically modelled the density of infected bats as a wave pattern). But a similar development as highlighted by Helmreich and Jones could be detected in that the ‘wave’ hypothesis has yielded efforts at modelling Ebola zoonotic dynamics in association with ‘sustained migratory waves of Ebola virus infected bats’ and their ‘birth pulses’ (Buceta & Johnson 2017; El Rhoubari, Besbassi, Hattaf & Yousfi 2018; Reed Hranac, Marshall, Monadjem & Hayman 2019). The field of ecoimmunology, sparked in the 1990s by discussions between disease ecologists and behavioural ecologists, has furthered this conception, which views immune response in animal populations as a context-dependent process interrelated with seasonal activities such as migration and reproduction (Brock, Murdock & Martin 2014). Bats would thus act as vectors of geographic spread, depending on their migrations, birth cycles, and supposedly intermittent viral shedding, from Central to West Africa.

Speculations about the role of bats as vectors of spatial transmission are notably guided by findings in the natural history and zoonotic dynamics of Marburg disease. Described as a ‘sister genus’ of Ebola (Hranac *et al.* 2019: 2), the Marburg virus has been shown to rely on the reservoir population of fruit bats. Anthropologists (see Helmreich 2003) have noted that phylogenetics rely on the language of kinship and descent implied by terms such as ‘sister’, which is problematic as viruses are known to swap genes laterally. Lyle Fearnley (2021) has uncovered how evolutionary distance is transposed onto zoonotic diagrams of COVID-19, whereby ‘molecular resemblance between virus genomes comes to visually represent hypothetical lines of transmission between host species’ and crucially, contact between them. However, and this is an important difference between Ebola and COVID-19, there exists but one publication that established ‘common ancestry’ between the genetic sequences of the Ebola virus in humans and infected bats, namely in the series of outbreaks that happened at the Gabon–Congo border between 2001 and 2003 (Biek, Walsh, Leroy & Real 2006). Humans and bats are exceptionally entangled in Ebola phylogenetic trees, as very few sequences of RNA have been detected in bats so far (Leroy *et al.* 2005). And lines of transmission appear even more hypothetical than in the case of COVID-19. The 2013-6 outbreak certainly multiplied the size of the genomic data set of Ebola sequences from humans, but there has been little opportunity, if any, to compare those to bats. Thus, the migratory reservoir hypothesis is mostly based on ecoimmunological research on bats and separate phylogenetic data from humans, a fact to which we will return soon.

Hypotheses, samples, and methods are being articulated to configure bats as silent animal disease carriers. This figure, incarnated by rodents for example, predated that of the human

‘healthy carrier’ (Gradmann 2010; Lynteris 2019b), the asymptomatic yet contagious individual who has informed epistemic frameworks and biopolitical relations concerned with the containment of epidemic propagation through population control since the nineteenth century. Bat migration patterns have been studied since the mid-twentieth century through a variety of methods, including banding, tracking with radio or satellite transmitters, and genetic analyses (Fleming *et al.* 2019), mainly for zoological and conservation purposes. Research on the influence of bat migrations on the spread of Ebola, and efforts at monitoring them for the purpose of sending warning signals, while still in their infancy, are becoming more common (Fiorillo *et al.* 2018; Koch, Cunze, Kochmann & Klimpel 2020). There is no equivalent for bats to the anticontagion policies that can be implemented against humans and their movements during outbreaks, and that are being tried against certain animal carriers, such as border fencing for wild boar carriers of swine fever in eastern Europe (as many of my interlocutors deplored, ‘animals know no borders’, especially when they fly). As for technologies to prevent direct and indirect contact with bats, they are not at all as well-spread as the netting, wire panels, and electric fencing employed to keep enclosed domestic fowls separate from the wild birds thought to carry avian flu. Even though they are being increasingly called for, there is still a dearth of anti-transmission technologies focused on preventing contamination by bats by materially restricting their movement and opportunities for contact. These techniques differ from the bushmeat regulations inherent to Ebola prophylaxis when understood as a disease of place, but they congeal around the same being: the bat.

It is the use of PPE by projects such as PREDICT that most strongly evokes the semantics of contagion now elicited by bat sampling. During the epidemic, the anti-transmission protocol for ‘safe and dignified burials’ was heavily inflected by biosecurity measures and populated by such protective equipment (Faye 2015). The dead body was disinfected and placed in a mortuary bag, and boots, overalls, gloves, goggles, aprons, and masks were to be worn by health and burial workers to avoid contact with body fluids. Bystanders were simultaneously urged to keep their distance from burial workers and from one another. After the epidemic, PREDICT sampling practices were heavily indebted to this protocol; and in the years following the outbreak, full-body suits were only donned by *préleveurs* of animals considered wild in Guinea. PREDICT employees witnessed the suits’ capacity to stir up painful memories in sampling sites, manifested by the mistrustful cries that called for retaliations when they put on their gear: ‘the white men have returned’, or ‘beware, they are wearing clothes like Ebola workers’. In the locality of Soulouta, one day after Dr Bilis’s speech that opened this chapter, PPE nearly caused

the loss of team members, according to several employees I interviewed about an incident that happened during bat capture. When three PREDICT agents put on their PPE overalls to handle bats caught in a net, they saw bystanders vanish. Women locked themselves inside their homes while a group of men appeared, armed with stones and machetes. One even fetched petrol to set the PREDICT car on fire. The agents owed their lives to the ingenuity of the driver, who swiftly turned around and opened doors for everyone to jump into the four-wheel drive, and rushed off like a shot. The agents were left so scared by the incident that they pleaded for activities to be halted in that subprefecture. Through its reappearance in the context of epidemic surveillance and virological research, PPE did not only transfer blame onto bats as ‘epidemic villains’ (Lynteris 2019a). It also reinvigorated animosity against the assemblage of anti-epidemic technologies and malevolent intentions that used to index the risk of contagion during the outbreak, and that humans and bats came to form in post-outbreak circumstances.



Figure 5. Prélèyeurs working in PPE, observed by children

The public display of technologies and protocols against transmission did not only resurrect the political violence of the outbreak response, what Veronica Gomez-Temesio has called the necropolitics of Ebola (2018). It also probably mobilised the ‘curious pharmacopic quality’ of PPE, which both provides ways of caring and acts as a mode of transmission (Brown & Sáez 2020: 16): that is, PPE signified infection in powerful and multivalent ways. That hazmat suits were worn strictly in conjunction with research on the animal origins of Ebola, in the years after the end of outbreak, dramatised the endurance of the disease as a sort of contagion. Bats were being treated as healthy carriers of Ebola, potentially able to transport the pathogen over thousands of kilometres through ‘waves’, or life cycles of birthing and migrations. They were thought to act like human vectors of contagion, operating across a network of roosts spread across Africa like the clusters deciphered in human phylogenetics. Bats came to embody the mobile threat of Ebola, one that relies on the long political history of contagious migrants, indeed thought to ‘know no borders’.

C. A virus

It is still a different picture of the disease that has spread throughout public spaces in West Africa since the 2013-6 outbreak. One image stands for it, not that of a round ball crowned by club-shaped spikes like SARS-CoV-2, but one typical for filoviruses: a virion in the shape of a filamentous particle, coiled or branched, resembling an earthworm (Piot 2012: 14). This visual image differs starkly from public health posters, in the first decades of the twentieth century, which enclosed sick human subjects within a social environment of ill health, and conflated microbiological and environmental causalities of the disease (Cooter & Stein 2010). In Guinea, images of Ebola shed this visual clutter in favour of surface representations: the disease is visually reduced to the singular causality of the virus.⁵ In 2019, several billboards still stood next to the *Route Nationale 2*, which connects Conakry to all the prefecture capitals of Forest Guinea, urging passers-by to ‘always respect health measures’, because ‘Vigilance! Vigilance! Vigilance! Let’s prevent Ebola’s return’. The message, sponsored by an international development project for ‘health measures in support of the road’s rehabilitation’, featured, in a corner opposite the EU flag (one of the donors), a thumbnail of a two-dimensional photograph

⁵ This is made evident by the National Agency for Health Security poster detailing the case definitions of diseases under surveillance in Guinea: while drawings or photographs of acute clinical manifestations portray meningitis, cholera and maternal deaths, ‘viral haemorrhagic fevers’ (of which only Marburg and Ebola are actually caused by filoviruses) are the only group of diseases visualised by a filovirus. The poster is visible throughout the country, taped on the walls of public healthcare structures.

of the virus. I suspect that, years after the end of the outbreak, many inhabitants of N'Zérékoré did not look at the faded poster anymore, even though there were three such billboards in the city. Tamba, a biologist who survived Ebola, owned a private healthcare practice which happened to be situated opposite one of them. He once told me he avoided looking at it, because it 'reminded [him]', he said pointing to his head, plagued already by the fatigue and memory problems associated with what became known as 'post-Ebola virus syndrome'. The virus form grounds an alternative causal framework for Ebola's persistence in post-outbreak Guinea, perhaps the only one that configures the disease at an ontological level. After 2016, research in pathology and immunology – not in disease ecology and epidemiology – has dramatically transformed the terms in which the risk of Ebola resurfacing is being thought and practised in West and Central Africa, with no bridge yet to spatial epistemologies of the disease.

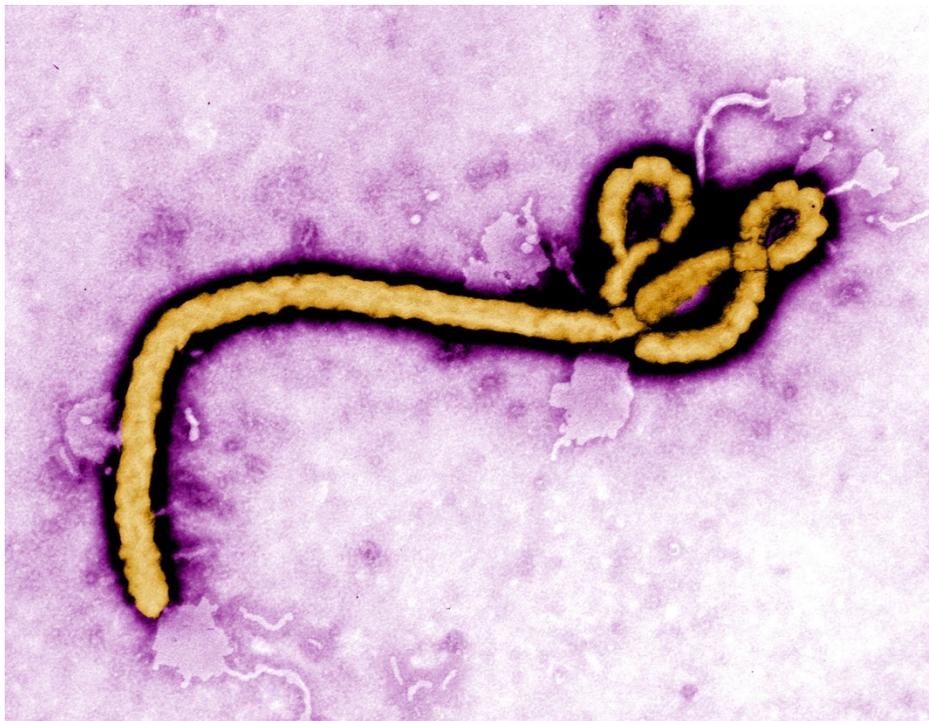


Figure 6. The Ebola virus by electron microscopy (photo by F. Murphy)

Sampling projects focused on animals, mostly those thought to be wild and occasionally on domestic animals, achieved a high level of visibility in the Guinean hinterland in the years following the end of the outbreak. That body fluids and blood were also being taken from people who recovered from the disease for the purpose of testing was a much more discrete endeavour by contrast. Ebola disease has been understood as a viral infection since the first 1976 outbreaks in Central Africa, from a cumulative clinical and epidemiological diagnosis of haemorrhagic fever disease (WHO 1978a; 1978b). Clinicians were aware that recovery from Ebola might be

followed by a lingering cluster of symptoms, and they have been studying the immune system response of survivors since the 2000s at least. But the phenomenon became more widely reported and researched due to the large number of survivors after the 2013-6 outbreak. The condition, known since 2015 as ‘post-Ebola virus disease syndrome’ (Carod-Artal 2015), includes fatigue, joint, muscle and chest pain, headaches, ophthalmic symptoms such as vision loss, and neuro-psychiatric issues including memory problems, insomnia, and anxiety attacks (Bond, Grant, Himmelfarb *et al.* 2021; Wilson *et al.* 2018). It was evidenced through the inclusion of survivors in observational cohort studies coupled with healthcare support in Liberia, Sierra Leone, and Guinea. Across Guinea and into N’Zérékoré Regional Hospital, more than 800 patients were recruited into PostEboGui, a multidisciplinary assessment programme of post-Ebola sequelae performed by Inserm, the French National Institute of Health and Medical Research, and IRD, the French Research Institute for Development (Etard *et al.* 2017). For up to three years, their health was regularly monitored and their body fluids – semen, breast milk, urine, faeces, saliva, and vaginal fluids – were collected and tested for antibodies and viral material (Keita *et al.* 2019). Their close contacts, including those who reported few or no symptoms, were also tested for traces of infection (Diallo *et al.* 2019). These populations experienced a form of therapeutic governmentality, whereby they were constituted, in their bodily and social existence, by the deployment of lab technologies together with humanitarian aid.

In N’Zérékoré, Tamba and 113 other survivors travelled to the regional hospital, where their transport and food costs were being covered, for regular appointments and whenever they experienced sickness. After showing their PostEboGui member card to the triage nurses, they were directed to a small room next to the hospital’s entrance gate. A paediatrician examined and triaged children there, while at a separate table, survivors were being received by Pascaline, a young nurse from N’Zérékoré who had herself recovered from Ebola and been employed by the ETC in 2015. Pascaline asked about their current symptoms and filled in forms before sending the visitors to the hospital laboratory, where their blood was taken and men were instructed to drop off a vial of semen, anticipatorily self-collected a few hours before. In what looked like an exchange of value for many of them, they were examined by hospital doctors for free, and received psychotropic drugs and other routine treatments. Pascaline also acted as president of N’Zérékoré *Association des Survivants d’Ebola*, whose main role was to invest and manage the funds granted by the World Food Programme and other aid projects to survivors for ‘income-generating activities’. Some survivors thus came to consult her about their gastritis

and enquired, on the side, whether the oil press machine bought with the grant was currently in use, and who stored and sold the jerricans of palm oil. The biology of Ebola survivors accrued what they came to recognise as scientific and economic value, like HIV-positive people included in antiretroviral trials and programmes in the 1990s and 2000s (Marsland 2012; Nguyen 2010; Prince 2012). Through integration into a para-state economy of global health, survivors hoped to attract income from donors and meet their needs. As certain male survivors protested when realising that scores of Guineans who did not have the disease benefited from employment in post-Ebola projects, ‘we are selling our samples’ and should be adequately retributed.

But unlike for people who belonged to the HIV cohort studies that took place in sub-Saharan Africa in the 1990s-2000s, there was an important epistemological and affective component to the biosociality furthered by survivor monitoring projects: the pathogenesis and immunology of ‘post-Ebola virus disease syndrome’ were little known, and so was its potential infectiousness. Tamba and others confided in me that they sometimes wondered at night whether they were truly *guéris* (healed, recovered): by which they meant whether the ‘virus was eliminated from their body’. They conflated their clinical health with their immune status and assumed that their bodily integrity depended on the elimination of biological difference. Such a vision of the ‘self’ has historically underpinned immunology, a discipline born in the early 1970s in the study of the human body’s ‘defence mechanisms’ against pathogens (Moulin 1989; Napier 2003). At the time of my first stay in the field in 2017, medical doctors had detected Ebola virus RNA in the semen of a man up to two years after he was discharged from an Ebola Treatment Centre (Fischer *et al.* 2017), a result publicised by survivor monitoring programmes in Guinea. A new biomedical discourse was developing in scientific publications and press releases: the virus was said to ‘persist’, ‘hide’, ‘lurk’, and perform ‘vanishing tricks’ in ‘immune-privileged sites’, such as the testes and eyes (Fischer *et al.* 2017; Mackenzie 2016). Immunology, a discipline indebted to vaccine pioneers of the nineteenth century and their fight against ‘germs’, has granted viruses volition through similar metaphors since its beginnings, and the start of a sustained dialogue with the burgeoning discipline of virology (Napier 2003; Silverstein 2009). The survivors themselves were told by PostEboGui officers that the ‘virus can hide in [their] body’.

This immunological discourse incorporated selective tenets from other disciplines at the end of the West African outbreak, and yielded what infectious disease specialists have called a ‘new paradigm’ for Ebola. Epidemiology and phylogenetic methods confirmed that most of the

disease flare-ups detected between 2015 and 2016 across the three countries were due to ‘persistently infected EVD survivors’ (Subissi *et al.* 2018). Virologists started writing about a ‘human reservoir’, or even, a ‘tissue reservoir’ of Ebola (Heeney 2015), in a striking attempt to deflect blame and reduce the threat to localised organs. The hypothesis garnered more attention after a new series of relatively minor outbreaks in 2020-1, in Guinea and the DRC. In February 2021, an outbreak in N’Zérékoré – which happened to affect Soulouta – was connected by the Guinean medical researchers who ran PostEboGui to transmission from a survivor, presumably at least five years after their recovery (Keita *et al.* 2021). Phylogenetics provided the main evidence for their claim that ‘resurgence of Ebola virus in 2021 in Guinea suggests a new paradigm for outbreaks’, but this new paradigm is crucially indebted to the discipline of immunology.

Ebola’s ontology, when it revolves around a virus, does not come down to the semantics of difference, which frame the presence (or absence) of the disease in ecology and epidemiology’s spatial discourses: it revolves around the cybernetic rhetoric of thresholds. The language of end-of-the-nineteenth-century bacteriology certainly pervades these new depictions: the virus is said to evolve slowly within the organisms of former patients, as a ‘latent’, ‘quiescent virus’ that could ‘wake up’ and trigger an outbreak. Immunological studies layer a more complex model onto that discourse of attenuation and recrudescence, a transformation in early-twenty-first-century immunology which David Napier has traced to social information feedback studies (2012: 124). It is suggested that ‘continuous’ or ‘intermittent’ stimulation by Ebola virus drives the production of antibodies (Wiedemann *et al.* 2020). Although antibody concentration appears to decrease in survivors over time, scientists describe a ‘wax-and-wane pattern’ (Diallo *et al.* 2021), a ‘decay-stimulation-decay’ pattern (Adaken *et al.* 2021), or an ‘ebb and flow of antibody levels’ (Woolsey & Geisbert 2021) in some of them. The curves that illustrate these publications feature, yet again, documented and modelled waves of antibody production in the years following recovery, hypothetically only induced by cyclical exposure to ‘de novo antigenic stimulation’. Unlike the waves of Ebola contagion examined above, with their ecological multifactoriality, these posit that the immunological pattern is monocausal.

Immunologists do not simply constitute survivors as disease vectors, as in the contagion paradigm, nor as a ‘breeding ground’ for mutations implied by viral chatter from reservoir spillovers. Survivors come to occupy an epistemically autonomous position as regards the latency of the disease and its elusiveness. As in early-twentieth-century depictions of ‘Typhoid

Mary’, an Irish cook thought to host an attenuated form of typhoid and infect her healthy employers (Wald 2007), survivors of Ebola are taken to act as a medium of recrudescence for a pathogen that is not only elusive but treacherous, as the metaphors quoted above abundantly show. Unlike in the contingent contagionism theory of the end of the nineteenth century, or the ‘seed and soil’ metaphor of tuberculosis (Worboys 2000), the sanitary predispositions and environmental surroundings of previously infected individuals do not seem to influence the virulence of the disease. There is (as yet) no talk of survivors’ habitat, nutrition, or health state affecting their antibody production and viral load (only ‘genetic factors, viral inoculum at infection, or regulatory differences’ appear implicated, Diallo *et al.* 2021). The Ebola virus does not assume an unpredictable nature within human bodies. Instead, the wave pattern is, thus far, its ontological expression when interacting with immune systems. As Napier has noted (2012: 133), developments in immunology have made it possible to think beyond the naturalised hostility and war metaphors of viral invasion: ‘those viruses, once embodied, now inform – as, we used to say, infect – [life]’.

These new reflections do not perform Ebola as a zoonosis since they do not focus on human-animal transmission: novel phylogenetic studies do not include viral sequences taken from apes or bats. Rather, clinical and immunological investigations into the disease enact it as a long-term combination of virus and immune system with repercussions on the pathology of infected people. Few scientists have thought across the two Ebola clusters I outlined, respectively centred on bats and survivors (although virologist Jonathan Heeney suggests that ‘the animal reservoirs of Ebola may be cloaked by sequestration of the virus in much the same way as its persistence in human survivors’, 2015: 454). Nor are these investigations necessarily brought together in institutional terms. In Guinea, the IRD, together with the Guinean research centre CERFIG, simultaneously directed PostEboGui and EBO-SURSY, a project for strengthening early detection systems in wildlife (the acronym of which, I was told, was intentionally chosen to echo the French *sursis*, which means both ‘deferment’ and a ‘suspended prison sentence’). But while the American aid agency USAID funded PREDICT and a so-called ‘sentinel site’ project implemented by the NGO International Medical Corps for the surveillance of survivors, their leaders and employees barely knew of each other’s existence, although they all had their headquarters in N’Zérékoré. The disease thus assumes two – rather than three – ontologically autonomous forms, as a space-bound disease and a threshold-bound disease, which few institutions have connected thus far.

That there are few intersections between disciplinary understandings, institutional networks, and infrastructural materialities involved in research on Ebola's origins has implications for visions and projects of disease management. We will see in Chapter 4 how the bat, in that it bridges environmental, sanitary, and contagion understandings of the disease, contradicts the goal of preventing the disease through implementing separations between humans and bats. By contrast, recent findings on the human immunology of Ebola have resuscitated hopes of eradicating (at least one) 'latent virus reservoir'. Researchers (Keita *et al.* 2021) started making a case indeed for people who recovered from Ebola being vaccinated or administered an antiviral agent. Ebola subjects – bats and survivors – exert a different traction on prevention schemes and public health policies. Conversely, different control mechanisms for each, due to different material affordances, enable the operation of distinct evidential regimes.

Conclusion

Laughter accompanied coffee break, in the room of Macenta Prefectural Department of Health, where PREDICT managers trained administrative personnel in zoonotic risk communication. The topic of 'rumours' had just been covered and participants now rivalled each other through telling what they saw as far-fetched stories of epidemic origins. Yossè, a farming technician employed by the Prefectural Department of Animal Farming, said he had read an article in 2014, which implicated the 'Israeli George Soros'.⁶ The media story allegedly reported that Soros had imported the virus from Central Africa and commanded experimentations in Sierra Leone. An animal had escaped the lab and been captured by a hunter, whose family became sick after eating it. Yossè found the narrative quite credible. He added that when, in November 2014, he heard that saliva samples from an Ebola victim, which were being transported onboard a travel bus, had been stolen by highway bandits (France 24 2017), he thought to himself: 'Isn't a Black Hand behind Ebola?' Others concurred: he had not been the only one to entertain such thoughts.

Yossè's narrative could be interpreted as a conspiracy. But it amalgamates elements from each of the three articulations of Ebola examined in this chapter: with a tropical ecology, the mining economy, and a hunted animal; with the importation of a foreign pathogen; and with

⁶ This figure conflates Israeli mining magnate Benny Steinmetz and US billionaire investor George Soros, at odds over the Simandou iron ore deposit, in the N'Zérékoré region.

the threatening potential of saliva samples, all welded together by the suspicion of nefarious intentions, characteristic of conspiracies (Sander & West 2003). The disease entity is not a self-contained category but involves endless processes of microarticulation (McDonald 2014: 129) – with places, bats, institutions, people, and histories which in turn shape divergent epistemic lineages and syntheses, among specialists and non-specialists. It is not a question of an anterior Ebola which is being represented more or less accurately, or even integrated as the outcome of different objects of knowledge, but a process of articulating matter and meaning (Mol 2002). This chapter endeavoured to capture the mutations of these assemblages at a moment when they were being reconstituted with even more urgency as the disease materialities had undergone a dramatic change of scale. Ebola's ontology as a virus could only arise in the wake of the large outbreaks, in 2013-6 in West Africa and 2018-20 in the DRC, which left thousands of survivors in countries with limited resources. Recent epidemics disrupted disease landscapes, generated novel biosocialities, and furthered institutional collaborations hitherto unprecedented.

Hannah Brown and Ann Kelly (2014: 294) have proposed to theorise such a zone of epistemological and material frictions as a hotspot in itself, 'where ideas can move between hosts as they approximate (or make proximate) their differing knowledge practices'. West Africa, and Guinea in particular, where the disease first emerged in December 2013 and resurfaced in February 2021, acts as such a hotspot. But the 'movement' of disease assemblages 'between hosts' is not unimpeded, and I showed them in their respective ecologies of evidence. Animal sampling projects such as PREDICT, on which this dissertation focuses, convoke Ebola as a disease of place and as a contagion, whereby local species of bats, taken to travel across African countries, are being sampled with the help of PPE, in a locality picked for its supposed susceptibility to disease, environmentally and sanitarily. This construction, in which the bat acts as a node, is formed by scientific communities, disciplinary methods, technological practices, and containment policies which are epistemically entangled with the question of Ebola's origins. What I call the 'bat bridge' yet remains, so far, largely hermetic to Ebola's articulation with the situated biology of survivors.⁷ This is partly due to the impossibility of including bats in interspecies phylogenetics because of the very limited number of viral sequences found in them, but also, the chapter suggests, to separate ecologies of evidence capturing selective dimensions of a plural disease phenomenon.

⁷ Although three anthropologists (Fairhead, Leach & Millimouno 2021) have urged scientists to integrate these models and reconfigure Ebola as 'an endemic disease over long timescales and wide areas', asking for 'balance between spillover and flare-up' explanations.

Importantly, these two material-semiotic clusters of Ebola, around the bat and the survivor, bear consequences for the way the disease is controlled and anticipated to be controlled. In the combined localist-contagionist aetiology, the disease is being accommodated with the rhetoric of absence and presence: PREDICT sampled bats to find out whether and where they harbour the pathogen. To this extent, the period in which I did my fieldwork was an interepidemic time of absence. It was but a *sursis*, in the wording favoured by the IRD to designate their wildlife surveillance project. Despite the rhetoric of forecasting common to animal sampling projects, in the case of Ebola they do not seek to uncover mutations in a known animal reservoir and anticipate which one will lead to an epidemic, that is they do not practise sentinel surveillance in Frédéric Keck's sense (2014). Since the Ebola reservoir is still an hypothesis, such research rather aims to recognise the presence of viral forms that are already known and prolong the *sursis*, a waiting until the next outbreak. But when configured immunologically, the disease does not stop at the end of outbreaks; it is never absent. The body-cum-pathogen is a medium of constantly fluctuating epidemic potential. It has a transformative character, which hinges on feedback mechanisms across immunological thresholds. Those movements may be controlled through constant monitoring more akin to sentinel surveillance. I expect the salience of this novel conception around the figure of survivors to grow in the coming years as Ebola outbreaks since 2018, increasingly frequent, have been traced, phylogenetically or epidemiologically, to survivors. But the rest of the dissertation will focus on animal sampling and present detailed accounts of entanglements between bats, place, and contagion in its planning and practice in Guinea. Ultimately, and by returning to narratives such as that of Yossè, I will question the connection between epistemologies of Ebola and the ways in which future epidemics are anticipated by animal samplers.

Chapter 2: Capture

‘Americans do not need many words: results and pictures, that’s it’. It was a warm afternoon in the PREDICT office, a villa far from the city centre, surrounded by high walls and barbed wire like many compounds in N’Zérékoré. There was no road sign, and no name was painted on the gate: unlike many projects in the city, PREDICT preferred discretion. Dr Bilis was coaching vet doctors Norbert and Nathalie on writing the mission report intended for the US project leaders, ‘in high places’ as they liked to say. At the end of every sampling mission, two agents were to complete a *rapport d’échantillonnage*, or sampling report. Reports are key documents in the NGO economy of value that anyone employed by the Guinean aid scene knew matter all too well. *Rapports d’échantillonnage* followed a template: mission dates and name of the sampling site as title, list of activities undertaken, result tables with the number of sampled animals and specimens collected by date, and ‘truthful pictures’ as annex. Dr Bilis, who praised himself for taking the best pictures, clarified what ‘truthful pictures’ had to look like. Animals had to be clear, their handlers had to look ‘human’. If photographed during a community meeting, the agents could not be engrossed in their phone, and if at work, they had to scrupulously respect the biosecurity protocol. Conclusions were the only text tolerated in *rapports d’échantillonnage*, and systematically noted a warm welcome by administrative authorities, the attentive participation of the population in meetings, and the disturbance caused by rain or ‘ritual ceremonies’ (Norbert asked: ‘how do you say *féticheur* over there?’), as he looked for a way to justify the interruption of activities on the funeral day of the leader of an initiation society). ‘You have to think of the people who will read your report, in the United States’, Nathalie pondered by way of an answer. ‘But we have nothing to hide’, reassured Dr Bilis.

The drafting of sampling reports, and the pains taken by Dr Bilis and his team in crafting a ‘truthful’ representation of their activity for the attention of ‘high places’, highlights the work, material and textual, performed by PREDICT *préleveurs*. Sampling operations are inextricably bound up with processes of numerical translation and visual transformation. These techniques underscore the tension at the heart of the notion of sample: both a part taken from an entity, and an artefact, prepared for circulation and collection. Throwing light on such a relational labour, articulated by and through the collection of viral samples, shifts the focus away from the expert scientists encountered in existing ethnographies of research on disease reservoirs (Fearnley 2020b; Keck 2020; Lachenal 2015; Perrey 2012). These works have tended to foreground an

economy of knowledge involving virologists, ecologists, and vet doctors. These experts deploy lab techniques, formulate narratives of disease origins, redeploy the same or different techniques elsewhere, and alter their narratives. Anthropologist Lyle Fearnley (2020b) indicates, for example, that scientists affiliated with the Food and Agriculture Organization (FAO) in Beijing, through their travelling to the epicentre of influenza outbreaks for investigations, were forced to displace their tools of enquiry and draw into their experimental systems ‘non-virological factors’ such as duck behaviour and husbandry techniques. Dr Bilis, Norbert, and Nathalie yet seemed to harbour quite different concerns, less diplomatic and epistemological than they were aesthetic, economic, and existential. These were tied to the material forms which they mediated between their American employees and the Forest Guinean inhabitants of the localities in which they operated. The vials, the tables, and the clear pictures formed Ebola as an object of scientific knowledge, and a proper project’s ‘result’. The chapter is interested in how acts of translation and concealment by PREDICT agents – independently of the disease assemblages highlighted in Chapter 1 – end up hardening the bat hypothesis.

If Dr Bilis asserted that they had ‘nothing to hide’, I repeatedly heard him and others celebrate the end of sampling activities and the start of communication in terms of ‘not having to hide anymore’. This ambivalence about self-dissimulation emphasises *préleveurs*’ complex work of mediation between samples and the context from which they were extracted. In this Chapter, I situate the type of translation at work in *rappports d’échantillonnage* within a theory of camouflage. Camouflage refers to military technologies of concealment that obstruct the identification of personnel, infrastructures, and equipment. The notion has been discussed with regards to the concept of mimesis (Brighenti & Castelli 2016; N. Leach 2006). Mimesis is generally understood by social scientists as a plastic proposition driven by imitation (Kendrick 2012: 109), and in a wider sense, as a process of representation and mediation between different lifeworlds (Gebauer and Wulf 1992; N. Leach 2006). Following anthropologist Ieva Jusionyte’s work on state camouflage (2015), PREDICT agents could be said to practise camouflage in that they use multiple symbolic and material orders to protect themselves from being recognised (and threatened, economically and physically) by blurring boundaries between different horizons of expectations, such as regarding the interference of ritual ceremonies with their work. The notion of camouflage enables us to focus on the symbolic, material, and performative work of obfuscating categories that grants legitimacy to the *préleveurs*’ practices. More specifically, it interrogates the nature of the relationship between collection practices and the truth-value of the animal fluids sent to the United States, seen from the Guinean field. Works

on the anthropology of blood indicate how pervasive the idea is that body fluids reveal the truth about a person's essence (Carsten 2013: S3). The rhetoric of truth, which we witnessed in Dr Bilis's discourse during community meetings in Chapter 1, expresses the conviction that samples, once tested and transformed into data by a foreign lab, will yield the 'truth about the disease'. By centring on the aesthetic, epistemological, and moral negotiations between this truth, taken to inhere in material parts extracted and circulated, and various dynamics of obfuscation in sampling activities, I illuminate something of the subversion of categories that enable sampling to happen. Camouflage – which I define in this context as the partial, staged, and polymorphous fusion of the extract and its milieu, of extractors and their sociopolitical context – comes to constitute the operational principle of sampling.

The chapter first investigates PREDICT agents' own self-definition as *préleveurs* against an historical and relational field of professional identities which frames their activity at various moments of the collection process. It investigates what I conceptualise as a threefold regime of camouflage enacted by *préleveurs*, using distinctions drawn by French intellectual Roger Caillois between three forms of mimesis: *préleveurs* blended in the sites selected for sampling with the institutional space of post-Ebola Guinea; they masqueraded as kin or enemies of the 'resistant' inhabitants of sampled sites; they finally impressed their US contractors with staged pictures of their fieldwork. I conclude with a few words on the epistemic work performed by *préleveurs*' mimetic acts and the scientific virtues which drive them and end up cementing a the concept that Ebola originate in bats in ways comparable to those examined in Chapter 1.

A. A space of mimesis

The fourteen sampling agents recruited by PREDICT in March 2017 had all trained as veterinary doctors except for five of them. Dr Bilis and the field supervisor were both state-employed vets trained abroad, respectively in Cuba in the 1970s and Algeria in the 2000s. Most of those recruited for animal sampling had trained at Guinea's Institut Supérieur des Sciences et Médecine Vétérinaire (ISSMV, or Higher Institute of Veterinary Sciences and Medicine), founded in 2006. At the ISSMV, vet training focused on the needs of the livestock and food industry rather than wildlife surveillance, as testified by the school's three departments: Veterinary Medicine, Fisheries and Aquaculture, and Animal By-Product Control and Technology. And for good reason, since the job prospects of ISSMV graduates in Guinea, for those lucky enough to find employment as veterinary doctors, were in private surgeries or in

the Animal Farming and Animal Product administration – although many aspired to start their own farming business in the booming poultry sector.

There was a discrepancy between the professional expertise and aspirations of these vet doctors, on the one hand, and their short-termed position as *préleveurs*, on the other. Animal samplers (*préleveurs*) was an unprecedented role in Guinea, which they would come to play for two years at least. There was no pre-existing figure of samplers, especially of animals considered wild, towards which PREDICT agents could orientate their identity, practices, and moralities, as in a dyadic relationship between model and imitation.¹ They thus aggregated references to plural figures. Anthropologist Michael Taussig, a major reference for his work on mimesis as a form of appropriation central to knowledge making (1993), has suggested that syncretic systems – such as shamanic medicine – are only particular moments in an ongoing mimetic and counter-mimetic reverberation across lifeworlds (1987: 218; see also Langford 1999). In his reading of Cuna figurines mimicking the white man, Taussig has argued that an imitation is not merely a shadow of the real: it assumes something of the character and the power of that which it represents. While I will later distance myself from Taussig's understanding of mimesis as a constitutive aspect of colonial and postcolonial power (see Ladwig and Roque 2020 for a reappraisal), I retain in the following section of the chapter his insistence that the efficiency of mimesis precisely lies in instabilities and dissonances (Taussig 1993: 51), 'so that it is [un]clear what (or even that something) is being copied' (Lempert 2014: 387). Active participants in Guinea's post-Ebola sampling enterprise drew on an eclectic repertoire of historical references and professional personas, which intersects with the genealogy of PREDICT we traced in the Introduction. This repertoire can be likened to a space of mimesis, where *préleveurs* manoeuvred and embraced different identities through their everyday activities.

¹ Accordingly, the dissertation refers to Guinean animal samplers as *préleveurs*. I use the word 'samplers' to designate these professionals in a general sense.



Figure 7. Préleveurs wearing overalls and rubber boots with the anthropologist for a group picture in front of the four-wheel drive (photo by M. Raab)

The technical term used in PREDICT documents to designate their activity, in French, was *échantillonnage*. But employees most succinctly defined themselves as *préleveurs*. A substantive form of the French *prélever*, from the latin *prae* ('before') and *levare* ('to lift'), *prélever* means 'to extract', and is widely employed in a medical context to refer to the activity of taking fragments from an organism for testing (in an economic sense, it refers to the act of debiting from an account or collecting a tax). As *préleveurs*, PREDICT agents discursively placed themselves within a medical economy that takes, circulates, and transforms fragments of biomaterial. In West Africa, many medical trials and community health projects are interacted with on the basis of an exchange of *prélèvements* against services or goods, even when no sample is actually taken (Fairhead, Leach & Small 2006). Some PREDICT agents had been employed in this economy already. Since the advent of zoonotic outbreak preparedness in the country, Guinean vets took samples from animals suspected of being affected by diseases under surveillance and sent them to regional labs. During the Ebola outbreak in 2014-5, Michel, one of PREDICT Guinea's two biologists, took samples from the bodies of people who died outside Ebola Treatment Centres to confirm whether the disease had caused their death. The promise of lab analysis for surveillance, a revelatory technology with political fallouts for

patient triage, burial protocols, and livestock culling orders, transfigured the object of *préleveurs*' sampling. As Norbert explained to the inhabitants of sampling sites, by 'taking *prélèvements* ... we will know the health status of the animal', a state which PREDICT agents configured in binary terms, 'positive' or 'negative', without specifying in relation to which pathogen.

The non-destructiveness of PREDICT's *prélèvements* structured a comparison between animals and the human patients of biomedicine. It enabled PREDICT agents to delineate their relationship to another figure: that of the pest exterminator. As Nathalie repeated to those who asked them to 'kill or burn the bats' after sampling: 'if you go see a doctor, and they take your blood and urine, are they going to kill you afterwards?' This questioning echoes the history of rat eradication campaigns conducted by European imperial powers during plague outbreaks (Alves Duarte da Silva 2020; Skotnes-Brown 2020). In their West African colonies, affected by the Third Plague epidemic from 1907 to the Second World War, the French authorities founded rat and plague services to capture, count, examine, and kill rodents (Soppelsa 2021). Those services relied on bounty hunts, also organised in the French colony of Vietnam (Vann & Clarke 2018), whereby the local people who collected rats were rewarded by a small sum. Specialised rat hunters were occasionally recruited, equipped with cats, nets, and rodenticides, and given hoses, shovels, and pickaxes for fumigating rodent burrows (Perrigault 1931: 202). PREDICT agents had also been endowed with hazmat suits and vaccinated against rabies prior to the start of their contract, conditions that rhyme with the 'flea-proof suits' and antiplague serum given to plague rat catchers (Soppelsa 2021: 72-3). In 2017-9, there were no pest extermination services in Forest Guinea, but a few companies operated in the Guinean capital where they targeted rodents, bed bugs, and fleas by means of spraying and fumigation. The technologies used by PREDICIT *préleveurs* did not only index the nuisance caused by bats and rodents: the hazmat suit, like 'flea-proof suits' in plague times, connoted their dangerousness to human health. This historical context underlines the inclusion of sampling activities in a global, generously funded postcolonial clinic of surveillance, which configures its object (the animal) as both a pest and a patient, an intersection the consequences of which are further examined in Chapter 3.

PREDICT agents lobbied their managers to be given, in addition, rubber boots against snake bites, and time and again, someone brought up the question of anti-venom and mosquito repulsive. Their employment was not only hazardous because of the unknown viral status of sampled animals, but also because they considered their work environment dangerous. When

interviewing candidates, after looking at their vet school diploma, Dr Bilis foremost enquired about their age and body condition: *préleveurs* would have to toil at night and climb rocks to reach the caves where bats roost. Probably for that reason, only three of those hired were women. His insistence on physical strength and endurance squared with the few media representations of ‘virus hunters’ to which PREDICT Guinean agents were exposed, such as a printed-out copy of a *Telegraph* article, which I saw lying on Dr Bilis’s desk in October 2018. The title, ‘On the hunt for disease X’ (Shute 2018), was framed by large pictures of PPE-clad individuals, empty-handed, standing against a dark green background of sprawling trees, tall grasses, vertiginous mountains, and spectacular skies. The article, based on PREDICT Sierra Leone ‘virus hunters’, had been forwarded to Dr Bilis by a PREDICT US-based epidemiologist, with the instruction to show it to the team, ‘for inspiration’. Its depiction of an anonymous yet certainly male adventurer of the wilderness replicates the self-presentation of US virologist Nathan Wolfe. In his TedEx talks and media interviews, according to historian Guillaume Lachenal (2015), Wolfe sports the cool yet self-dramatising attitude of a scientist-cum-explorer of ‘unknown galaxies’ of viruses (Trost 2009). PREDICT agents might never have heard the expression ‘virus hunter’, or the French *chasseur de virus*, but each of them kept a visual collection of their experience not unlike that of colonial-times trophy hunters (see also Frerot 2021a). They curated on their phone a collection of blurry bat pictures, where an impressive fruit bat with a ‘dog head’ and ‘big eyes’ occasionally stood out. Such trophy pictures, reminiscent of safari hunting (Michaud 2015; Ryan 2000), were as cherished as they showcased the live animal, normally invisible, torn away from the dark and brought under the lights of the mobile lab.

These images were only granted a few more seconds of attention as the agents quickly flicked through their collection when they showed it to me or to others. Their large quantity testified, for *préleveurs*, to their massive achievement. The seemingly glorious pictures of themselves posing in front of caves nevertheless went with gruelling narratives of exhaustion: how hard it had been to climb these slippery hills in the rainy season while carrying crates of material! Images and narratives, when combined, echoed less the glorious era of trophy hunting than they did, perhaps, the period of interwar animal extraction in Guinea. In the 1920s-30s, many Guineans were hired and trained for primate capture and research by the French military vets and doctors who ran the Pasteur Institute of Guinea (Leblan 2018; Thomas 2016; 2020).²

² The Institute was founded by Pastorian bacteriologist Albert Calmette in Moyenne Guinée in 1922, at a time when the overseas network of Pasteur Institutes dramatically expanded (Dedet 2001; Moulin 1995).

The Institute was primarily designed as a research centre for experimentation on primates and for the study of human and animal pathogens (Dedet 2001). Described as a ‘simian kingdom’ (Thomas 2017), the Guinean colony was also expected to provide the metropole with sought-after material for French and foreign laboratories, at a time when simian models prevailed in human medicine. Colonial scientists, like naturalists and safari hunters, needed local people to act as porters, hunters, guides, and carers in bush expeditions (Thomas 2020). These personnel played a most determinant role in animal capture: between 1923 and 1926, seven hundred chimpanzees were bought by the Pasteur Institute from local hunters (Rossiianov 2002: 293) and two convoys of about a hundred monkeys were directed to Paris every year until 1939 (Dedet 2001: 114). No PREDICT agent knew about this history of animal capture and export. They were nonetheless subjected to comparable logics of numerical extraction and reliance on local labour force. Therein, samples were not only framed as tokens for biomedical surveillance, as they were also raw material to be *mis en valeur* (improved, in French colonial parlance) by foreign powers.

Despite scientists’ reliance on them, interwar Guinean hunters and carers were frequently accused of mistreating animals and perpetrating ‘barbarian massacres’ (Perrigault 1931: 72; see also Leblan 2018). PREDICT workers were as deprecative when it came to the knowledge of the contemporary Guinean hunters which they could have relied on. If the project’s protocol suggested involving local hunters in the search for bat roosts, *préleveurs* sought to distance themselves from them. When I asked one of them why PREDICT agents did not turn to hunters for help, Michel answered: ‘*chasseurs* [hunters], in the communities, are seen as subhumans; they are poorly regarded’. ‘They do not know anything about life and can be easily intimidated’. This judgement confirms ethnographic accounts that decentre the figure of hunters as a social pillar in the Mande region (Jackson 1988; M. Leach 2000; McNaughton 1988). According to anthropologists, hunters would operate on the margins of village sociality through their sorcerer-like dealing with bush spirits. Furthermore, in recent decades, growth in the urban demand for bushmeat and the depletion of the animal population have led to a rise in rifle hunting by younger men, a profitable practice frowned upon by hunter brotherhoods and state actors alike, anxious about unregulated firearm spread (M. Leach 1994; 2000). The words of Michel, who grew up at the turn of the twenty-first century, may reflect increased distrust of all sorts of hunters in Guinea. Distrust was likely compounded by the social and educational gap he perceived between *préleveurs* and hunters, and the legacy of colonial prejudice displayed by Pastoria scientists against ‘barbarian’ hunting practices.

The term *chasseur* nonetheless encapsulates a variety of meanings in contemporary West Africa, where brotherhood hunters, confronted with the decreased availability of game, have been employed as security guards, park rangers, and mercenaries during the 2000s civil wars (Bassett 2005; Ferme and Hoffman 2004). The Forest Guineans among PREDICT agents remembered a recent time, in 2000-1, when municipal authorities also organised groups of youth vigilantes in Forest capitals to resist cross-border attacks (Arieff 2009). Thousands of young men responded to the rhetoric of defending their homeland and organised roadblocks and patrols to protect property and borders (Engeler 2020). The ethos of these *Jeunes Volontaires* harkened back to the civilian militias of the socialist era, when all party militants received basic military training (Camara 2000; McGovern 2017). *Préleveurs* strikingly deployed the same rhetoric when PREDICT US managers asked the Guinean team to collectively brainstorm ‘success stories’ about their action for USAID communication. The story titles they invented dwelled on a military metaphor: ‘a team armed against hidden enemies’ (‘to knock out the sleeping enemy’ had been voted against), ‘PREDICT at war against zoonotic diseases’, ‘armed like commandos against rebels’. When their US-based manager complained that this ‘lexical field of war and woe’ was too ‘sad’ for success stories, Dr Bilis retorted aside that he was aware that they were metaphors, yet ‘were we not combatting an evil?’ He had, like others, first-hand experience of the 2000 rebel attack on Guéckédou and subsequent bombing by the Guinean army. It was this imagery of guerrilla fighters and patriotic duty that PREDICT *préleveurs* wanted to illustrate in the media, where their samples were now configured as a prized war booty rather than safari trophies.

There was no original model to inform the practice of PREDICT *préleveurs*, barely exposed to the ideal of ‘virus hunter’. What we could see as the space of mimesis in which they circulated creatively articulated pre-existing moral discourses, social imageries, and professional identities into a partly dissonant figure. PREDICT agents entered into mimetic and anti-mimetic relationships with the medical *préleveurs*, game hunters, colonial scientists, militia men, and pest exterminators who had been roaming the region and animated various networks of extraction. The animal fluids and pictures that composed *rapports d’échantillonnage* were endlessly refracted by this web of characters. This is in accordance with the views on mimesis of social theorists Walter Benjamin (1986 [1933]), Max Horkheimer and Theodor Adorno (1947 [2002]), which inspired Michael Taussig’s *Mimesis and Alterity*. They posited mimesis as an adaptative behaviour, in which distinctions between the self and the other become porous. In Adorno’s words, ‘mimetic behaviour does not imitate something but

assimilates itself to that something' (1997 [1970]: 162), a capacity with a creative potential that the Frankfurt school saw as threatened by 'instrumental reason'. Such an historical-materialist perspective helps us discern the space of mimesis in which *préleveurs* were entangled. However, I contend that another theoretical approach might better illuminate their phenomenological experience of camouflage. Since *préleveurs* did not practise mimicry in the sense of mischievous and subversive imitation implied by Taussig, and since they even contested having a strategic intent to deceive people about their activity, I find Roger Caillois's theory of mimesis as a passive, nonfunctionalist process (see Hamilton 2015) more productive. We will now examine how *préleveurs* search for the 'truth of the disease' in the light of Caillois's threefold model of camouflage.

B. Blending in

Thinking with Guinean *préleveurs* about their sampling practice not only implies that we direct our gaze towards the mimetic space in which they were imbricated. It also implies staying with the tension entailed by the idiom of sampling qua *échantillonnage*, a scientific method whereby a subset of the population is surveyed to make statistical inferences about the whole. The mathematical technique here, commonly traced to seventeenth-century demographic studies, arose at the end of the nineteenth century with the generalisation of scientific surveys (Kruskal & Mosteller 1980). Statisticians have debated the best way to achieve 'representativeness' in sampling (*ibid.*, 173): should full coverage be attempted, or should investigations focus on case studies? I suggest that *préleveurs*, in their selection of sampling sites for research into the dynamics of Ebola infection in wildlife, inflect and blur the boundary between scientific epistemologies and other idioms relative to the correspondence between part and whole, extracted and background – that is, relative to camouflage.

Roger Caillois, in his famous essay on 'Mimicry and Legendary Psychasthenia' (1984 [1935]) and his lesser known *The Mask of Medusa* (1964 [1960]), proposed a theory of mimicry as 'search for the similar' (1984: 27). In line with the surrealist programme of his time, he displaced the phenomena of mimesis from the 'society of humans' to the 'society of insects'. Through their instinct to deck themselves in their environment, certain species of invertebrates, he inferred, 'suffer the lure of material space' (*ibid.*, 31). This leads to a form of depersonalisation, whereby the insect, devoured by space, is 'not similar to something, but just *similar*' (*ibid.*, 30, original emphasis). Taussig, in his reading of Caillois's theory (1993: 33-4),

has reaffirmed the agency of the self in mimesis. But Caillois's defence of material mimesis sets out to dispel the evolutionary myth that a species evinces agency when mimicking its environment in order to survive, for it often fails (1960). By stressing excesses in the mimetic behaviour of insects, in a 'transverse' comparison with humans, he affirmed a 'deep and redoubtable anthropomorphism' (1960: 146, my translation). Caillois's anthropomorphism is based on the situation and 'behaviour' at play in mimesis, common to insects and humans, rather than the morphology, or importantly, the function of mimesis. I will favour this phenomenological analysis to illuminate *préleveurs*' practices, starting with the translation of protocols for site selection. It can indeed be analysed as one of Caillois's three forms of mimicry: disappearance, or *assimilation au décor* (1960: 102; 1984: 27). The *décor*, in the case of animal sampling, is a location with affordances as environmental as they are social and political, a *décor* which, as *préleveurs* blend in with it, comes to define the extracted sample.

PREDICT Ebola Host Project aimed 'to identify the wildlife hosts of Ebola virus, investigate the distribution of the virus, and assess and characterise risks for future spillover and emergence' (2020a: 3). According to disease ecologists (Plowright, Sokolow, Gorman, Dasza & Foley 2019: 2), these different objectives actually call for divergent sampling approaches, as the nature of the thing that is purportedly represented varies.³ Despite the metrics implied by probability discourse, disease ecologists have noted that, in situations where the reservoir host is poorly known, sampling is 'often opportunistic or haphazard and is guided by sparse information' (Plowright *et al.* 2019: 1). The FAO guide for 'Investigating the role of bats in emerging zoonoses' concurs and specifies (2011: 48): 'statistical analyses may indicate the need to sample a certain number of individual animals to achieve statistical significance, [but] animals often live in difficult environmental conditions ... or they may be solitary or scarce, making it difficult to achieve large numbers of samples'. Therefore, research on Ebola's ecology is shaped by the sheer need to find biological material, even if hundreds of kilometres away from the outbreak site studied.⁴ Locating bats thus frequently means eluding epistemologies of representativeness. Rather than samplers in a statistical sense, the agents of

³ 'Virus distribution' implies a wildlife survey accounting for the known probability of detecting the pathogen in different animal populations, while 'spillover risk' estimation implies spatially and temporally stratified sampling of reservoir host populations. Both strategies assume that the said reservoir host is known.

⁴ When the Robert Koch Institute's scientists asked in Méliandou about the location of fruit bat populations, they were directed to 'two relatively distant regions of south-eastern Guinea': Kelema and the Ziama Forest reserve, respectively about 250 and 130 kilometres away (Sáez *et al.* 2015: 19).

many such projects act as *préleveurs* qua collectors: they try to locate material from which parts – as many as possible – can be extracted.

The context in which they perform this spatial work acts as a background to which they assimilate, politically and socially, thereby altering the representativeness of their sampling geography. Before the Ebola outbreak was declared over, a sampling site map had been drafted in Guinea. In June 2016, the FAO Guinea office designed a map indicating ‘ecosystems conducive to interactions between animals (wild and domestic) and men’. The map singled out sites for research on zoonotic disease in each region of Guinea, along the southern and the northwestern borders, near and in protected areas. The selection based on protected areas equates disease ecology research with conservation work, a fusion implied by the One Health policy that was being mainstreamed across Guinean ministries at the time. But the distribution of sites across all regions also suggests a concern with a fair sprinkling of the monies from international research projects, in the manner of political patronage. To Prof Koné, PREDICT Guinea country representative, the FAO map was the ‘ideal research plan for Guinea’, as it represented – in a political sense – Guinea’s ‘four natural regions’, constructed as ethno-environmental units since administrative partition by the French colony in the 1920s (Goerg 2011). The map indicates spaces where, by virtue of their institutional protection as biodiversity hotspots, a resource considered scarce elsewhere could be collected. It suggests that wildlife sampling projects could do something like ‘dissolve’ themselves in a ‘search for invisibility’ (Caillois 1960: 102, my translation) in a clientelist system.

PREDICT Guinea devised a strategic plan for two years, only partly based on the FAO map despite Koné’s appraisal. The strategy proclaimed a ‘risk-based approach’, whereby sites and species to be sampled in the two regions were picked according to the ‘highest likelihood of exposure to Ebolaviruses’. The document did not justify the site selection by statistical calculations, as usually expected of risk thinking, but by the nexus of zoonotic disease drivers of epidemic emergence mentioned in Chapter 1: ‘human outbreaks’, ‘wildlife-domestic animal-human contact’, ‘live animal congregation’ and ‘high density of species at risk’. PREDICT managers assumed that these drivers were broadly present in two semi-forested regions of Guinea: Forest Guinea and Guinée Maritime (‘coastal Guinea’), in the west of the country. These two zones also happened to be the two major outbreak foci in the country, where human-to-human transmission of the Ebola virus caused most casualties. The list of sampling locations was then narrowed down to seven prefectures in each region, and three sites were selected in each using epidemiological data. Two sites were selected because they had declared Ebola

cases, and one site with no declared case was singled out as a ‘control site’. As the site selection was being narrowed down, its epistemological underpinnings seemed progressively displaced. The representativeness of sites for Ebola animal dynamics was articulated at the crossroads of understandings of Ebola as a disease of place, and a contagion among humans. Plural and sometimes contradictory logics (environmental, sanitary, and epidemiological) bent quantitative epistemologies, aided by the fact that bat scarcity overdetermined the places of collection. Since Forest Guinea as a whole, almost by nominal definition, was taken to meet the landscape and resource conditions, other parameters took central place in PREDICT Guinea’s decisions. By electing to intervene in sites characterised by the last outbreak’s epidemiology, parameters related to post-Ebola public health and surveillance were emphasised. They were instituted as something like the *décor* to which *préleveurs* would assimilate.

At the project’s inception in 2017, it was mostly the sampled localities’ officials who agreed to open their doors for animal capture. The mayor, the village secretary, the health centre director, usually more educated than the rest of the population, were supposed to have a greater understanding of scientific ends. Moreover, since they had authorised the missionaries to come to their locality, they were also assumed to be morally committed to their success. They were compensated by PREDICT for their participation in community meetings, and thus had a financial incentive to enable the project’s work.⁵ In Houndonin, a rural neighbourhood of Guéckédou severely affected by Ebola, many mice traps were also placed inside the houses of survivors. This placement was not directed by epidemiological thinking; rather, PREDICT agents insisted that survivors, knowing that the disease was a ‘real’ health problem (i.e., not a conspiracy), were generally more hospitable to post-Ebola projects, whose aid they depended on. Thus, PREDICT can be said to have ‘exploited its resemblance’ (Caillois 1960: 111, my translation) to projects, embedded in the West African economy of *prélèvements*, that dealt with the same disease. As described by anthropologists (Fairhead & Leach 2007), blood and participation in medical trials are framed as transactions in which free medication is exchanged for the fluids extracted and sent to Europe or America. Electing to dissolve their particularity in such an economy was a fraught choice for PREDICT in 2017. The disruption of longstanding accommodations between Forest Guineans and state institutions during the epidemic (Fairhead 2016) had paved the way for troubles to mar epidemiological investigations and vaccination campaigns in the immediate aftermath of the outbreak. But PREDICT agents felt that blending

⁵ The intervention of these middlemen was a double-edged sword, as it could backfire if their legitimacy was contested, a source of incidents during the Ebola outbreak in Forest Guinea.

in with the wealthy health administration and networks of survivors, and remunerating local patrons would ensure their survival. This practice may have, in some cases, kindled hostility and triggered incidents such as their expulsion from a locality near Soulouta, mentioned in Chapter 1. Caillois's notion of camouflage (also see Brighenti & Castelli 2016: 246) throws light on the apparent tension between camouflage and the goal of self-preservation: far from (only) being strategic deployed, imitation is a yielding to space prone to 'aberrances', which can paradoxically expose the subject to danger.

I was rather astounded by the trajectory of these decisions: research about Ebola's multispecies ecology was now overwhelmingly framed by the interhuman epidemiology of the disease. Scientific publications (Baize *et al.* 2014), as well as Guinean understandings of the outbreak's causality presented in Chapter 1, ruled out the 'human-animal interface' playing a role in human spread of the disease beyond the supposed spillover. PREDICT research still not only straddled two registers of probabilistic sampling, ecological distribution and spillover risk, but also that of case-control studies, whereby the variable most strictly controlled for was actually the circulation of the Ebola virus in human populations.⁶ When I enquired about this apparent contradiction with US and Guinean managers, they explained that the programme initially sought to document the potentiality of what virologists call a spillback,⁷ and so included domestic animals – goats, sheep, and dogs – in their sampling plan: could Ebola patients have infected some of them? This research question nevertheless reversed the case-control logic, whereby it was not the causes leading to human Ebola infection that were explored, but their consequences on farmed animals. Regardless of the confusion in the goal of different survey methods, domestic animal sampling seemed a secondary objective, and it was halted after a few months for regulatory and ecological reasons.⁸

However, the stratification of data collection through case controls remained: wild animals – bats and rodents – would still be sampled in zones of high Ebola transmission, distinguished from zones where the virus did not circulate. To PREDICT Guinean staff, the question about

⁶ From a statistical point of view, case controls are used to identify factors that may contribute to a certain condition, such as high disease transmission, which is controlled for in the case selection.

⁷ The concept of spillback designates the transmission of a zoonotic virus from a human host 'back' to its original host or to a third host species, as when workers in fur farms transmitted the SARS-CoV-2 virus to minks in Denmark in 2020 (Koopmans 2021).

⁸ Most of the farmed animals alive during the outbreak had probably been slaughtered and consumed by the time the project began. In addition, there was a bureaucratic hurdle in that the United States require an additional permit from the Department of Agriculture for importing material derived from animals that might pose a risk of introducing livestock diseases 'exotic to the US'.

the direction of viral exchanges – potentially, from humans to domestic animals – was overturned by the reduced focus on wildlife. They explained to me that, essentially, it was the effect of wildlife infections on human epidemiology that was being tested: the project wanted to find out whether consumption of uncivilised foods by Forest people had triggered the outbreak (a culturalist and sanitary generalisation similarly waged against southern Chinese during the SARS and COVID-19 epidemics, see Mahr 2020; Zhan 2005). The sites targeted by sampling reflected and solidified the notion, independently examined in Chapter 1, that Ebola inhered in specific places, rendered disease-prone by their environment and the lifestyles of their inhabitants.

Reconstituting the rationality behind the selection of sample sites in Guinea reveals the alternative, sometimes opposed, scientific epistemologies – exploratory, probabilistic, stratified sampling – that constitute bats as an epistemic object, whose material presence may still elude calculations and lead to prioritising an extractive approach. It is why the sociopolitical *décor* in which *préleveurs* evolved played a determining role in site selection. In the end, PREDICT agents fused their collection with the post-Ebola assemblage of disease surveillance and economic patronage. This sort of camouflage inflected the epistemic object of their quest: while for a short time, the site selection raised the possibility of the virus spilling back to animals, it foremost enshrined a culturalist reading of Ebola’s spread as driven by bushmeat consumption.

C. Masquerading

After arriving in a sampling location, every PREDICT mission began with a day spent reconnoitring places suitable for rodent burrows and bat roosts. Sampling teams moved in a space delimited by a radius of five kilometres from the locality named in the protocol. They were accompanied by ‘guides’, usually young men with a political mandate to represent the youth at the district level, whom they asked to show them tree plantations and houses known to host bats. Upon inspection, they searched for palm trees, which they knew fruit bats to be fond of, and traces of insect bat urine and droppings along the houses’ walls. Rather than only treating those as clues of the presence of bats, they judged them against the indications given by guides. If there were palm nuts and droppings, it proved that those had told the truth and that their community was willing to collaborate with sampling operations. If the roof said to be infested by bats was closed, or if the church indicated was evasively located ‘far away’,

PREDICT agents interpreted it as a sign that they were not entirely trusted, and thus could not trust either.

Préleveurs' hermeneutic resembles that of hunting tales in the Mande region, where according to literature scholar Stephen Belcher (2007: 174), 'very few of the texts are centred in the conflict of hunter and prey'. 'The natural world is less important than the human society', Belcher writes, and the success of hunters is very much affected by their social and sexual relationships, which are performed in tales of lies and betrayals. Likewise, PREDICT agents placed more emphasis on gaining the assent of local people than locating potentially infected animals, and overplayed their social connections. In this, their camouflage can be looked at as another form of mimicry, named *travesti* by Caillois (1960). Rather than blend in, the *travesti* masquerade: they imitate the appearance of another being, so as to 'fool' (*donner le change*) attackers (1960: 81). Caillois insists that insects take advantage of their organic plasticity to that end, a 'behaviour' which finds correspondence, among humans, in myths of metamorphosis where the individual mimics another recognisable appearance. Social theorists Andrea Mubi Brighenti and Alessandro Castelli elucidate 'masquerade' as a 'becoming-another-one' (2016: 232). To PREDICT agents, this becoming-another-one seemed an integral part of their participation in a scheme of hospitality, which is very socially scripted in Guinea. The anthropological literature has analysed hospitality as a form of mistrustful and dangerous engagement with strangers (Candea & Da Col 2012; Mühlfried 2019). As *préleveurs* on mission became their hosts' kin and lost something of themselves, their vulnerability to hosts indeed increased, a dynamic of identification and fragility reminiscent of what happened to response teams in epidemic times.

The network of trust built by animal *préleveurs*, like that nurtured by workers in health projects in other places in Africa (Geissler, Kelly, Imoukhuede & Pool 2008; Molyneux *et al.* 2013), overlay the localised and temporary geography of engagement of the Ebola intervention, whereby the collaboration of key actors perceived to hold political legitimacy was constantly sought and negotiated (Le Marcis, Enria, Abramowitz, Slináez & Faye 2019). PREDICT's intervention differed, however, from the outbreak response by the longitudinal character of the study: agents went back to every location up to four times over the course of two years, so as to sample wildlife in the wet and the dry seasons. They stayed up to seven days in sampling sites, where they slept in a guest house and paid the mayor's wife to cook for them. This frequency allowed them to develop and nurture relationships over time: the spatial work of reconnoitring was always accompanied by social labour. This was clear to Dr Bilis, who, on

the eve of a first sampling day in N'Zérékoré, urged the team to pay personal visits to the targeted neighbourhood, to 'warm old friendships and do some [social] reconnoitring'. There was a hermeneutical problem: agents tried to conceive a possible common ground between them and individuals previously foreign to them. Agents belonging to the dominant ethnicity made sure that they uttered their patronym distinctly when introducing themselves. During downtimes, they socialised with local people: female agents helped with the cooking, men drank palm wine or joined the afternoon tea ritual. Muslim agents ostensibly went to the mosque on Friday. They also looked for kinship ties or forged them using the joking register, thus entering into avuncular relationships, very significant to political alliances and interethnic relations in the region (McGovern 2012a). Male agents might give sweets to a girl, who became their 'little wife' over the course of several visits, making them categorical wife-receivers and nephews of the families living in the sampled site. These relationships created a social purpose that transcended the objective of every mission: they made for effusive reunions, sharing of food and company. By assimilating their coming-and-going to the *longue durée* of family ties maintained across the urban-rural divide, over the course of several missions, the agents were also seeking to redress the wrongs committed by the Ebola response. At the time, health workers came unannounced with a pickup truck to take suspected cases away; some workers did not leave their car for fear of infection or attack; shaking hands was prohibited and there was no time for exchanging greetings and kola nuts. Adopting the codes of hospitality through a becoming-kin ruptured with the Ebola response and the estranging habits which alienated response workers from the locales they visited.



Figure 8. Préleveurs eating rice porridge and talking with local people in the early morning in Macenta

Authorisation to capture was nevertheless a fragile achievement constantly needing reiteration, if only because the number of participants in such agreements was virtually unlimited. A house owner could half-willingly agree to the team installing their nets next to their house, only to retract their permission when crowds of curious children and passers-by swarmed to observe the foreigners at work and noted the similarity of their attire to that worn by response workers during the epidemic. *Préleveurs* deployed hermeneutic skills, an ability to gather clues and ‘read faces’ (*lire les visages*) to formulate hypotheses about what they called ‘the population’s mentality’ towards them, and act accordingly. Dr Bilis liked to tell a story revealing of his talent of interpretation and bodily composure, while on an epizootic investigation during the Ebola outbreak. In January 2015, in his capacity as the regional director of Animal Farming and Resources in the N’Zérékoré region, he investigated unexplained cases of dog mortality in the southern prefecture of Yomou. The Ebola outbreak was still ongoing in the area, and only three months had passed since the Womey massacre. Given the heightened attention paid to zoonoses, Dr Bilis wanted to sample and test some of the dead dogs for the virus. But when he arrived in one affected village with a small team of officials, they found the village square empty, and thought that ‘villagers prepared themselves to hack them’. After a sour exchange with the district chief, whom he tracked down to his house, Dr Bilis decided

their team had better ‘retreat’ as the residents opposed their endeavour. As the men were hastening back toward their car, apprehensive about presenting their back to a potential attack, he exhorted them to walk excessively slowly. They were to leave the place without haste, because ‘self-control and calmness are extremely important in these situations’. PREDICT *préleveurs* praised themselves on being able to identify their subjects’ intentions beneath appearances, a quality central when one considers the gap, in the Mande world, between things and their underneath (Ferme 2001). This skill assimilated them, analytically, to Mande hunters. Reputed masters of tactics of invisibility and powers of detection, hunters were employed by the Sierra Leonean army in the 1990s to ascertain the loyalty of militiamen (Bassett 2003; Croll & Parkin 1992; Ferme & Hoffman 2004). Rather than literally interpret Dr Bilis’s sense of strategy and taste for masquerade as a functionalist expression of a will to survive, it is interesting to look at the scene, and the theatricality of the dangers faced by *préleveurs*, as penetrated by resonances with stories of cunning combatants.

When ‘self-control and calmness’ did not suffice, or when the *préleveurs* had assembled a coherent narrative of mistrust from the traces gathered and the faces deciphered, they resorted to another set of skills: disguise. When handling animals, PREDICT workers were required to wear, at a minimum, protective personal equipment composed of an N95 respirator, a face shield, gloves and dedicated overalls, or PPE coveralls if working in caves. But as clarified in Chapter 1, the agents were concerned about feeding suspicions that they were injecting viruses into animals, and the altercations that could ensue. Consequently, they heeded the spirit of a famous military saying, common in Francophone Africa: ‘*le terrain commande*’ (‘the field commands’ in English), a locution emphasising resourcefulness and flexibility as qualities required for fieldwork. They stripped down protections to a minimum: many only wore gloves to penetrate people’s homes to collect traps, reasoning that most traps were empty, and hastily adding a face shield if they discovered one triggered. They could not be said to masquerade only in that they adapted their outfit to circumstances, but in that they masqueraded as militaries themselves adapting their outfit and methods to circumstances. Such disguise was not judged adequate for the work of lab sampling, however. Whenever possible, after collecting traps and untangling bats from the net, the team embarked the caged rodents and bagged bats and drove to a location deemed safe: their N’Zérékoré office for example, which had a closed courtyard, or their village guest house. People entering or leaving the courtyard were loudly urged to close the front gate behind them, lest passers-by witness what a forestry employee once called ‘ninjas’ at work. Only their local guides were welcome to satisfy their curiosity and observe the team,

but far enough away that they would not be exposed to the animals, their bite, or their fluids. They had to stay at least three or four metres away, delimited by striped hazard tape.



Figure 9. A field lab between three houses, in Macenta

Techniques of concealment appear to offer a protective shield against multiple dangers: that of infecting observers, of anxious agents accidentally infecting themselves, of feeding rumours about the lab's activity. 'It is not that we are hiding to work, we are protecting ourselves', PREDICT agents told me several times. Caillois refuses however to see in mimicry the pure expression of an instinct of self-preservation: an instinct of renunciation, or 'loss of *élan vital*', would be at least as important. Philosopher Owen Hulatt specifies that Caillois's mimesis is 'devoid of intrinsic structure' and 'epistemic motion' (2016: 139-40). When mimesis is driven by extraneous forces – such as self-preservation – it generates more structuring, abstract and efficient forms, as Adorno's take on Caillois's theory makes plain, according to Hulatt. Likewise, the masquerading of PREDICT activities as military action was not only

determined by a drive for strategic control. The figures masqueraded took a life of their own when the threats occasionally actualised in conflicts with the inhabitants of sampling sites. We saw in Chapter 1 the fear and haste with which PREDICT *préleveurs* took flight from the locality near Soulouta, as armed villagers surrounded them when they donned their hazmat suits. The next day, Kpelle-speaking Michel was driven back to the place to try and explain their activity to local people, who reportedly lashed out at authorities and accused them of having been handed bags of money. Michel was, he later recounted to me, ‘taken hostage’ until, the villagers insisted, the forty bats sampled the day before came back. When he returned (with no bat in his hands) to his colleagues after the subprefect intervened, Dr Bilis held an impromptu meeting to debrief on what had happened. ‘This was a battle, but we got out of it. Bravo to all of you, I am happy that there was no contradiction amongst us regarding our withdrawal. Our cause is just and our intentions clear. Communication is the sinews of war’.

Warfare was not only a metaphor, the incident in Soulouta suggests: its logics provided *préleveurs* and the inhabitants of sampled sites with a social script to interact. There was a theatrical element in this re-enactment of rebel attacks and ‘hostage-taking’. I was told for example, with much drollery, that during their flight from Soulouta, the agents had not forgotten to hoist one of their larger female colleagues into the four-wheel drive. Caillois saw in camouflage an excess of forms vis-à-vis the aim supposedly served (1960). This ‘luxuriousness’, or artificiality, is not entirely tamed by the goal of survival: in fact, sometimes, it places the self in peril as it attracts rather than deflects attention. The agents’ lives may not quite have been threatened by ‘attacks’, yet the *préleveurs*’ exaggerations crystallised the hostility of those that they confronted and might have even accentuated it through the forms mimicked. It was not only the pathogen which was an ‘enemy’, as claimed by the success stories PREDICT agents brainstormed, but the inhabitants of sampled sites were ‘resistant’. In Guinea, the discourse of resistance, addressed in the Introduction, has inherited positive connotations from the anticolonial fight of the first half of the twentieth century. Resistance to the French colonial master and foreign intrusions after Independence has been politically celebrated to this day (Iffono 2010). In 2014-5, the mythical legacy of Forest Guinean – most notably Kpelle – anticolonial heroes was further appropriated by those who contested anti-epidemic measures (Anoko & Henry 2020). These semantics are quite slippery in Forest Guinea, which emerged as an opposition stronghold to President Alpha Condé in the years when I was doing fieldwork. The national authorities deliberately preferred using the euphemistic ‘reticence’, a terminology which unlike ‘resistance’ implies that conflicts can be solved through negotiations (ACAPS

2015: 1). PREDICT agents put the emphasis on communication to address reticence, but their efforts at dialogue were somewhat compromised by their mimetic references to armed conflict. The vocabulary of guerrilla warfare, the special skill of ‘reading faces’, and the set of techniques they deployed (such as hostage-taking and strategic retreat) rhymed with PREDICT agents’ experience in the complex regional war of 2000-1, when the incursions of foreign rebels in Forest Guinea were countered by civilian militias – and their ‘luxuriousness’ may have accounted for some incidents.

As indicated by the kinship and clientelist relationships in which *prélèvements* were embedded, the ability of *préleveurs* to remove parts from a milieu demonstrated the readiness of local people to participate in an economy in which the circulation of objects activates social obligations. Like rumours of blood stealing and stories of organ trade during the Ebola outbreak, tales of virus injection by wildlife *préleveurs* are available interpretations for bioscientific extractions and show that participants are concerned with the fairness of transactions. PREDICT *préleveurs* were acutely aware of the danger constituted by such interpretations. They framed their sampling within interpersonal relationships, drawing on the idiom of kinship, urban-rural ties, and ethnic alliances, wherein the circulation of goods and money becomes a ritualised factor of social cohesion. This sort of social disguise, through which foreigners assimilate to local people, generally underpins relations of hospitality in Forest Guinea. PREDICT agents could be said to develop this script as they moved between the two mimetic poles of kin and militiamen. Through acts of mimicry, ‘complex, dangerous incidences of proximity’ (Hendrick 2016: 111), the inhabitants of sampled sites were, by turns, relatives-in-becoming and enemies-in-becoming. In the insecure context of Forest Guinea, the extracted sample materialised a measure of the readiness of local people to orientate this becoming towards the kinship pole rather than that of resistance – one ‘truth of the disease’ was its causing so much social unrest.

D. Intimidating

Their hesitation to wear hazmat suits in public led the *préleveurs*, under the ‘terrain’s command’, to – in their own terms – ‘simulate’ wearing them at times. I gathered this confidence from Cheikh, a Maninka biologist whom the project temporarily resettled in Forest Guinea, a part of Guinea which he visited for the first time in his life. Cheikh considered his posting in N’Zérékoré akin to a sacrifice, given rising intercommunal tensions between

Maninka and Kpelle since the 1990s, framed as an ethno-religious conflict. Cheikh doubted that Soulouta residents would have taken him hostage if he had been in Michel's place: they would have slit his throat. He confided in me that consequently, when their supervisor and field manager were not around, PREDICT staff could untangle bats without wearing a hazmat suit as prescribed, then 'set the net somewhere, two people, and the picture is sent out', an act of deception which Cheikh named 'a simulation'.

In this final section, I am concerned with PREDICT *préleveurs'* acts of camouflage intended for their US contractors. The medium foregrounded by these acts is not, as in the masqueraded relationships, the sample, to be obtained from reluctant residents, but pictures, the second element of *préleveurs'* collection. These were not only selected for their clearness, they were also carefully staged. I look at this practice in a dialogue with Caillois's last form of mimicry, intimidation, whereby 'the animal paralyses or frightens its enemy (or its prey)', a behaviour associated by the intellectual to mask-wearing in humans (1960). The effect intended by intimidation is not resemblance but terror – like Medusa's eyes transfixing her enemy – and is redefined by Brighenti and Castelli as a 'becoming-monstrous' (2016). PREDICT *préleveurs* did not alter their appearance to literally impose on other beings. Taking pictures rather mobilised their aesthetic sense as they sought to elicit a certain impression in those who would look at them. Anthropologist David Napier (1986) identified in the mask of Medusa a primordial apotropaic weapon, whose symbolism can be traced across myths and histories: the mask forces its viewers to look away. Thus, rather than readily take my cue from the etymology of 'monsters', from the Latin *monstrare* meaning 'to show', I see the articulation of disguise and intent in 'simulations' as interlacing attraction and deflection (and Napier proposed indeed that masks express an interplay of ambivalent forces). US managers were both meant to appreciate pictures and not look too closely at them. Such visuals as generated by PREDICT activities, whose evolution in the European history of science was studied by historians (Daston & Galison 2007; Tucker 2006), are emblematic of what Lorraine Daston and Peter Galison call epistemic virtues. By aesthetically assembling the three objects already focused on – the sampled location, bystanders, and the sampled object – the pictures did not explicitly seek to represent something of the truth of the disease. They staged the scientific ethos of *préleveurs*. The virtues they upheld, their exemplarity, came to define what counts as evidence of the disease.

Photographs were a deliverable explicitly requested from PREDICT field teams, who had been handed out a special 'content collection guide' for taking pictures. Francis, a sociology

graduate hired by PREDICT who never felt comfortable sampling bats, was often entrusted with the task of visual reporting. He told me about the guide, a crumpled copy of which I found in an office drawer, as encompassing one of the greatest teachings of the project. He now knew how to immortalise moments in a way different from the smiling dressed-up portraits that his countrymen liked to take of themselves: what mattered, he held, was to ‘seize the instant’ by taking pictures ‘on the go’. The content collection guide only had one page dedicated to the technicalities of photography and filming. Most of the document focused on the content of pictures. It specified that every step of PREDICT missions was to be visually documented: while preparing equipment for fieldwork, while arriving in a sampling site, while setting up the laboratory, and naturally while capturing, sampling, and releasing animals. Many indications were given in between brackets: about the camera angle, how *préleveurs* should ‘preferably smile’, or how indeed, local resident were to be photographed ‘without staging, in their normal activities’. Like the site selection, the picture collection was framed by institutionalised technical norms. These seemed to collapse, in the vocabulary of Daston and Galison (2007), reasoned depictions of friendly *préleveurs*, in an idealised manner characteristic of pre-nineteenth-century scientific atlases, with the images of random and unstaged bystanders which Francis learned to value, rather reminiscent of nineteenth-century mechanical objectivity. The distinct epistemic virtues encapsulated by these norms directed the visual objectivation of certain features of scientific practice, judged worthier of being registered.

Photographs took even more significance towards the end of the sampling period of the project, as activities shifted towards the training of state personnel in wildlife sampling. Those civil servants who were not vaccinated against rabies, and were not authorised to handle animals, were to be primarily visually exposed to the labour of wildlife sampling, and their pictures sent to the US management. Several audiences were thus drawn into a mimetic spiral of the sort I define as ‘intimidation’, as performance and pictures aimed to impress an idea about *préleveurs*’ scientific persona onto their viewers, Guinean bureaucrats, and US scientists. PREDICT agents expressly identified themselves as *scientifiques* (‘scientists’). By this they did not mean, as in the French spoken in France indebted to the Ecole des Annales, to oppose their positivism to the supposed subjectivity of humanities graduates. The term referred to their secondary school education, which would have torn them away from the alleged superstition of unschooled Guineans. This was the meaning of Sékou Touré’s ‘scientific socialism’, which largely replaced the idea of class struggle, consubstantial to Marxism, by a struggle between populations which subscribe to African ‘fetishism’ and those which reject it. To be *scientifique*

meant more than partaking in the sociality of *intellectuels* in Guinea, who read and discuss the news in cafes (Somparé 2020). It implied aligning oneself with and defending the truths taken to inhere in science against so-called beliefs.

One evening on the outskirts of Kissidougou, a prefecture capital on the edge of Forest Guinea, I was able to observe the energy Dr Bilis put into documenting their activities scientifically. It was in a backyard potato field surrounded by palm trees that the agents were to demonstrate bat capture to a dozen staff from the local Departments of Animal Farming, Health, and Environment. Dr Bilis complained that some of the *préleveurs* busied themselves with placing rodent traps and could not appear in his pictures, and asked two of them to unroll the net for capturing bats (he rightly deemed rodents less implicated in PREDICT's Ebola-focused quest, and their lesser spectacularity, compared to bats, seemed to diminish their worth for training purposes). Dr Bilis picked a net that did not have holes and instructed the men to set it up with slow moves. Tiptoeing in the field in his chic city shoes, he carefully moved around the net to take a variety of shots, ensuring that the mud brick houses, on whose property they were working, would not appear in the camera's frame. 'Now we are *wild* [in English], exotic, this looks like a big forest. It does not feel like we're in the city!' He ordered the agents who had just come back from setting rodent traps to move the equipment trunk and bat bags out of his frame. At a woman who was carrying a bucket across the field to the nearby stream, he shouted to skirt around, as well as at the guide and me, who were not wearing overalls and could not safely approach the net. Norbert suggested Dr Bilis take some pictures with the mass of *curieux*, a crowd of adults and children who stood by the upper end of the field and watched the men pulling the net taut; it would show that their investigation triggered popular interest. But Dr Bilis was much less enthusiastic about this because the by-standers could be too close to the net. PREDICT managers were concerned with what we could see as the epistemic virtues that their visual performance conveyed. These differed from the notion of representativeness, or the relation between part and whole, implied by the sampling protocol and expounded above: they rather focused on something like exemplariness. Staging photographs that could count as evidence has been a labour-intensive process since the nineteenth century (Tucker 2006). Similar to the perfected models characteristic of 'truth-to-nature' depictions (Daston and Galison 2007), the forms enacted by Dr Bilis's practice were not to include idiosyncrasies and the useless clutter perceived to saturate traditional beliefs and 'fetishes'. Only the *préleveurs*, the locality, and the bat were to be in it. Only thus would they convey the agents' professionalism.



Figure 10. *Préleveurs* arranging a bat net for Dr Bilis to take pictures in Kissidougou. The bystanders in the background are usually not included in the frame.

The *préleveurs* had not been explicitly instructed to provide visual evidence of each site they worked in. But they understood that they were to provide samples from a variety of interfaces at each sampling location: in and near houses, far from inhabited zones, etc. The fluids extracted all looked similar, but they held that diverse pictures would act as evidence of their respect for the desires of superiors. The teams struggled most when it came to finding ‘wild interfaces’, which, as we understand from Dr Bilis’s interjection, they wished would look like the untamed jungle of the *Telegraph* piece. Sampling in public heightened the risk of altercations with residents. But locating, as Dr Bilis described it another time, ‘a natural milieu, *wildlife* as they say, in the middle of the bush’ was no easy task. The reason for this lay in the social accommodation (Fairhead 2016) that enabled sampling: PREDICT agents sought to obtain the approval of the local state and of elected authorities, of house and field owners prior to capture, and the assurance that their activities would not be disturbed. The space they invested was thus rarely uninhabited or uncultivated. If it had been, it would have been considered ‘genie territory’ in many regions of Guinea (Leblan & Bricka 2013: 102), and in

Forest Guinea it would have been embedded in a ritual landscape dedicated to the cult of the ancestors (Paulme 1946). Rather than deal with genies, or with the elders entrusted with sacrifices, the agents directed their efforts towards rice fields, palm tree plantations, bush farms, and the outskirts of towns, unequivocally placed under the custodianship of local people. Most of the land in Guinea officially belongs to the Guinea state, but the state has recognised so-called customary laws (Black & Sessay 1997: 603), making space for Forest Guinean notions of ownership and land access to prevail in many instances. PREDICT *préleveurs* explicitly relied on this sociopolitical arrangement to access sites for capture and conjugated the oral consent of residents with the policing force of state law, represented by the subprefect in most locations. They elected to work in spaces only as ‘wild’ as they somehow remained under the jurisdiction of the state and of PREDICT’s local patrons. Such prudence firmly anchored their enterprise in the regulated space of the village, by contrast with the lesser regulated space of the bush, in their eyes. Attention to social accommodation nonetheless stymied their capacity to take exemplary pictures, comparable with the mythical ‘virus hunt’ displayed in the media.

I meant to address his photographic practice in Kissidougou with Dr Bilis, but guessing the sense of my interrogation, he quickly said: ‘it was not camouflage’. He did not feel like he was staging images to necessarily concord with the mythical space of ‘virus hunting’. Caillois’s developments on ‘intimidation’ make it clear that eyespots on a butterfly’s wings do not terrify because they induce the predator to believe they face a mammal: their circular form itself induces fascination (1960: 118-29), a petrifying power found by Napier in many historical masks (1986). The forms captured by photographs may have looked ‘wild’ on US or Guinean terms, but most importantly, they would impress an affect (respect for their courage, connoisseur’s appreciation, etc.) in their viewers, and those would not further interrogate how the pictures were taken. Moreover, Dr Bilis told me that he been ‘pressured to send credible pictures’ to PREDICT US managers for that day’s work, in Kissidougou, when they were mostly expected to demonstrate their work to Guinean state employees. Even though the collection phase had passed, the agents and their Guinean managers were used to treating fieldwork pictures as weaving a network of remote surveillance, which was not only visual but also numerical. They speculated that the metadata attached to any picture taken with the project’s camera, including their GPS co-ordinates, could prove their geographical situation, and disclose their lie if they did capture and sample bats in a different place than that pictured. As we will see in Chapter 3, PREDICT Guinea staff once dreaded their contract being terminated after inappropriate pictures were sent out. Dr Bilis’s answer to my questioning can

thus be understood in relation to the rapport between camouflage and epistemic virtues, and its inflection in the triad formed by the sampled milieu, the sampled fluid, and the picture. PREDICT agents called ‘simulation’ something which may be characterised as a set of techniques concerned with forming a visual identity and conveying exemplariness. Such simulation seems to pertain to camouflage, following Taussig’s redefinition of Caillois’s mimesis as a ‘tense yet fluid theatrical relation of form and space’ (1993: 34), which I insisted is not only strategic.⁹ We can look at *préleveurs*’ simulations as an aesthetic labour of camouflage that connects cryotubes and pictures extracted from exemplary milieus. These are not exemplary in the sense that they were statistically selected, but in that they were professionally transformed into a visual which resembled some sort of original ‘virus hunting’ picture and was thought to induce satisfaction in PREDICT contractors. These multiple notions of representativeness speak for the interdiscursivity of imitation (Lempert 2014). What *préleveurs* saw as the ‘truth of the disease’ which was the object of their quest lay in how well the visual evidenced, in Daston and Galison’s sense, the exemplariness of workers, of the extracted fluid, and of the milieu from which it was taken. That this labour might fail to match other ethical visions of truth, for example as ‘objectivity’ for their US contractors who may have thought differently about the value of ‘simulated’ pictures, was conveyed by Dr Bilis’s denial of camouflage.

By being attentive to how and why PREDICT agents crafted a visual identity to their activity, we can grasp something of the representativeness that their sampling aimed at. The Guinean managers had the idea of producing a film about PREDICT Guinea, which was shot and edited by a local cameraman during the last week of animal captures and personnel training. The twenty-minute-long report was designed for two audiences: the PREDICT US management and the Guinean viewers of the public broadcaster Radio Télévision Guinéenne. The tension between these two publics, the ‘reluctant’ providers of samples and the quality controllers of pictures, translated into a difficult exercise in public communication/private documentation. Dr Bilis and Prof Koné tirelessly ordered the cameraman to multiply takes of every activity filmed until the activity recorded was exemplary: there was to be ice in the cool box, and *préleveurs* had to wear cryogenic gloves when plunging the cryotubes in the nitrogen tank; they also had to ‘look human’, so the unrecognisable PPE-clad agents intently waved at the camera and made

⁹ Anthropologist Rane Willerslev developed a phenomenological notion of mimesis as a self-aware mediation between self and other (2007). He similarly sees mimesis as an ambivalent human faculty, as much drawn to assimilation as to difference. He gives it a central place as a mode of being-in-the-world among Siberian Yukaghir, an argument which does not seem to apply to Forest Guineans.

V-signs with their fingers.¹⁰ Those stances did not aim at disappearing into their surroundings, nor did they typify a masquerade of everyday relationships: they were meant to actively impress receivers. As a form of ‘intimidation’, their aesthetics projected the ethos which *préleveurs* aspired to: that of globalised, responsible, and innocuous virus hunters, against the background of a *wild* potato field.

Conclusion

We might further extend Dr Bilis’s saying that ‘[they] were not doing camouflage’ by taking a final look at the material effect of their mimetic practice. PREDICT agents often transported animals to a safe location for sampling, and to the edge of town for release. But the scientists who authored the sampling protocol advised against transporting animals altogether. Not only could the animals be stressed, which imperilled their welfare; they could also contaminate each other, or they could contaminate new spaces such as a car boot (aware of the risk, the agents preferred to squeeze themselves into the second row when riding with caged rodents in the rear area). The disease landscape could be affected by moving the sampled animals. Animals could also contaminate each other through the proximities induced by transport. In the end, this could interfere with the validity of the results generated by sampling potentially cross-contaminated animals. The practices and ethos that drove PREDICT *préleveurs*’ collection did not only have the aesthetic and social impact of camouflage: they could have an ecological and epistemic impact.

For Caillois, camouflage is a less than agentive process: it expresses an ‘instinct for renunciation’ (1984: 74). The philosopher Hulatt sees in this basic propensity an ‘epistemic nullity’ (2016: 141), but also an ‘epistemic openness’ (2016: 138). Mimesis, an ‘intrinsic source of epistemic openness to the particularity of one’s environment’ is, he argues, structured by the abstract forms produced by self-preservation – an admixture theorised by Adorno’s later views on mimesis. As this theoretical conversation suggests, it must be stressed that *préleveurs* did not dissolve themselves into ‘just similar[ity]’ (Caillois 1984: 30) through their mimetic work. Importantly, their activity is epistemically driven by the visual techniques I have described as ‘intimidation’, in that they aimed to conjure an epistemic virtue. The idealised pictures, devoid of bystanders and biosecurity mistakes, convey an ethos of scientific exemplariness that is itself

¹⁰ This performance had likely been taught to them by PREDICT US managers, who were also active in East Asian countries, where the V-sign enters in the composition of many popular photographs.

structured by something like self-preservation, as Chapter 3 will clarify. The two other mimetic practices, disappearing and masquerading, are thus presupposed by intimidating, as the same virtue and the same goal of self-preservation could be seen to structure them. The situated administrative and political criteria that came to shape PREDICT's selection of sampling sites were indeed rationalised by statistical epistemologies perceived to be more *scientifiques*. The fluid social relationships that locally enabled sampling were selectively objectified in *rapports d'échantillonnage*, written in a modern language which mixed French and English. These virtues – exemplarity, professionalism, modernity – drove *préleveurs* to give an epistemic form to the 'truth of the disease' that they sought to capture.

This construction is largely congruent with the articulations of Ebola examined in Chapter 1 and thus only partly transforms the disease ontology. Through blending in and masquerading in the locations selected for sampling, PREDICT agents perpetuated pre-existing aetiologies of Ebola as a disease of place, and the outbreak response focus on the 'resistance' that supposedly drove contagion. The labour of *préleveurs* also foregrounded the bat as a disease node, though not for the epistemic reasons we saw in Chapter 1. The presence of bats in certain sites overdetermined the selection of places for capturing animals; and a community's collaboration was judged by its willingness to indicate bat roosts. A place's susceptibility to the disease and a community's sensitivity to *scientifique* research were evidenced in the photographs taken by *préleveurs*. Bats, the only subjects pictured in close shots, were transfigured into the 'origin of Ebola' as PREDICT staff sent their portraits to their US managers together with large shots of wild forests and, occasionally, medium shots of curious and respectful bystanders. Such bat portraits did not only evidence the origin of the disease. They evidenced the ethical nature of epidemic preparedness, which we will see recurring throughout the next chapters – as it is carried out by tidy, pedagogical, discrete, and timely *préleveurs*.

Chapter 3: Sample

Mohamed, the field supervisor for PREDICT, received me in his Conakry office at the Haemorrhagic Fever lab. Way out of the city centre, the lab, built in 2017, stood weirdly isolated on a large plot of weedy land in the residential neighbourhood of Nongo, next to the containers and tents of an Ebola Treatment Centre turned into a Treatment Centre for Diseases with Epidemic Potential designed to last. At the time of our meeting, his days were filled with the task of packaging and dispatching to the United States the specimens sampled by PREDICT over the last two years. Half looking at Excel spreadsheets on his laptop, he speculated that the project would be replaced by another one when it would end, with better remunerations for all. He stressed that, despite their collective performance, ‘not everyone [on the project] had the necessary skill’ and stood a chance at being rehired by the future project. In his opinion, many sampling agents lacked the skills to handle the animals correctly:

Some only went for the money, and they have not learnt anything. They were only good to go on missions to the bush, that’s it. When you see how they handled the bats, no... We are lucky that no accident happened. If you had asked them to dissect bats, they’d never have respected the protocol! They would have twisted the bat, *et voilà*.

Mohamed was an ambitious civil servant from the National Department of Veterinary Services at the Guinean Ministry of Animal Farming and Products, where he was in charge of zoonosis surveillance. He had obtained a master’s degree from an Algerian university after studying at the ISSMV, an educational achievement abroad that distinguished him from his colleagues. His scorn for their deficient ‘mastery’ and their supposedly economic motivation resonates with the writings of Jean Perrigault (1931: 72), evoked in Chapter 2, about ‘black manners’ in primate captures for Kindia’s Pasteur Institute. Although close to one century apart, their bemoaning of the practices of scientific auxiliaries crystallises a longstanding imperialist trope about relations between colonised people and animals (Chakrabarti 2010; Saha 2015). But Mohamed displayed a further concern with PREDICT’s sampling protocol. Protocols have accompanied the increasing formalisation of animal experimentation since the 1980s, whereby they translate an ethics of care into bureaucratic requirements and technical specifications (Davies, Greenhough, Hobson-West & Kirk 2018). This chapter moves away from the epistemic concerns of the preceding chapters and investigates the effects of PREDICT’s protocol for animal handling, a product of the intersection of the post-Cold war concern for global biosecurity and the newer rhetoric of One Health.

As discussed in the Introduction, since the first Ebola outbreak in 1976, virologists and disease ecologists have captured and sampled several thousand animals with the hope of detecting antibodies or viral material in some of them. Sampling efforts have concentrated on bats since 2005 and the finding of Ebola virus RNA in one species of fruit bat (Leroy *et al.* 2005). Until the 2000s, animals trapped or purchased by scientists were euthanised, their blood sampled, organs dissected, and their skin and skull sometimes preserved for identification (Olson *et al.* 2012). But bats have been sampled on a much larger scale since 2002 and the epidemic of SARS, due to a coronavirus hypothesised to be maintained by species of bats (Wang & Cowled 2015). Increasingly, scientific investigations have taken what is conceptualised as ‘animal welfare’ into account. Considerations for the welfare of sampled bats stem from concerns for animals used in experimental settings, which arose in the first half of the nineteenth century in Britain (Brown & Winnicker 2015), with a recent focus of wildlife veterinarians on managing the pain of animals in zoos (West, Heard & Caulkett 2014). Similar concerns are displayed by the One Health agenda, of which we see a little more in this chapter. Building up on this agenda, in 2011, the FAO published a manual on ‘balancing ecology, conservation and public health interest’ in emerging zoonoses-related investigations on bats. The guidelines recommend the use of ‘non-destructive sampling methods’ when possible (i.e., no dissection), depending on the conservation status of the species and the reliability of detection techniques in bodily fluids. They urge ‘scientists capturing bats for disease surveillance [to] consider the safety of both the field personnel and the bats being sampled’ (FAO 2011: 51). The chapter considers how the balance between effectiveness, conservation and biosecurity is achieved by vulnerable professionals through routinised and improvised choreographies of care for vulnerable beings.

One Health field research on emergent zoonoses can be said to generate a specific kind of laboratory. The laboratory was generally framed in early anthropologies of science as a ‘fact factory’ where scientists can manipulate objects in standardised ways and produce knowledge through practice (Knorr Cetina 1995). More recent scholarship has challenged the idea of impermeable separations between labs and their surroundings and asked for renewed attention to the precarious and contentious delimitation of lab boundaries amid power dynamics, through a labour which is as much industrial as it is ethical (Goody 2008; Kuklick & Kohler 1996). Analytically, PREDICT field investigations seem to form such a lab, situated in a postcolonial locale where, as historians and anthropologists indicate (Anderson 2008; Hayden 2003), laboratories have long served as sites of extraction and exchange. As what I call a ‘One Health

lab', i.e., a lab concerned with producing knowledge about human-animal health, it acts as a place of encounters between human and nonhuman animals and interlace regulations and technologies with care practices. Feminist-inspired scholarship on animal research has stressed in particular that animals in the laboratory are not passively submitted to the detached and objectifying gaze of scientists (Candea 2010; Davies *et al.* 2018; Kerr and Garforth 2016). In her ethnography of lab science in the United States, anthropologist Lesley Sharp has underscored the moral power of animals, especially mammals, to 'test human-animal boundaries' (2018: 3). Sharp takes the notion of 'human-animal boundaries', which she traces back to the works of Mary Douglas, E. E. Evans-Pritchard and Claude Lévi-Strauss, to designate more than a notion of difference between species: boundaries depend on the pre-eminence of humans over other animals (2018: 14-8). Her ethnography suggests that, in US research labs, human-animal boundaries, and by extension hierarchies, are challenged and reshaped through long-term intimacy across species. Unlike in research labs, in the One Health lab constituted by PREDICT, bats are not caged and bred; they are only detained for up to a few hours, so samplers do not accrue long-term responsibilities towards them. Furthermore, and crucially, this One Health lab confronts samplers with the permeability of physical (and not only moral, in Sharp's sense) boundaries with animals, who are sampled precisely because they may harbour pathogens that can be transmitted to humans. Ultimately as we will see, physical boundaries between humans and animals are not only tested by the One Health lab: their reinforcement amounts to an existential imperative – with consequences for moral separations between species as well.

The chapter contributes to this scholarly discussion of boundary-work in and around labs by adopting an 'interspecies' perspective on PREDICT work with animals, following anthropologist Julie Livingston's and queer theorist Jasbir K. Puar's introduction to an issue of *Social Text* (2011). Viewed through an interspecies lens, boundaries between certain humans and nonhumans in postcolonial contexts are troubled by political processes which contribute to differentiate and oppose species and races. Turning my attention to the ways in which such politics redraw hierarchies and challenge binaries, I propose to move beyond the human-bat dualism and underscore the dual ontology of bats: in a One Health lab indeed, bats are a risk to human health, while their health is also endangered by human activities. I call these two figures the 'bat who harms' and the 'bat who is harmed', an analytical distinction of mine which, while not ethnographic, emphasises the agency of singular bats in every encounter with PREDICT

préleveurs I observed.¹ The first section below situates the emergence of these two bat figures in the history of veterinary medicine and disease surveillance in Guinea. The second section looks at how *préleveurs* practised ‘care as biosecurity’ when sampling bats and can be said to challenge boundaries between bats and them, yet to a limited extent. This is not only the case because, the third section suggests, moral imaginings and everyday experience endow the bat with a ‘negative charisma’, but also because, as the fourth section elucidates, *préleveurs* would be threatened by an unsettled interspecies hierarchy. While PREDICT staff themselves did not frame the bat in a ‘One Health lab’, this analytical operation works to highlight the intersection between racialised, gendered, and specied hierarchies for *préleveurs* and the animals they subordinate.

A. Guinean vets and One Health: a history

During their time at the ISSMV, in the 2000s-10s, PREDICT *préleveurs* had not been exposed to the health issues of nondomesticated animals. ‘Wildlife’ only made a brief appearance in the curriculum, in the course on infectious pathologies: wild animals (bats were mentioned) were rather vaguely depicted as disease reservoirs, primarily for rabies. Most of them did not even know that bats were mammals, and as such were endowed with an anus, contrary to a traditional saying in rural Guinea that bats ‘poop out their mouths’.² This lacuna in their professional training is a legacy of the colonial history of Guinean veterinary services. Veterinarians made a significant contribution to the expansion of the French Empire in Africa in the nineteenth century. Their role was further consecrated in the first decades of the following century when experts in zootechnics and rural economy – two strengths of vet training in France, considered the cradle of vet education in the world (Davis 2008) – were hired to modernise and improve animal husbandry and range management across West African landscapes. Since 2010, this focus on animal production has dovetailed with the professional domination of vets in One Health institutions and impacted the emergence of the bat as an institutional object in post-Ebola Guinea.

¹ This chapter, because it takes seriously bats’ agency in their interactions with *préleveurs*, and in line with contemporary use in anthropological works sensitive to critical animal studies, opts for the use of personal pronouns for bats.

² This notion seems quite widespread in other locations in the world and is commonly associated with the fact that bats sleep upside down.

Until 1918, the only trained vet doctors in French West and Central Africa were enrolled in the colonial army and cared about animal diseases rather than zoonoses (Benard 2008; Daumal 1996; Davis 2006; 2008; Landais 1990;). After the French administration was established, between 1910 and 1920, they were joined by civil veterinarians. However, vets in the colonies fundamentally remained what historian Sylvie Daumal has called ‘polyvalent scientists’ (1996). They researched tropical diseases and also organised vaccination campaigns, they trained vet assistants and compiled fauna inventories. The tradition of ‘barefoot’ polyvalent vets was strengthened by the foundation of the *Institut d’Elevage et de Médecine Vétérinaire des Pays Tropicaux* (IEMVT, Institute for Farming and Veterinary Medicine in Tropical Countries) near Paris in 1928. But the Veterinary School of Bamako, created by the French in 1924, was not intended to train autochthonous vet doctors (a few studied at the IEMVT) but livestock assistants and veterinary nurses, who would extend the reach of veterinary medicine into the remotest areas of the empire. The number of colonial vets diminished from the 1950s onwards in the countries moving towards independence. They were replaced by a mass of zootechnicians, primarily employed for vaccination campaigns against epizootics. The situation partially changed with the advent of veterinary schools in Senegal in 1968 and in Guinea in 2006. But even nowadays, most of the staff in rural subprefecture posts for disease surveillance and livestock treatments in Guinea are zootechnicians and farming technicians, schooled in one of the four National Schools of Agriculture and Farming, where training mostly emphasises manual work in farms. Likewise, Guinean vet doctors are expected to travel to farms and pastures to perform medical acts and vaccinate. As a result, their professional habitus is closely tied to their patronage networks and physical labour in the field, an enduring and defining feature of their practice.

After 1902, the newly established French colony of Guinea showed interest in the epizootics of livestock diseases that regularly decimated cattle and hindered farming reforms, such as rinderpest and bovine pleuropneumonia. Animal disease surveillance was a prerogative of vet doctors from the Zootechnics and Epizootics Service, founded in 1904 in the French colonies of West Africa to regulate cattle movement, inspect slaughterhouses, and control epizootics (Daumal 1996; Landais 1990). These colonial vets, from the beginning of the century, often completed part of their studies at the Pasteur Institute. Their familiarity with infectious and parasitic pathologies inspired some to wish to expand their official purview to

hunting and wildlife protection (Landais 1990: 38-9).³ But according to historian Etienne Landais, their claims went unheard by the French government. To the extent that it displayed an institutional interest in wildlife, the colony of French West Africa subsumed it to their policy of forest resource management (Guillard 2014). ‘Big fauna’ in particular, i.e., elephants and chimpanzees, were to be protected from local hunting (redefined as ‘poaching’) and what was perceived as the desertification effect of slash-and-burn agriculture (Fairhead & Leach 1994; Leblan 2017). The Forest services, founded in the 1920s in French West Africa as natural reserves were being created, endowed forestry specialists with a conservation mandate. Protected species were envisaged, as with all colonial resources, within the economic framework of the *mise en valeur* – and the forest services did not incorporate veterinary staff. At the same time, interest in the role of vectors and wildlife in what began to be framed as the ‘ecology of diseases’ affecting livestock (such as brucellosis, foot-and-mouth disease, rinderpest) and humans (sleeping sickness) increased with research in tropical medicine and parasitology in the African colonies, especially in relation to zoonoses such as sleeping sickness (Tilley 2004; Vaughan 1991). Some historians have even talked about a ‘colonial veterinary regime’ in the colonies under British rule (Brown & Gilfoyle 2010; Figuié, Binot & Caron 2015: 168). By contrast, it has been suggested (Headrick 2014: 5-6; Lyons 1992: 37-63) that such efforts were less sustained in Belgian and French colonies, partly because of the unsuitability of landscapes for vector and game control strategies, and because of the French focus on eliminating the trypanosome in humans.

While research in the ecology of animal and zoonotic diseases continued in West African independent countries from the 1950s onwards (Boutrais 1989; Landais 1990), it was not until the beginning of the twenty-first century and the advent of One Health that zoonotic diseases became a major focus of research and policy investments by international co-operation. One Health is a conceptual approach to zoonotic disease emergence that advocates collaborations across the sectors of human, animal, and environmental health to prepare for epidemic outbreaks (Bardosh 2016; Bresalier, Cassidy & Woods 2015). The concept is often traced to Calvin Schwabe, a US veterinary epidemiologist at the University of California Davis who called for veterinary and human medicine to come together to combat zoonotic diseases in the 1960s. Schwabe was credited with rethinking the earlier term ‘One Medicine’ to designate a

³ The Pasteur Institute of Kindia, placed by Calmette under the leadership of army vets, studied the infectious diseases of domestic animals and prepared serums and vaccines against the epizootics that ravaged herds until independence (Dedet 2001: 111-6). Even though chimps were used as models for experimentations with the smallpox and BCG vaccines, the institute also displayed an interest in primate pathologies (ibid., 114).

common paradigm across human and veterinary medicine (Zinsstag *et al.* 2011). The concept was rebranded at a 2004 symposium hosted by the US Wildlife Conservation Society as a model extending to wildlife and the whole ecosystem. Since, ‘One Health’ has generated countless publications, advocacy platforms, and policy initiatives across the world. In 2005, the global spread of the epidemic of H5N1 avian influenza acted to accelerate the endorsement of the rhetoric by donors, governments, and civil society groups, and it was finally adopted as a template by United Nation organisations in 2008.

Social scientists have acknowledged the contribution of One Health’s complex understandings of disease ecology. Instead of conflating ‘human-animal contact’ with risk, it recognises the porous boundaries between human and nonhuman animals, and the social relations and practices of care that mediate them (Lezaun & Porter 2015; MacGregor & Waldman 2017). The concept forges alliances between biosecurity, where human health benefits from animal health, and conservation, where animal health matters in itself. However, despite One Health’s insistence on inclusivity and interconnections (it would reference ‘a demise of species barriers’ according to Craddock & Hinchliffe 2015: 1), the agenda tends to exclusively emphasise the role of animals as transmitters of disease (Cassidy 2018). Historian Angela Cassidy has pointed out that this may be due to the predominance of veterinary medicine in shaping the institutional One Health agenda, which obscured the early disciplinary contributions of wildlife veterinarians. In Guinea, this preponderance dovetailed with the structuration of the Animal Farming services for zoonosis surveillance and influenced the uptake of the One Health agenda. In 1994, a national Network for the Surveillance of Animal Diseases in Guinea (*Réseau Epidémiolo-surveillance des Maladies Animales en Guinée*, or REMAGUI) was created to oversee zoonosis outbreak surveillance, but it solely focused on farmed animals (Garrigues 2019). In 2005, the FAO and the World Bank initiated a short-term One Health collaboration for avian influenza preparedness in Guinea, involving this time the human health administration and the veterinary services (Standley *et al.* 2019: 6). The advent of more complex governance mechanisms came, in the 2010s, as a response to outbreaks of diseases thought to originate in wild mammals and to be worrying because of their effect on humans – diseases such as Ebola. Surveillance through data collection, zoonosis research, and epidemic investigations in Guinea have thus been foremost motivated by the threat represented by animals such as primates, rodents, and bats.

A more integrated approach to zoonosis surveillance was adopted following the Ebola outbreak in Guinea, the presumed bat origin of which turned donors’ attention towards wildlife.

Under the umbrella of the US Global Health Security Agenda, and with the expertise of the US Center for Disease Control, priority zoonotic diseases were identified in 2015 and existing capacities and gaps mapped (Standley *et al.* 2019).⁴ The three ministries targeted – Health, Environment, and Animal Farming – were brought together for monthly ‘One Health Platform’ meetings in Conakry, which took place in the US-renovated offices of the National Agency for Health Security. They were later duplicated at the regional, prefectural, and subprefectural levels across the country. In parallel, the World Bank designed a programme for Regional Disease Surveillance Enhancements (REDISSE) in West Africa, with substantial long-term investments in the infrastructure of central and regional laboratories and their equipment for zoonotic disease testing.

Under the reform impelled by the CDC and other partners, passive surveillance, whereby disease cases in farmed animals and humans are detected on the basis of a reported clinical suspicion, is undertaken by the Ministries of Animal Farming and Public Health for priority diseases. There has been considerably less interest in setting up an equally elaborate mechanism for wildlife surveillance at the Ministry of the Environment (Garrigues 2019). A unit for ‘Fauna epidemiological surveillance’ was created within the Guinean Office of Parks and Reserves, but it is telling that in 2019, Mohamed – as we recall, a vet officer from the Ministry of Animal Farming – boasted this function as well. Occasional collaborations across sectors took place, such as when the FAO trained hunters to report found animal carcasses to the Forestry services in 2017. But these local initiatives have not fed into a structured reporting system: according to a 2019 external assessment, the last time the carcass of a dead wild animal was reported by forest wardens dates back to 2011 (*ibid.*, 21). In interviews conducted for the 2019 assessment, agents from the Ministry of Environment admitted to deferring to vets’ supposed expertise in wildlife, for the control of bushmeat for example, which normally falls under their mandate (*ibid.*, 26). But many vets, the report also suggests, consider themselves to be ‘specialists in domestic animals only, and not competent in terms of wildlife’. Passive surveillance of wild mammals presents distinct challenges, as they necessitate intense observation efforts and data collection. The costs associated with wildlife surveillance may also account for their lower priority and the institutional acceptance of large-scale wildlife sampling projects such as PREDICT by the Ministry of Environment.

⁴ The eight priority zoonoses are rabies, brucellosis, avian influenza, viral haemorrhagic fevers (Ebola and Rift Valley fever), anthrax, and trypanosomiasis. The National Department of Veterinary Services has added tuberculosis to this list. Dengue and yellow fever are also mentioned in certain documents (Garrigues 2019).

When bats emerged as an object for the governance of human-animal relations in Guinea after the end of the Ebola outbreak, they were considered wild and thus a prerogative of the current Ministry of the Environment, as wildlife was one of the colonial Forestry services before. But bat surveillance has shifted from a resource management and conservation issue to a One Health matter, entrusted to state agencies. The One Health agenda gives a preeminent role to vet doctors in zoonotic disease management, and wildlife sampling initiatives specifically look to hire vet doctors when recruiting staff for their operations. This is the case even if vets, in line with the colonial priorities that directed educational policies in West Africa, are not trained in handling and caring for wildlife.

B. Care as biosecurity

Every mission day after the first, around 6 p.m., the agents carried heavy crates from the project's four-wheel drive to the site reconnoitred earlier as auspicious to bat populations. They planted a few poles, between which they pulled taut six-metre-wide polyester nets. As dusk set in, one bat, then two, swooped from their perch; some flew down into the net and were trapped. 'Capture!' When two or three were caught, two agents quickly donned PPE, before the flailing animals snarled up too tightly. It was the start of my fieldwork with PREDICT but I was attending the last sampling missions. The experienced agents, who had been repeating these gestures for the last two years, were eager to perform professionalism in front of the white student, perhaps fearing I might otherwise report negatively to their superiors. One agent began to disentangle the fragile jumble of hair, bones, and claws, which took up to several minutes. The task required ability and gentleness for the net should neither be torn, nor the bat hurt. A bat's wings are especially difficult to separate as their skin is thinly stretched, and if perforated, could impair flight and compromise the animal's survival (a frailty that street-smart boys know to take advantage of by targeting fruit bats' wings with a catapult). The bats were then inserted in cotton bags hung off a branch, 'so they feel suspended', the *préleveurs* explained, as bats should.

PREDICT agents were trained to handle bats – whom most of them had hardly manipulated before – following a bioethical protocol. Adapted from manuals for zoo and wildlife veterinarians, approved by UC Davis Institute for Animal Care and Use Committee (IACUC), the university's Institutional Review Board and the national authorities as required, it prescribed 'the most humane and least invasive techniques to sample wildlife while minimising pain and

distress'. The personnel were to receive training in the animal handling protocol for 'ethical and safe sampling', delivered through a seven-day long workshop by a conservation scientist specialised in chiropterology. The scientist, a German woman, was a bat specialist who had run several bat surveys in the region and had even built up a voluntary monitoring network of the straw-coloured fruit bat (*Eidolon helvum*), with representatives in Guinea. The workshop began with two days of theoretical training through a hybrid crash course in chiropterology, virology, and conservation – a typical intersection in One Health programmes. Extensive details were provided on the taxonomy of bat species present in Guinea, accompanied by coloured pictures, descriptions of their 'capture sites' and 'characteristic traits'. One slide of the presentation singled out ten bat species as 'suspected in the Ebola virus ecology in Guinea', eight megachiroptera (fruit bats) and two microchiroptera (insect bats). The numerical imbalance between the two groups ingrained a deepest fear of fruit bats in the *préleveurs*, who were furthermore initially asked by their superiors to concentrate their capture efforts on these. But the training made a greater case of the 'ecosystemic benefits' of bat populations to human health and economy: fruit bats were said to contribute to pollination and seed dispersal, and insect bats to insect control. Caves, where the agents would learn to look for fruit bats in particular, were said to be such an ecosystem sensitive to human disturbances, which many bat species classified as threatened in West Africa (*Rhinolophidae* and *Hipposideridae* were mentioned) depend on. The training integrated the habitat conservation and ecology focus, characteristic of One Health, that was foreign to Guinean vets prior to post-Ebola reforms in the curriculum.

It was the ensuing five-day-long hands-on training that the *préleveurs* remembered best. They were acquainted with a laminated document for the identification of bat species and their 'biotope' in the field, a skill which they immensely valued for the scientific vocabulary it taught them. Their interest was further sparked by an electronic bat detector, which the chiropterologist activated to amplify the ultrasounds emitted by bats. Through these media, *préleveurs* were invited to attune their corporeal senses to another form of interspecies experience, like Australian carers volunteering for a bat shelter (Keck & Morvan n.d.). This new sensitivity was mediated by what they experienced as an interracial encounter: up to two years later, I still witnessed hilarious impersonations of the chiropterologist who trained them, described to me as a 'small fast-running *tubabu* woman' (i.e., 'white' in many West African languages). She allegedly loved bats so much that she cupped them in her hands and blew on them 'when they were cold!' It was not only the woman's empathy for bats which durably impressed the *préleveurs*: her extensive knowledge of a single animal order was something unseen in Guinea,

the vets felt, where ‘you stay rather generalist’. Nurturing a bat perspective seemed to challenge postcolonial asymmetries in vet training.

The workshop most importantly featured practical training in the technical challenge of sampling bats without hurting animal nor technician. It aimed to inculcate ‘humane’ care for bats in the agents, a skill spanning a field of technical specifications and sensory practice. The protocol put forward numerical criteria: the sampled blood quantity was limited to 1% of the animal’s body mass. Anaesthesia was to be avoided, for overdosed anaesthetics can be fatal to small bat bodies. In addition, animals should ‘neither be stressed nor kept for long’, although no indicators for animal distress or pain were specified. The protocol also demanded that ‘disturbance of the social groups/colonies and their habitat’ be ‘minimized’, for example by releasing animals within one kilometre of the site of capture. These bioethical principles interweave two doctrines of animal health: animal welfare is foremost interested in preserving the biological life of the animal, while wildlife conservation is attentive to the species ecology. The German specialist – as revealed by her impersonation by the *préleveurs* – further attempted to sensitise them to the welfare of individual bats and taught them to observe and read a variety of signs. In her presentation, she recommended ‘mov[ing] softly and slowly’ and attuning themselves to the bats’ breathing to adjust manual pressure on their body. The *préleveurs* did not dissociate these distinctive visions of bat welfare – biological, ecological, and individual – but collapsed them and summarised their goal as: ‘we are told to treat animals humanely’. While this expression could be read as explicitly anthropocentric, it weaves an entangled net of interspecies equivalences: it certainly anthropomorphises the object of care by mandating the ‘humane’ treatment of bats, but it also equates caring for the animal’s wellbeing with the carer’s humaneness.

If looked at in its practice in this way, the *préleveurs*’ activity seems to foreground the vulnerability of the ‘bat who is harmed’. This is yet in tension with rules imposed by another bat figure, the ‘bat who harms’. ‘Scientific care for wildlife’, when animals represent a biological risk, activates a practical tension between the need to protect oneself and the requirement to protect the animal (Cassidy 2019: 145; Keck 2012). Although PREDICT protocol estimated the prevalence of rare pathogens in bats to be ‘between 0.01 and 1%’, wildlife *préleveurs* were taught to observe strict biosafety precautions, and protect themselves from the bats’ attempts to resist their handling. Once transferred to the sampling space, bats were the object of the taut attention of agents dressed in full-body protective equipment, seated in an area delimited by security tape. One agent took bats’ weight by means of a portable scale,

uneasily read through their face shield. Another one took them by the collar with a firm grip, to prevent them from turning their head and biting. They presented animals to a third agent who determined their sex, age, and species, and measured their forearm for identification purposes. Knowing that the bat's DNA thus extracted would allow the species to be identified in another lab in the United States, the agents usually did not bother to identify species below the family level. Their deferral to lab technologies located elsewhere for identification had much to do with their concentration on extracting a great number of samples: four cotton swabs, inserted into each animal's mouth and anus, and two to four samples of blood, collected by way of a pipette held close to the punctured brachial vein. The collection process took ten to fifteen minutes of handling animals who panted, squeaked, and squirmed to break free, their mouth open and ready to bite. Bats' sharp teeth caused much apprehension among the agents as they could easily pierce through several layers of glove. Even though all agents had received practical training at the start of the project, in practice animal restraint was entrusted to those who felt most confident handling bats without incurring their biting or hurting them. 'In certain contexts, care is precisely what *enables* the instrumentalization of life' (Giraud & Hollin 2016: 31). Practically, the role of care for the 'bat who is harmed' was to smooth specimen collection by ensuring the animals' compliance with experimental goals, and thus meet and exceed the sampling target if possible. Care was merely the best technique to prevent the bat from becoming one 'who harms'.



Figure 11. Three préleveurs sampling a fruit bat, without leather gloves

In the field lab, techniques for bat containment were not consecrated requirements, but objects of negotiations that considered the vulnerabilities of two subjects of care: *préleveurs* and bats, who might both harm and be harmed. The protocol recommended, for instance, using resistant leather gloves with larger fruit bats, where the bite and scratch risk was deemed higher. These robust gloves were usually worn above nitrile gloves to prevent exposure to bites. However, this technology had a flipside: it diminished the *préleveur's* sensitivity and increased the risk of hurting the bat so restrained. Some *préleveurs*, negotiating with professional pride, fear of infection, and respect for the authority of protocols, judged their handling skills sufficient to restrain the animal without inflicting pain nor getting bitten, and most importantly for allowing the light procedure to which they were subjected. This was part of *préleveurs'* tacit knowledge: attention to animal suffering may lead to eluding procedures and 'tinkering' with sociotechnical infrastructures (Birke, Arluke & Michael 2007; Law 2010). The vulnerability of the 'bat who is harmed' and the *préleveurs'* vulnerability to the 'bat who harms', whose conflict might have fatal consequences, were managed through attunement to the bat bodies, as

inculcated during chiropterology training – and an emancipation from strict observance of the protocol.

This tinkering with the protocol tallies with the observations of social scientists who have looked at care for animals in biosecurity systems (Law 2010; Lockerbie & Herring 2009; Lowe 2010), not in the context of passive wildlife surveillance but of active surveillance on farms during outbreaks. Anthropologist Natalie Porter has portrayed avian flu management in Vietnam as a form of biopolitical contest between two visions of what a ‘good death’ entails for farmed poultry (2013). These visions were defended by two different groups of people: while Vietnamese state vets enforced the biosecurity policy that dictates pre-emptive poultry culling in farms close to reported flu cases, farmers might choose to shield their birds from culling, because poultry only represents a respectable source of income if subjected to a ‘good death’. This latter form of care for animals on farms, although it still implies their subordination to human ends and ultimately kills, evades the biopower of state-mandated culling and takes place ‘despite biosecurity’. Care is not a regulatory formula as much as a repertoire for situated action, ‘holding together that which does not necessarily go together’, caring and killing (Law 2010: 69). Although like Vietnamese farmers, Guinean *préleveurs* did not rigidly routinise their practices, what they performed was less akin to ‘care despite biosecurity’ than to ‘care as biosecurity’.

In fact, within the One Health paradigm, bats are cared for precisely *because of* the risk of cross-species infection and their operation as ‘sentinel devices’. ‘Disease sentinels’ are technologies of biosecurity surveillance which track the circulation of pathogens in and between their spatial reservoir(s) (Keck 2015; 2020). Sentinels are animals who announce the diseases of humans through sending signs that they must detect and interpret. As outlined in the Introduction, PREDICT framed its activity as aiming to ‘predict the next outbreak’, by which the project’s designers specifically associated the constitution of a database of wildlife viruses with increased capacity to swiftly respond to future outbreaks of yet unknown zoonotic diseases. Once an epidemic is declared, the stored pathogens closest to the newly sequenced virus, identified via phylogenetic methods, are thought to point to a species and a geographical origin to the disease, thus allowing a targeted response. In addition, as will be discussed in Chapter 5, the discovery of new viruses was to be disclosed by PREDICT to governmental authorities, who could implement ‘risk-reduction’ strategies to prevent outbreaks, mostly through communication on the risk of zoonosis. In this sense, the value of wild animals’ lives is infinitely superior from the prism of surveillance, when they act as disease sentinels, than

from the prism of precautionary culling. This may be why Frédéric Keck (2015: 229) casts sentinel surveillance by Southeast Asian virologists and birdwatchers as an exchange of perspectives, whereby ‘letting sentinel birds live’ ‘becomes a way to make [humanity] live’. The welfare of the animal and the preservation of their liberty to circulate grant their future capacity to mingle with other nonhuman and human animals. Through being sampled in the mode of ‘care as biosecurity’, they may send humans signs of an impending epidemic.

The vulnerabilities of bats and humans are not negotiated as a by-product of sampling. The very configuration of the One Health lab, its ‘caring as biosecurity’, force wildlife samplers to care for and protect themselves from bats who both harm and are harmed. In Guinea, the job of *préleveurs* was to navigate the competing imperatives of biosecurity and animal ethics in sampling disease sentinels for a foreign-funded project. Nevertheless, they could not necessarily be said to exchange perspectives with the bat. The rest of the chapter will elucidate this through looking at the relevance of biopolitically fraught categories, such as race and gender, for thinking about human-animal relations in Guinean bat sampling.

C. Interspecies encounters

Bat *préleveurs* were among the few adults in Guinea to interact with live bats (besides perhaps bat hunters, a rare figure in the country’s rural areas). Crucially, they were the only ones who aimed to keep them alive (except perhaps some children, who like playing with insect bats). Their corporeal engagement with these live creatures as individual animals was among the most elaborate in the region, and so, too, their experiences and knowledge of them. If we think with geographer Jamie Lorimer’s study of ‘fluxes of wildlife’ (2015), animal charisma is shaped by such embodied encounters and their valuation under a given political economy. It is a relational product, derived from corporeal interactions, ecological understandings, and aesthetic judgements. In Guinea, as we will see, bats can hardly be said to possess the ‘nonhuman charisma’ of large mammals of interest to conservation programs in West Africa: they have, overwhelmingly, a ‘negative charisma’. By dwelling in the interstices of *préleveurs*’ training, the bioethics protocol, and bats’ operability as ‘disease sentinels’, I now turn to the question of how sampling agents were affected by bats’ ‘negative charisma’ in their work. This leads us to reframe the bioethical negotiations described above as interspecies encounters within a sensory lifeworld fraught with morals, gender, and religion.

Most PREDICT agents had stayed clear of bats in their childhood. Either they grew up in areas where bats were scarce, or their parents – mostly teachers and civil servants – forbade them to approach bats, mainly because of their bite. In 2017-9, dead fruit bats were hard to find in local markets, where fresh catches – considered a delicacy – had become rare. Thus, many people, typically in urbanised environments, never saw bats up close nor ate bat meat. Bats are typically not considered to fall within the vernacular category of common ‘bushmeat’. It should also be noted that there is no general way of talking and thinking about bats in Guinea. There is, we might say, no such thing as ‘bats’, or *chauves-souris* in French, in vernacular languages and local taxonomies, a point also made by anthropologist Michèle Cros in Burkina Faso (2020).⁵ But in their everyday encounters with them, adults tend to frame them as dirty, pullulating, and killable: they are often the object of what anthropologist John Knight referred to as a ‘pestilence discourse’ (2000). The conversations that PREDICT *préleveurs* had with the inhabitants of sampled sites revealed that insect bats roosting under house roofs are a source of noise pollution. Their droppings and urine leave a foul smell and dark marks. Their nocturnal behaviour, on top of troubling people’s sleep, raises concerns that they might be metamorphosed witches. Consequently, Forest Guinean people have developed a repertoire of techniques to force them out of roofs, such as by burning the shells of groundnut harvests to smoke bats out of their roosts. Local people never failed to ask PREDICT agents if they knew more effective methods to get rid of the pest.

Bats’ anatomy, half-bird half-mouse, was the topic of a few origin myths that attest to the ambiguity of bats’ ‘negative charisma’. I was introduced to the story explaining ‘why bats are bats’ by the agents sampling them. It was on one of my first meetings with them, on an idle day at PREDICT office, when young vet Paul, with much drollery and mimicking, set out to recount the tale for my pleasure and that of the other staff present, who knew his talent. In days of old, he told us, animals had to pay a tax to the lion, the king of animals. The lion had tasked the panther with levying the tax from mammals, and the eagle from birds. One mouse tried to outsmart them. They asked birds for wings, and when the eagle asked the mouse for the bird tax, they opened their mouth and disclosed their teeth: ‘Have you ever seen this [a bird with teeth]?’ The eagle left them in peace. When the panther came to levy the mammal tax however,

⁵ The suborders of the chiroptera, the (fruit-eating) megabats and the (insect-eating) microbats, do not necessarily belong to an encompassing vernacular order. They have different names in Maninka (respectively ‘kona’ and ‘dorondoron’), Kissi (‘tongando’ and ‘liibaa’) and Kpelle (‘tonwei’ and ‘dewe’, although this last noun can also designate bats in general). Insect bats are often likened with or mixed up with birds, more specifically swallows, which they resemble at night for they seem to fall from roofs as they furtively leave their roosts. As only fruit-bats are hunted for consumption, the Ebola-time ban was mainly interpreted as targeting those.

the mouse flapped their new wings to take their flight. The two administrators went to the lion and complained about the mouse who had become a flying mammal. As punishment, the bat was ousted from the society of animals. ‘This is why they do not go out by daylight, why they hide themselves in their wings, sleep head down, and fly fast so as not to be seen’, Paul concluded.

Other West African origin myths about the bat, collected by ethnographers in Burkina Faso and Mali (Cros 202; Hampâté Bâ 2002), underline what structuralist anthropology saw as their liminality. They are neither domesticated nor wild, neither of the earth nor of the skies, they defy gods and live hidden. The bat is excluded from the community of animals by virtue of dissonances in their appearance and functioning: their wings attach them to the realm of birds, while their teeth and breasts attach them to the realm of mammals. In the versions compiled by Benjamin Frerot in the northern Guinean region of Futa Djalon (pers. comm.), the bat is rejected by the other animals, who do not recognise them as their like and do not help them accomplish social rituals. The narratives I heard, all told by Guinean *préleveurs*, place more emphasis on the ethical ambiguity of the animals’ intelligence, as in narratives of wilderness in the Upper Guinea region (Jackson 1982; Paulme 1961). In these stories, introduced to me as tales from Forest Guinea, the bat uses their ambivalent physical appearance, or fashions it to escape social obligations, such as taxes. Sorely chastised in response, they are endowed with anti-social traits: nocturnal habits, defecating from the mouth. Michèle Cros, in her study of bat myths in Burkina Faso (2020), has referred to Claude Lévi-Strauss’s analysis of ‘blocked or pierced’ mythical beings, ‘with no mouth or anus’ (1990 [1968]: 187). Cros suggests that bats’ mythical leaking of faeces transposes their hypothetical reservoir status, since this leaking of sorts makes bats ‘ideally pathognomonic before any biological imputation’ (2020: 45, my translation). This analysis – equally mythical – tends to read, select, and accommodate myths that do not clash with virological knowledge and redeem them as forms of proto-hygiene (Douglas 2001 [1966]; Lynteris 2016a). Rather than assess the validity of Guinean origin myths from the perspective of virology, I aim to illuminate the reverberations of such myths for *préleveurs*, in their own sensory and narrative lifeworlds.

The myths I recorded seem to ground and elucidate bats’ ‘negative charisma’ for PREDICT agents. Assuredly, participants in research on bat-borne viruses generally operate in a framework directed by a conception of hazardous bats. A study of the perceptions of an international sample of bat scientists has indicated, for example, that scientists working on bat infections are more likely to see them as dangerous than those working on their ecology (Boëte

& Morand 2016: 3). But their bodily features were inextricably intertwined with their morality for PREDICT agents. They constantly described bats as ‘unsightly’ and ‘cunning’, in particular because of their sharp teeth.⁶ There was no place, in their discourse, for cuddly anthropomorphised bats, at the source of the nonhuman charisma of many flagship species in conservation politics (Lorimer 2015). Bats were even the target of dark humour while on the sampling table, jokes which pivoted around their corporeal affordances and edibility: ‘Keep this one for my soup after sampling!’

Bat restraint was not delegated to female vet colleagues, a gendered division of labour which seems to naturalise women’s vulnerability to wild animals. By extension, male agents fantasised that they were chased by the women living in their sampling sites and referred to them as ‘bats’ (or sometimes ‘*chauve-sourices*’, a linguistic innovation that feminises the noun *chauve-souris*, designating both male and female bats in French, and rhymes with *nourrices*, a widely used term for breastfeeding mothers in Guinea). The metaphor, which overlaps animals and women as absent referents (Adams 2015 [1990]), gave fodder for many puns involving spreading out one’s ‘nets’ in local bars to catch and ‘thump fat bats’.⁷ It was even whispered that the daughter of a female *préleveur*, who left the project because she was pregnant, looked like an *Epomophorus*, i.e., a genus of chiroptera targeted by PREDICT sampling. Or perhaps she looked like her mother’s close friend Michel, another single *préleveur*. In this rumour, spread by male agents, the local idea that consumption of certain animals by pregnant women endows their baby with similar bodily features (and female *préleveurs* who were also *nourrices* were preferably not tasked with handling bats) dovetailed with gossip about extramarital affairs. The interspecies creature which resulted, a girl in the likeness of a bat, or perhaps in that of a bat *préleveur*, transgressed frontiers between species only to naturalise the subordination of women to middle-class male vets. Misogynous banter via an animal proxy appeared to naturalise the gender hierarchy in Guinea, where the superiority of men over women is even less challenged than over bats.

These gendered affects contributed to making the demand to ‘treat bats humanely’ utterly incongruous. The discordance was significantly brought out by a fatal incident at the inception

⁶ One exception was PREDICT’s youngest female agent, Nathalie, a faithful Christian woman who claimed love, gratefulness, and admiration for the bats who pollinate the grapes she was so fond of.

⁷ This animalising metaphor is more than anecdotal in Guinea, as attested by the song ‘Limbaa Landounya’ by Kissi artist Gnouma Kantambadouno, a song about a woman’s keenness for her lover, whose title means ‘The bat has clung to me’ (2018).

of the project, which the *préleveurs* found amusing. Dr Bilis, self-proclaimed master of all veterinarian techniques, accidentally killed a bat while handling them. Distressed by such a breach of protocol, he offered his condolences to the team, mischievously, and called the country director to report the accident. According to the animal care protocol, only ‘severely wounded’ animals could be euthanised following the guidelines of the American Association of Zoo Veterinarians, and a justification report had to be sent indeed to the country director and UC Davis personnel ‘for evaluation’. PREDICT agents told me that they accidentally killed quite a few bats directly after their training by the German specialist. But their deaths were likely not all reported, as I gathered from the fact that Dr Bilis’s anxious reaction still triggered hysterical laughing when later recollected by the sampling agents. Lab studies have suggested that humour helps to cope with the stress of lab work (Kerr & Garforth 2015), and laughter could have channelled and released anxiety with regards to the precariousness of *préleveurs*’ employment and its subordination to feminised caring skills. More generally, affectionate gestures towards bats – such as petting them, blowing on their body to warm them, or just feeling sorry for causing their loss – were often derided. These gestures always seemed facetiously performed, and the look for my attention which accompanied them underlined that they were motivated by the supposition that Western people felt more empathy for bats. Caring for bats was not only dissonant with a local ‘pestilence discourse’; their negative charisma, affordance as food, and gendered inferiority naturalised their status as ‘bat who is harmed’, in an apparent opposition with foreign norms.

Something else happened, sometimes, on the margins of the One Health laboratory (and not in the interstices examined so far). Once *préleveurs* left the space theoretically regulated by bioethics, after they bagged the bat again and took it away from the lab’s lights, the protocol stopped codifying their practice; it only indicated a measure of one kilometre for the release perimeter. Some agents unceremoniously shook bags open so that the bats fell flat on the ground and crawled into the darkness. I heard of agents from another sampling project discreetly handing over bats to bystanders for consumption. But PREDICT *préleveurs* preferred not to release animals in the immediate vicinity of the inhabited sites where they captured them, since, as we saw in Chapter 2, they feared that their gesture could be interpreted as intentionally releasing injected viruses into the environment. Therefore, Omar – a PREDICT agent and forest warden with a professional commitment to wildlife and what he described as ‘personal affection’ for animals – embarked with the bagged bats and drove a few hundred metres down a bush road. Omar liked to take care himself of releasing the animals. Once away from prying

eyes, he took the bats out of the bags, one by one. If they did not immediately take flight, if they looked a little disorientated and weak, he carefully placed them on a tree trunk. If he laid them on the ground, they could be eaten by snakes. Sometimes, when he opened the bag, he found the bat dead after losing too much blood. Once, Omar had just released an animal when an eagle dived and snatched it. This brutal death touched him deeply because he ‘believed in fate’. ‘Yes, we removed them from their environment, but if we had not trapped them today, another predator would have. You may take many precautions while sampling, and release the animal in a proper place, but they had to die that day’.

Omar’s reflection, accompanied by gestures of care and compassion, could be seen as reaffirming the equality of all species in the face of death. Through his employment as a forest guard, he had encountered many dead, accidentally ensnared animals, such as birds. But he never acted on his overwhelming pity to try to convince hunters to position their traps differently or release the unfortunate beings. His caring interventionism bowed to what he perceived, as a practising Muslim, as the godly law of ‘fate’, or as other *préleveurs* would put it, ‘luck’. His labour did not take responsibility for singular beings; their accidental mortality was naturalised. Likewise, US researchers working with animals subjected to experimentation contrast life in nature as brutish and short, compared to the ‘good life’ furthered by humane treatment in laboratories (Sharp 2018: 42). In Sharp’s ethnography, researchers consider that they are offered an opportunity to rectify nature’s flaws in the lab by preventing useless deaths from inter- and intraspecies cruelty. Omar would certainly agree with them, although bats do not dwell on the sampling table like monkeys in research labs. At times, sampling agents also happened to snatch bats from the jaws of a near certain death, such as from snakes they found preying on their catches. Thereafter, liberating the bat was not returning them to a state of freedom from science, it was releasing them from a space of controlled protection. But Omar would not have contended with US lab workers that ‘the ethical codes of conduct that steer laboratory life – and, by association, death – are superior and preferable to the laws of nature’ (ibid., 42). Omar might be said to ‘share suffering’ with some bats, in the sense of Donna Haraway (2008), in that he bowed to their common finitude, brought upon by higher forces, whether God or eagle. Through his witnessing and reflection on the death of individual bats, he embraced something like their individual perspective instead of subsuming them to their species. But higher forces did not treat bats as ‘disease sentinels’, who ought not to be killed at all – and neither should humans, in his opinion.

Scholarship on human-animal relationships in biosecurity and lab contexts tends to celebrate the moral ambivalence of human-animal encounters, their reworking of the boundaries between species: if killing must happen, it entails deliberations and care (Haraway 2008; Law 2010). But for *préleveurs* embedded in a rural economy where bats foremost acted as a nuisance and sometimes a resource, killing them was caring for humans. The laboratory was certainly a space of exception where this anthropocentric ethics might be suspended. But even when, outside the lab purview, certain *préleveurs* were affected by bats' frailty, they naturalised their mortality as killability. The figure of the 'bat who may be harmed' is thus inherently ambiguous: their vulnerability legitimises the harm inflicted upon them by humans and nonhumans, while it could also warrant protection – or at least an implication of responsibility – from the humans who subject them to collection. In the One Health lab, hierarchies between humans and bats are enacted and cemented through a labour which is thoroughly social.

D. Postcolonial frontiers

If we look past the apparent ease with which *préleveurs* tinkered with bioethical protocols, certain situations still exposed them to intractable conflicts between the logics of care and those of biosecurity. PREDICT agents perceived that they were carrying an inordinate proportion of the risks entailed by animal sampling for One Health surveillance. For a while, after the inception of the project in 2017, they collected bats at night and waited until morning to sample them, rested and in daylight. But prolonged restraint poses a risk to the animals' health. The protocol recommended not to keep them bagged for longer than twelve hours, and the German chiropterologist suggested a maximum duration of six hours: bats had to be liberated on the night of capture. Consequently, PREDICT staff were ordered to proceed to sampling directly following capture. They put on their hazmat suits soon after the first catches, around 8 p.m., so as not to start the lengthy sampling process too late. Their haste also meant that, while waiting for more bats to become trapped, they could wear PPE continuously for longer than two hours, as not normally recommended, and work until the early morning hours. The team was reassured by their managers that their 'safety came before the results', but they often complained about fatigue – and ultimately, the capture goals were revised to limit night-time labour.⁸

⁸ The daily catch was highly variable, depending on the geographical location, the landscape, and the season, ranging from one to, I heard, two hundred bats sampled in one night.

These tensions conjure up the haunting presence of power relations of a postcolonial nature. In Guinea, the asymmetries implied by international projects, a fortiori by medical aid and bioscientific research, were not experienced as intersecting various forms of inequalities, for example between the Guinean educated and the uneducated, countries with higher and lower income, etc. They were read as imperialist relations that continued the legacy of French colonialism and were overdetermined by a racial hierarchy between ‘black’ and ‘white people’. This postcolonial situation, I suggest, transfigured relations and hierarchies between *préleveurs* and bats. Sampling for One Health professes to protect both humans and animals, but following Natalie Porter (2013:144), it ‘provokes dilemmas surrounding whose lives and livelihoods are worth protecting in multispecies biopower’. These dilemmas confronted *préleveurs* to the two bat figures highlighted in ways that had colonial echoes in practice. *Préleveurs* were entangled in their work with ‘bats who hurt’ and ‘bat who may be hurt’, an entanglement which generated new threats to human and bat lives.

As explicated in Chapter 2, the outcome expected by the PREDICT project entailed bat fluids and field pictures, which were to connect according to criteria of representativeness and exemplariness. The agents, caught in what I analysed as a field of mimesis, felt they bore the brunt of dissonances between foreign expectations, field-bound constraints, and practical accommodations. Prudence was particularly indicated when it came to sharing field pictures with superiors. The *préleveurs* had been warned about the potential of visuals for their remote surveillance by one blunder, which almost cost them their jobs. In the first months of the project, project donor’s representatives on a field visit took pictures of Mohamed at work, untying a bat from the net, using gloves but no apron, no face shield, and no coveralls. They unknowingly sent the pictures to the global lead of PREDICT activities as illustrations of their expedition. It seems that American managers, certainly worried by the biosecurity risks taken by employees who had taken liberties with the protocol, scolded the Guinean team as a collective. For some days after the rebuke, PREDICT agents held their breath, fearing that Mohamed’s mistake would mean a halt to the project and cut the source of their income. At stake was not only their professional ethos, examined in Chapter 2: bat welfare and the personnel’s biosecurity were held in a precarious balance which always threatened to tip to the disadvantage of PREDICT staff.

As hinted at by Mohamed and as many readily admitted, in conversations with me and through bantering, their motivation for joining the project was primarily financial. The job market offered few opportunities to Guinean graduates aside from short-term contracts in

donor-funded projects, especially scarce for vets. Still, most were not satisfied with their remunerations, because they were allegedly inferior to those in comparable projects: 3,5 million Guinean francs per month (i.e., £260) and 2,5 million GNF in per diem per mission (i.e., £185).⁹ They supposed that their managers preyed on their salaries in the course of drafting budgets, as embezzlement was common in all economic sectors in Guinea. Most were infuriated by what they perceived as a gap between the risks they took and their remuneration. In one-on-one conversations, they spoke candidly about their ‘self-sacrifice’, as if echoing the ethos of health workers during the Ebola epidemic (Calain & Poncin 2015). They emphasised that night-time labour was not only tiring and increased their chances of making biosecurity mistakes, it exposed them to snake bites and other mosquito-borne diseases. Nights were cold, especially in the dry season. They frequently worked well past midnight sampling bats, getting up before 7 a.m. the next day to set up mouse traps. Their eagerness to finish work as early as possible led to skirmishes among themselves, especially when cleaning up the lab at the end of their stint. The guest houses where they lodged had Spartan amenities – no running water nor much electricity. They slept three per bed, sometimes on mattresses they brought and rolled out on the floor. Food was not scarce but not very varied either. After a nine day-long mission, the joyful chatter that accompanied the drive to the mission locality was not heard on the way back to N’Zérékoré. Squeezed in the single project car, the raddled agents stayed silent or slept. If, as we saw, Guinean vets liked to describe themselves as *hommes de terrain*, or ‘field men and women’, their labour in private practices practically never mandated long stays in villages; and their higher education and middle-class aspirations for comfort and privacy made them favour an urban lifestyle. They experienced a conflict between relative financial security and a thankless job in rough conditions.

On a few occasions, I heard some *préleveurs* offer a political reading of their predicament, which appealed to a persistent anti-imperialist discourse in Guinea. Norbert and Omar, for example, drew parallels between their work for PREDICT and their past employment by a French conservation organisation as caretakers for chimps in a national park. Norbert, who had started a private vet practice in Kissidougou afterwards, vividly remembered their difficult work conditions. He narrated them to me in a voice still vibrating with indignation at their unfair treatment by ‘white people, French people in particular’, i.e., their former colonisers. The director of the centre allegedly greeted the chimps by their name every day without

⁹ The monthly income in Guinea averages £58 (World Bank 2022).

consideration for their nameless carers. They worked more than sixty hours a week and were not allowed to consume the fish or game found in the reserve, while the nearest market was located dozens of kilometres away. Norbert's anger at their mistreatment was compounded by lack of masks and medications for dealing with 'potentially HIV-contaminated chimps', he said (the medications available, administered to chimps and humans alike, were expired). After a brief stint, he had presented his letter of resignation, which invoked the veterinary code of conduct and the Guinean legislation. Norbert concluded his story, riffing on independence leader Sékou Touré's famous 1958 statement to the General De Gaulle on a diplomatic visit to the Guinean colony: 'our Guinean brothers, reduced to slavery...'¹⁰ Seen through the lens of the political ecology critique of wildlife conservation in Africa, one could find this story symbolic of the 'vulnerability of African people in the face of the world's fascination with African animals', who sacrifice themselves to enable a kind of capitalist production of nature (Garland 2008: 55; S. Jones 2006; West, Igoe & Brockington 2006). But Norbert's narrative did not so much oppose the welfare of animals to that of postcolonial workers: they were all inextricably entangled in a postcolonial economy of conservation, which allocated sparse resources to medications for the health of individual animals and humans, and generated vulnerability for all.

The double bind between the 'bats who harm' and those 'who are harmed' also confronted *préleveurs* to excruciating interspecies dilemmas. These specifically concerned animals which excited deep moral feelings, such as lactating bats with their pups, and pregnant bats. Usually spared the dark humour and treated with compassion, these 'good bats' deserved care because they were caring themselves, in contrast with the 'bad bats', whose bite can harm (see Cassidy 2012).¹¹ I noted the distressing force of these affects on a night when I was able to observe the agents of another project in their bat sampling work. When finding out that he had to sample a lactating bat, Cissé, an elderly state vet from the Ministry of Animal Farming, urged everyone else involved to proceed quickly to limit the separation between mother and pup. A dreadful shriek suddenly pierced the air. The mother bat had attempted to escape and bitten Cissé, who shook his hand to have her let go. She soon took off, leaving her pup behind. Immediately, a

¹⁰ Touré exactly said: 'We prefer freedom in poverty to opulence in slavery' (Hallett 1974), a statement taught to generations of Guinean schoolchildren since.

¹¹ *Préleveurs* particularly pitied the bat pups that became accidentally orphaned through their activity. It is possible that this compassion was bolstered by a process of identification with orphaned beings. The *préleveurs*' distressed attempts to attach these to other females hint at the circulation of orphaned children in West Africa through the institution of fosterage, and the tensions around kin obligations and inheritance that arise (Bledsoe 1980; Guyer 1995).

dispute arose around responsibilities for the accident, and the sad fate promised to the bat pup. Cissé, who went to disinfect his hand, plainly said: ‘My health comes first. I don’t have any insurance if I get sick.’

Cissé likely spoke out because he worked in a project with two young French interns. He assumed that they would be evacuated for treatment if dangerously ill, as happened during the 2013-6 Ebola outbreak, when hundreds of West African health workers died (Benton 2014). As he reminded one of his expatriate colleagues who had also been the victim of such a biosecurity incident, the intern had, immediately afterwards, ‘called France’, that is their family in France, a telling metonymy for the perceived former colony’s interest in the health of its citizens. As for the *préleveurs* employed by PREDICT, they had been vaccinated against rabies, and their work contract mentioned an insurance covering 80% of their health costs. But the agents, anticipating heavy paperwork perhaps, paid their health bills out of their own pockets. When fieldworkers were bitten, which was not rare, an anxious search began for a tear in the glove, and a long wait for symptoms of contamination to perhaps manifest themselves eventually. Staff apprehended defaulting from the protocol, watched the reaction of supervisors who could very well terminate the contract of blunderers, and feared for their existence. They did not expect to be airlifted out of the country if they fell seriously ill. Thus, in many of their encounters with animals they found otherwise pitiable, the bat had sharp teeth before she had breasts.

In certain situations, the ‘bat who harms’ obliterates the ‘bat who is harmed’. When I recounted to my PREDICT friends what happened to Cissé, they told me, hoping that I would pass their concern on to their foreign managers: ‘We are told to treat bats humanely, but us too! It is good to save other species, but when your own species is in danger...’ This plea covered up a political concern for equality (and the priority that should be granted to all human lives) with the vocabulary of conservation. The agents perhaps felt that it was more amenable to foreign powers whose humanitarian response to Ebola had been activated by fears for the biosecurity of their own population. Consequently, no fruit juice was given to bats despite the bioethics protocol’s recommendation, as agents claimed that they were offered no beverages either, despite the biosecurity protocol’s recommendation against dehydration. *Préleveurs* felt that they bore the costs of the One Health dual concern for ‘bats who harm’ and ‘bats who are harmed’. In that respect, the potential for blurring boundaries between species through care seemingly yielded to a postcolonial frontier.

Conclusion

Because of uncertainties about their zoonotic origins, the 2013-6 Ebola outbreak and the COVID pandemic prompted calls for research into the emerging zoonoses carried by bats and, simultaneously, conservation measures (Rocha *et al.* 2020; Schneeberger & Voigt 2015). A One Health approach to human-bat health strives indeed to highlight the beneficial role of bats for environmental and human health. As the anthropologist James Fairhead has suggested (2018: 176), this inclusiveness is mediated by technologies such as the sampling lab, on which the possibility and sustainability of human encounters with elusive bat worlds depend. This chapter has expanded the list of inclusion-oriented technologies to the protective equipment and professional skills which enable safe investigations of the role of bats in emerging zoonotic diseases.

Through situating animal sampling within a laboratory in another sense, attentive to processes of boundary making in the field, the chapter has invited us to consider the ways interspecies perspectives are engaged and transformed in a context shaped by power differentials. In Guinea, the compartmentalisation of colonial services structured, after the independence, the management of zoonoses by veterinary doctors whose education centres on domestic animals. This imbalance has not been overthrown by One Health programmes – similarly vet-focused – in the space of the few years since their advent in West Africa. Social scientists have generally foregrounded the uneven geography of human-animal interdependencies and of the institutions created to manage them (Craddock & Hinchliffe 2015). Despite the claimed universality of threats to interspecies health – industrial farming, global traffic, microbial resistances, etc. – the ability to recognise and respond to risk events is unequally distributed, all the more as risks themselves are differentially spread. This chapter has built upon that critique and suggested that One Health produces pathogenic entanglements at the same time as it places the responsibility to care for disease sentinels on certain human beings. Sentinel sampling, in mandating contacts between humans and live bats, otherwise rare, generates new risks and vulnerabilities for both. This is partly so because One Health postulates the ideal of universal-minded, caring, and careful humans (Hinchliffe 2015), while the work is often carried out by vulnerable bodies located in places with cross-cutting gender and species hierarchies, and where labourers may have low access to healthcare, and little or no social protection.

Chapter 4: *Sensibiliser*

Francis was a young sociology graduate with little work experience before being hired by PREDICT to manage the project database in N’Zérékoré. *A bon vivant*, he was a frequent visitor to *maquis*, where he indulged in drinking palm wine, beer, and counterfeit whisky. I preferred to follow him to one of the city’s many ‘spots where bushmeat is sold’ (he knew all of these *gargotes*, or ‘greasy spoons’ in English), where clients are sheltered from the street by a mere tarpaulin. *Viande de brousse*, or bushmeat, is a term used by West African French speakers although they are more likely to precise what they want to eat (cane rat, duiker, etc.).¹ In these ‘spots’, women serve pieces of braised antelope or cane rat, accompanied by fufu or acheke, to a clientele of male workers and middle-class civil servants. In 2014, at the height of the Ebola outbreak, while still a student in Conakry, Francis was warned by his aunt against such *gargotes*: bushmeat (*viande de brousse*) was said to transmit the frightening disease. As the outbreak expanded and the country was plunged into a crisis, Francis travelled back to N’Zérékoré to be reunited with his family, where he still resumed consumption of cane rat and ‘joined their party’. Circumspect at first, he noticed no effect on his health after two meals and gave free rein to his famous appetite for such meats.

There were limits though. One evening in 2017, Francis visited his neighbour, a man who tapped palm wine for consumption, and noted his offering of ‘a potful of cooked bats’. The sight made him quiver. ‘Ah, so you consume that meat!’ he said, ‘I really want to eat it too. But my job does not allow me to do that; they say bats are disease reservoirs’. The man replied: ‘Come on brother, forget about this, they are all liars! They want us to believe that, but our ancestors have been eating bats for centuries. Only you know what you are doing in this project.’ Francis came back the next day and found his neighbour with a freshly killed fruit bat. Interested in finding out about nearby bat roosts for PREDICT activities, he asked: ‘Where did you kill this one?’ The man angrily snapped: ‘I notice that every time you find bats, you say things. What is wrong with you? Do you work for Ebola?’ Francis took his wine jar and

¹ *La brousse* (bush) is a marker of colonial geography, whereby what lies beyond roads also lies beyond modernity (Runcie 2020). Classic works in the anthropology of the Upper Guinea Coast (Jackson 1977; Jedrej 1976; M. Leach 1994) support an ethnographic distinction between the village and its domesticated cattle, poultry, goats, and sheep, and the land outside (fallow land and high forest) with undomesticated animals like rodents, antelopes, wild boars, snakes, etc. Hunting and trade of the latter are each subject to distinct regulations and inspection by the Environment rather than Animal Farming services. Some Forest Guinea entrepreneurs recently started farming cane rats and snails for the urban market, an economy which may unsettle the distinction between animal species, at least for regulation purposes.

cautiously sat down, mumbling that he had no problem. But his neighbour threw a bat in his jar and asked him to drink the wine. Francis quickly walked away, never to return. He felt that any mistake, with a group of drunken men, could have cost him a lot. He later commented to me that ‘it is no use talking with sceptics; you may well argue, but they are quite a job.’

This chapter deals with communication on zoonotic disease risk, during and after the 2013-6 Ebola outbreak. It is concerned with the way uncertainty about Ebola’s zoonotic origin is debated and acted upon, among and beyond Francis’s social circle. Outbreaks of emerging zoonotic diseases, such as avian influenza and COVID-19, acutely pose the problem of public action in health emergencies when causes and consequences are uncertain and unfolding in real-time (Hinchliffe 2001). Up to 2021, public health messages disseminated during and after outbreaks of Ebola consistently focused on consumption of ‘bushmeat’, in particular primates, thought to act as intermediate hosts – and bats, hypothesised to act as reservoirs. And yet the experience of Francis, his ‘sceptical’ neighbour and virtually that of all inhabitants of the Forest region stood in contradiction with this message: eating bushmeat had never appeared to sicken anyone. Time and again, PREDICT agents – like Ebola response agents before – were asked to back up their messages with evidence during meetings in sampling sites: ‘what did you find in bats? What did you see inside our food?’ The PREDICT project deployed a battery of investigations – virological and qualitative – each with their standard of proof, to give them an answer that would be actionable despite scientific lacunas about Ebola’s ‘disease reservoir’. This answer was communicated during a *sensibilisation* campaign that followed the end of PREDICT sampling activities in Guinea. This chapter addresses how different kinds of evidence were integrated by PREDICT workers in understanding, controlling, and communicating epidemic risk in relation to the concept of a disease reservoir. I examine how the notion that bats (in particular fruit bats rather than insect bats) are reservoirs of Ebola has hardened in West Africa, regardless of experts’ uncertainty and in tension with the ‘bat bridge’ across epidemiology and ecology examined in Chapter 1. Borrowing the idea of a ‘pandemic public’ from Ruth Prince (2019), I ask what pandemic public is brought into being by this One Health intervention, in the interplay between evidence, affect, politics, morals, and – crucially – human responsibilities and nonhuman agencies.

The idea that animals can act as ‘disease reservoirs’, which dates back to the nineteenth century, answers the question of where infectious diseases go between outbreaks, i.e., in which animal(s) they are maintained. The study of Ebola’s zoonotic origin through mass sampling is indebted to the reservoir concept: the first epidemiological investigations in the 1970s, when

broad collection efforts were initiated, readily took up the idea of an Ebola disease reservoir (Arata & Johnson 1978). While sampling has focused on bats since the 2000s, microbiological and epidemiological evidence linking the Ebola virus and certain species of fruit bats have been scarce, and their reservoir status remains an hypothesis only, diversely contested by different scientific disciplines. Ebola virus ribonucleic acid (RNA) and antibodies were isolated in several species of fruit and insect bats over the last couple of decades, leading virologists to entitle one early publication: ‘Fruit bats as reservoirs of Ebola virus’ (Leroy *et al.* 2005). Generally to ecologists, the presence of microbiological material in bats does not however clarify the animal’s capacity to replicate and shed the virus. A reservoir host is not only a species that can be infected and transmit a virus: it is an ‘ecological system’ in which a pathogen can be ‘maintained’ and whose dynamics are conducive to virus transmission to a target population (Ashford 2003; Haydon, Cleaveland, Taylor & Laurenson 2002). Ecologists only harbour, in their own words, ‘speculations’ and ‘suspicions’ on the identity of the species implicated in Ebola’s maintenance system, their possible variation across locations, the influence of seasonality on that system, and the mechanisms of transmission across species (Groseth, Feldmann & Strong 2007; Ohimain 2016). Virology and ecology set different standards on the burden of proof required to establish that a host, or multiple hosts, function as a pathogen reservoir. This difference was obfuscated in the way research findings were translated in PREDICT’s risk communication campaign.

Communication campaigns have become frequent after Ebola outbreaks, where they are carried out by NGOs and global health projects such as PREDICT (Center for International Forestry Research 2021; Niyonkuru 2021). Chapter 1 has suggested that the 2013-6 epidemic and following outbreaks enacted an epistemological shift away from the figure of the bushmeat hunter as the mythic operator of the spillover. Accordingly, communication efforts have recently abandoned the focus on bushmeat hunting and consumption and turned to warning against the assemblages of humans, nonhumans, and animals (especially bats) that appear to shape the transmission of Ebola. This chapter pays attention to how this framework was taken up by PREDICT agents, whose sampling practices, as we saw in Chapter 2, foreground the bat in different ways from scientific disciplines, and how this framework was contested by the people to whom responsibility for human-animal transmission is deflected. I reflect here on the biopolitical fallouts of the idea of Ebola’s origin in a dialogue with three related anthropological concepts: ‘risky zoographies’ (Porter 2012), the ‘hotspot’ (Brown & Kelly 2014) and ‘zoonotic semiotics’ (Sodikoff 2019). The three concepts presuppose that messy human-animal-

nonhuman entanglements, shaped across multiple spatial and temporal scales, drive the movement of pathogens (see also Nading 2013). They diverge in the distance that they take from the epistemological postulates of the zoonotic disease framework. The notion of a ‘hotspot’, reformed by Hannah Brown and Ann H. Kelly (2014), somewhat takes for granted that danger inheres in specific ‘material proximities’, however diverse, in places marked by scientists as ‘disease hotspots’. The idea of ‘risky zoographies’, used by Natalie Porter (2012) to designate maps of the flu risk drawn by farmers and health workers in Vietnam, also takes stock of interspecies entanglements but includes competing notions about where the power and responsibility to control a zoonosis lies. The concept of ‘zoonotic semiotics’, elaborated by Genese Sodikoff (2019) in the context of plague outbreaks in Madagascar, goes one step further in raising the possibility that the narratives emplotting outbreaks of zoonotic disease question the role played by animals in disease circulation. This chapter projects these notions onto another to make sense of how PREDICT’s pandemic public engaged with the politics and moralities of risk communication.

I first lay out the basis of defiance towards zoonotic disease risk *sensibilisation* in terms of an ‘antizoonotic semiotics’ which signifies, for Francis as for a broad Forest Guinean public, that Ebola did not originate in bats. For Guinean politicians and the Forest Guinea middle class however, the zoonotic narrative has gained traction because it recasts a biopolitical version of enshrined prejudice against Forest Guinean lifeways. It is against this background of epistemic doubt and ethnic stigmatisation that PREDICT’s *sensibilisation* activities operated a shift away from a focus on bushmeat hunters and onto a messy array of ‘contact behaviours’ between humans and bats. *Sensibilisation*, or ‘sensitisation’, designates communication activities in the French-speaking development world. The term strictly means ‘arousing interest’ and denotes, from its origin in biology and photography, the goal of ethically transforming people through exposing them to an expert discourse. PREDICT *sensibilisateurs* precisely urged people to take responsibility for a disorderly field of relationships. In emphasising the nodes where ideas of ‘disease reservoir’ were reconciled or conflicted in *sensibilisation*, I emphasise the epistemological labour that goes into fabricating a zoonotic disease discourse with effect on governmentality, in a place where no one saw Ebola as coming out of a bat.

A. 'Antizoonotic semiotics'

When PREDICT started their sampling campaign, many Guineans, if I asked them where Ebola comes from, responded with something like: 'I heard that the disease came from wild animals'. Some even uttered the technical name: Ebola was a zoonosis.² The term zoonosis is closely tied to the notion of disease reservoirs, for scientists have been studying animal populations as reservoirs since the nineteenth century. Different models of infection have been employed over time to describe zoonoses (Lynteris 2019b). An early cybernetic model of transmission presupposed that zoonotic diseases went through phases – 'enzootic', 'epizootic', and finally 'epidemic' – as the pathogen passed thresholds and circulated through populations of animals and humans. This vision has somewhat ceded to a 'spillover' view, whereby a single contact between a human being and an infected animal may augur a 'species jump' and a worldwide pandemic. The spillover model of emergence has become predominant in zoonotic conceptions of Ebola and HIV since the first decades of the twenty-first century (Quammen 2012). The two frameworks still coexist in the scientific literature on Ebola: since 1976, researchers have been searching for mutations in the disease's animal reservoir, and simultaneously hypothesised that the disease moves through cycles, possibly causing asymptomatic or mild infections in humans through 'viral chatter' (Arata & Johnson 1978; Monath 1999; Ohimain 2016). However, in the 2013-6 outbreak response, the spillover model overshadowed cybernetic understandings, as an effect of and looping back into the 'zoonotic semiotics' of Ebola for West Africans, or rather its 'antizoonotic semiotics' as I will suggest. It is this social life of zoonotic epistemologies as they become a biopolitical tool of government that I consider here.

A few months after the supposed start of the Ebola outbreak in Guinea, the first health communication messages were disseminated by response institutions in Guinea. In April 2014, a circular from the Guinean Ministry of Territorial Administration banned trade and consumption of bats, monkeys, rodents, antelopes, basically anything bushmeat.³ Zoonotic understandings of Ebola were transposed into the sphere of epidemic containment. The scientific consensus on the cause of Ebola disease outbreaks is that they are triggered by contact

² The two denominations are not synonymous strictly speaking, as zoonotic diseases also include diseases transmitted by domestic animals, such as dogs, cats, and cattle.

³ The 1990 Code for Wildlife Protection and Hunting Regulations included a three-page long list of partially and integrally protected species which did not mention bat species. To the Forest administrators which implemented it in N'Zérékoré in 2019, only chimp meat was forbidden, but they had not seen it at the market since 2013.

with wildlife.⁴ A handful of index cases in Central Africa at the turn of the twenty-first century, documented by epidemiologists, were infected through hunting and butchering primates, and fruit bats in one case (Gonzalez *et al.* 2005; Li & Chen 2014). In addition, primates appear to have sustained a spate of Ebola outbreaks over four years in Gabon and the Republic of the Congo, where distinct epidemics resulted from handled primate carcasses introducing different strains of the virus into the human population (Leroy *et al.* 2004). Such an epizootic could not be detected in Forest Guinea in 2014 as no massive die-off of animals could be observed. But it could not be excluded. The cybernetic model of zoonosis thus directed the initial response to the epidemic. In April 2014, the WHO Ebola Strategy (2014) listed ‘wild animal-to-human transmission’ as the first mode of transmission, before ‘human-to-human transmission’. As in previous outbreaks, hunters became the primary target of the epidemic response, before health workers even.

In N’Zérékoré, the municipal forest administration closed down the bushmeat market – a section of stalls where fresh catches of cane rats were sold next to smoked pieces of antelope, wild boar, and snake. The ban heavily affected the livelihoods of Guinean traders and hunters: close to £1 million worth of bushmeat was lost in sales, and almost 100,000 people became unemployed (FAO 2015b; 2015c). It became relatively quickly evident to the authorities and response organisations that every sick person was not infected because they had encountered a sick animal, but because they had often cared for another person sick with Ebola (Gire *et al.* 2014). For scientists, the animal origin became the myth that sustained the hypothesis of a single spillover, from a possibly isolated infectious animal into a single human being, namely a child – but animals clearly did not sustain epidemic transmission (Sáez *et al.* 2015). Communication efforts were re-orientated accordingly by mid-2014 and the bushmeat messages were withdrawn, but the bushmeat ban was never officially repealed.

⁴ At least until 2021, when flareups of Ebola in Guinea and the DRC led scientists to ask for greater attention to the role of survivors and asymptomatic patients in maintaining the disease (Fairhead & Leach 2021; Keita *et al.* 2021).

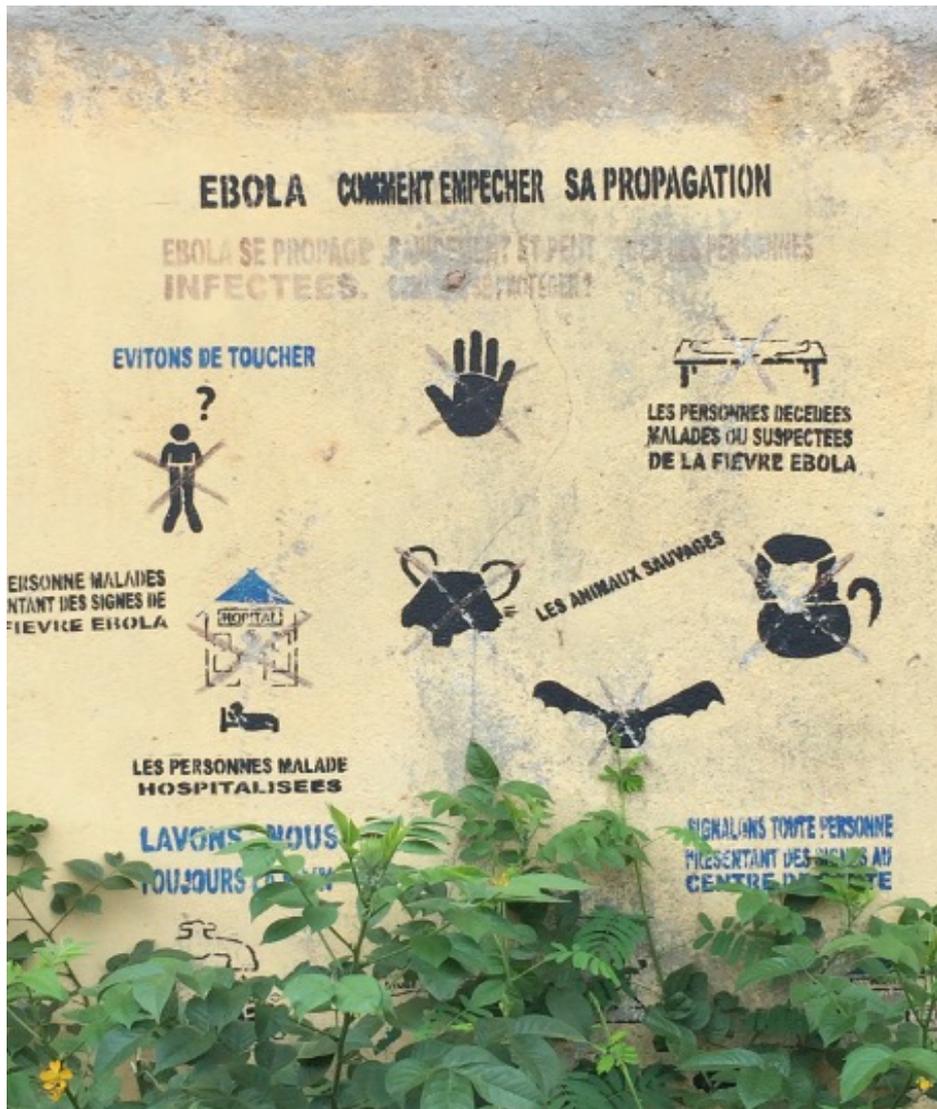


Figure 12. A faded painted mural in N'Zérékoré, showing les animaux sauvages ('wild animals') with whom contact should be avoided to prevent the spread of Ebola

Tumultuous communication did not help with the climate of defiance and disbelief in the epidemic response. The impact on livelihoods irritated many people, especially in Forest Guinea. Their frustrations were compounded by what veterinary anthropologists Jesse Bonwitt *et al.* (2018: 169) depicted, in 2014-5 Sierra Leone, as the discrepancy between the ban and 'previous experiences and concurrent empirical observations'. Two types of 'epistemic dissonances' were analysed by Bonwitt *et al.*, which resonate with a study of the 'socio-economic and cultural practices of Forest Guinea communities living at the interface with wildlife' conducted by vet student Mamadi Dramé for the CIRAD development organisation a few years later (2018). First, wild animals are generally seen as healthier than farmed animals, for they feed on 'natural' products: grass, fruits, other animals. Unlike rabid dogs, or anthrax-

infected cattle, wild animals are in Forest Guinea perceived as not liable to falling sick or transmitting diseases to humans, and are generally thought to die by accident, poisoning, or hunting. Second, and I also heard this claim frequently during PREDICT meetings, people have been hunting and eating wild animals for generations without that practice ever generating outbreaks of disease, as far as anyone knows. Those were elements of propositional knowledge, uncovered and brought forward by qualitative research. Grounded in local experience with animal and zoonotic diseases, they seemed to exclude to Forest Guineans, in 2014, the possibility that Ebola might circulate through the animal populations of an endemic reservoir. They could however be accommodated with the possibility of a spillover, a rare event that belies the predictability of recorded history.

In Forest Guinea, the idea of an Ebola bat reservoir was not only at odds with epistemologies of zoonoses. It also conflicted with people's experience of multispecies coexistence. In 2014, bats had become a relatively rare sight in the region, according to agents from the Environment administration, forest wardens, and their contacts among hunters.⁵ Bush animal populations generally seem to have declined in Guinea (Ba 2005; Dufour, Bikouyah, Gautier, Nganga & Ohlsen 2013), at least those of large mammals such as antelope species (Duonamou, Konate, Xu & Humle 2021). As far as bats were concerned, a Macenta forest warden testified that the inhabitants of the subprefecture where he was posted had witnessed the rarefaction of fruit bat populations, once plentiful, since slash-and-burn agriculture had been intensified. Those large bats, which were the only ones hunted and traded for consumption as 'bushmeat', were hardly available as fresh game in markets. They could now essentially be found around February-March, when they were imported from the northern Guinean region of Fouta Djallon, already smoked. By contrast, smaller insect bats – which are not commonly seen as 'bushmeat' since adults do not hunt them – had seemed to flock to village houses, where sheet metal roofs, increasingly common in the Guinean countryside, tend to favour their roosting. Research in chiropterology does not provide conclusive evidence of such variations in colony sizes and populations movements.⁶ However, threats to bat conservation were flagged

⁵ I was never able to meet any of the few Forest Guinean hunters who visit caves to shoot fruit bats, and who may have provided different insights.

⁶ Scientific interest in bats goes back to the eighteenth century, when bats started being collected and drawn by naturalists, while experiments were being conducted into their capacity to orientate themselves in the dark. Their migrations became an object of study in the twentieth century, but the discipline of chiropterology expanded tremendously in the last years of the century. On top of studies in acoustic ecology and bat species diversity, chiropterologists have been delving into research on their exceptional immune system and their pathogens (Keck & Morvan 2021).

by zoologists in Forest Guinea, where the animals would be disturbed by habitat destruction due to mining, agriculture, and potential military conflicts (Decher *et al.* 2015; Monadjem, Richards & Denys 2016). To Forest Guineans in any case, a perceived depletion in fruit bat populations, and even more visibly, their decreasing availability at markets, were at odds with the scientific view of bats as an endemic Ebola reservoir. If bats were disappearing from their midst, how could they have infected people?

These doubts plagued people even more because rodents overshadow bats in their local reputation as both a nuisance and disease carriers (Kelly & Sáez 2018). Bats are discrete animals whose presence is hardly noticeable unless one ventures into caves or certain plantations to hunt fruit bats, or one's home houses a colony of insect bats in its roof. While bats may share a habitat with humans in certain places of the transborder area investigated by PREDICT, this proximity is far from common experience. Unlike rats and mice, insect bats in particular do not populate the roofs of every house in the Guinean countryside and urban areas. Neither do they prey on the food stored or spilled by residents. If some people employ techniques to rid their home of bats, such as by smoking them out, these are not generally deployed, unlike rat poisons and mouse traps.⁷ Bats are not considered commensals, unlike rodents, which Forest Guineans, like Sierra Leoneans (*ibid.*, 31), say 'live[d] with [them]'. Not being naturalised enemies, bats offer little grip for zoonotic disease epistemologies in Forest Guinea; their after all limited 'negative charisma' curtails their potential as epidemic villain.

Anthropologists Brown and Kelly have argued against limiting ethnography to what local people know and urge us to take account of 'broader relational contexts of transmission' (2014: 283). I do propose to foreground local knowledge of Ebola's animal reservoir but distance myself from the propositional focus on cognition entailed by 'epistemic dissonances'. I look instead at various accommodations and frictions between disease epistemologies and the experience of sharing a world with other animal species. From 2017, I observed indeed that epistemic notions and people's experiences with animals kept being connected and mobilised as a repertoire of arguments, contradictory in parts, which, one could say, formed an 'antizoonotic semiotics'. Bats' elusiveness in Forest Guinea, and the absence of visible clues indexing the presence of the disease (such as dead rats in the case of the zoonotic plague studied

⁷ From a legal perspective, article 43 of Guinea's Wildlife Code proclaims that 'no animal is, generally and permanently, declared pest'. Certain animals, 'protected or not', may be chased or destroyed upon enquiry by the Forestry service if evidence is found of their constituting a danger or causing damage to human activities.

by Sodikoff, 2019) provided for local outbreak narratives which, though inconclusive, resisted the idea of an animal origin.

B. Reservoir in the people

Despite these ‘antizoonotic semiotics’, the consumption of bat and primate meat came to a noticeable halt in Forest Guinea (Duonamou *et al.* 2020). Conversely, subsistence hunting was barely affected, and only a marginal decrease in ‘bushmeat consumption’ was reported, with many vendors pursuing their activities underground even more easily as they only manned ‘spots’ (FAO 2015b; Ordaz-Németh *et al.* 2017). But I heard that the stalls of tradeswomen selling bat meat were attacked by young men in Macenta during the outbreak.⁸ In 2017, most people had returned to the consumption of bushmeat, which was easy to source again, but many claimed not to eat bats, at least not anymore. Vet student Dramé (2018: 16) reports that some of his interviewees said they stopped eating bats because of the risk of disease, but even more people cited ‘disgust’ as a reason for not consuming bats. If the suggestion that Ebola was a zoonosis failed to gain traction, outbreak communication and the bushmeat ban reinvigorated attitudes towards certain sorts of meat as marking dangerous transgressions. The ‘bushmeat’ category was broken down in favour of distinctions by species and preparation, which scientific institutions investigated by qualitative methods. We now turn to what we could see as the ‘epistemological bricolages’ (Lévi-Strauss 1966) by which some middle-class Guineans, in and outside Forest Guinea, blamed the ‘lack of culture’ of those who did consume bats. These accusations highlight the biopolitical leverage of understandings of Ebola’s reservoir: they work as instruments of a population’s government through characteristics such as ‘culture’ or ‘ethnicity’. Culturalist blame translated the bat-focused construct of Ebola as a problem in the relations between certain humans and their surroundings.

Groups belonging to the ethnic mosaic of Forest Guineans living in southeastern Guinea – non-Islamised minorities, by contrast with the majority – are stereotypically known for eating anything, even foods that others consider repulsive, such as monkey (before bat even). Since colonial times, the people who inhabit areas rich in what is now seen as biodiversity, and consume some of the abundant undomesticated species, have been deemed ‘savage’ (McGovern 2017). This prejudice became more salient during the postcolonial socialist period,

⁸ There were also attempts at culling bat populations far from Forest Guinea, in northeastern and western Guinea, where colonies of fruit bats roost in urban spaces (Frerot 2021b).

when the food habits of Forest Guinean people shored up the Maninka elite's claim to rule over the rest of Guineans.⁹ More recently still, responsibility for the spread of primate meat consumption was attributed to Forest Guineans in the western Kakandé region (Leblan 2017: 154). Disgust was newly connected to disease risk during the Ebola outbreak. With the epidemic, the colonial view that the culture of the colonised expose them to disease gained new life (Poleykett 2018), a form of reduction that remains typical of contemporary epidemiological thinking (Wald 2007). Some Forest Guinea leaders consequently denounced the bushmeat ban in political terms: it stigmatised Forest people for their eating practices. This view had a representative in the person of Jean-Marie Doré, leader of the opposition's *Parti pour le Progrès de la Guinée*, which had its electoral base in Forest Guinea. Doré accused the government in interviews and videos of using the bushmeat ban to blame Forest Guineans for the epidemic (Mamlama 2014). But the middle-class Forest Guineans I knew held more complex views than Doré: bushmeat was not inherently 'disgusting', but rather its improper handling, imperfect cooking, and the consumption of certain meats such as bats or rats. The meat of domesticated animals could also be 'disgusting' if they had not been slaughtered but found dead, such as the cattle killed by anthrax and sometimes eaten by their owners. The notion of 'bushmeat' was unsettled by these hygienist views, which introduced within Forest Guinean people a refined hierarchy based on cooking practices and food preferences. Imputations of pathogenicity to 'bushmeat consumption' strengthened a longstanding politics of disgust at the national level; but in Forest Guinea, they were further negotiated to enforce social distinctions.

Among certain Forest Guineans, the bushmeat ban cemented ethnic pride: 'We do eat up everything!', I was told one afternoon when visiting N'Zérékoré Regional Department of the Environment. My self-confidence had frayed as the interim director, a middle-aged man with a grave composure, gave me a long defiant look when I introduced my interest. It was only when, in response to his questioning, I confided that I had myself put much effort into finding, buying, and trying to eat a smoked bat from a woman who sold them discreetly from her house, that tongues loosened. 'Ebola did that! [People became wary of bats] Otherwise it's very *doux*!' ('sweet' in English). The three Forest Guinean men readily overplayed the stereotype of their liking for all undomesticated animals, whose pathogenic dimension they refuted. According to them, clarifying that they were 'wearing the peasant's clothes' as they spoke – and not their

⁹ McGovern (2017: 49) writes that during the succession struggle after President Sékou Touré's death in 1984, the constitutionally mandated interim president, who came from Forest Guinea, was told that 'Those who eat monkey will never rule over us!'

fonctionnaires' shirts – their food customs explained the legendary strength and endurance of Forest Guinean people. It was an idea spread by the colonisers, and common to twentieth-century anthropometry-versed French sociologists, that Forest Guineans are 'vigorous and stocky, [with] short and muscular limbs' and 'work in harsh conditions' (Rivière 1971: 31-2, my translation). 'Because bats live long', the *fonctionnaires* in peasant clothes inferred, their consumption endowed Forest Guinean people with force, longevity, and intelligence. They were also said to act as 'medicines' (a multivalent category and power attribute in Kpelle societies, Bellman 2012) and to 'harden' the bodies of children. The men held that certain undomesticated animals – fruit bats, cane rats, etc. – have a higher nutritional value than farmed animals, for they have a 'healthier' diet of animals, insects, and plants. They were also 'healthier' than peridomestic animals such as insect bats and rats, thought to feed on human refuse and therefore seen as more likely to carry diseases. Certain sorts of bushmeat not only tasted delicious, their consumption was also seen as a health practice integral to the corporeal identity of Forest people, shaped since colonial times. 'The others from Haute Guinée' wanted them to stop eating what conferred so much force on them. Forest Guinean civil servants saw the government crackdown on bushmeat as the latest attempt at reforming their lifeways in a long history of denigration, with the ultimate aim of affecting their health.



Figure 13. Smoked bats for sale at the N'Zérékoré market in February 2019, discreetly photographed by préleveur Nathalie

However, in Guinea, the consumption of hunted animals was a transethnic and transreligious phenomenon: Christians and Muslims from the four regions consume them in varying proportions depending on their residence and their purchasing power (FAO 2015b: 5). Hence the ban not only provoked discontent and disbelief among Forest Guineans: it puzzled many in the political sphere. Guinean decision-makers, although far out in the capital, themselves articulated an ‘antizoonotic semiotics’. They had their doubts, as many press statements qualifying the zoonotic origin of Ebola testify. The Minister of Health and Public Hygiene Rémy Lamah, himself a Kpelle man, and his Director of Health Prevention declared that bats alone, the ‘only virus reservoir’, were to be avoided; monkeys were ‘theoretical’ carriers that ‘no scientific study proved to present a risk’ (Bah 2014). They also admitted that the Ebola virus was killed by cooking temperature or sunlight, with the result that smoked meat could be safely eaten (BBC News Afrique 2014). The Ministry was compelled to impose the prohibition half-heartedly but tried to accommodate disbelief by refining distinctions between sorts of bushmeat and cooking techniques. This led one Guinean blogger to write (Diallo 2014,

my translation): ‘People in power say nothing or enact laws that are half-heartedly followed. How can they convince [people] about a situation’s seriousness when they are not themselves convinced?’

In fact, many middle-class Forest Guineans saw the Ebola bushmeat ban as an alibi for the covert agenda of protecting endangered species. Journalists and disease ecologists had built on a pre-existing narrative of biodiversity threat and forest loss to explain the emergence of Ebola in Forest Guinea. Despite contested evidence of forest fragmentation in this region (Fairhead & Leach 1996), and a scientific debate on the relationship between deforestation, biodiversity loss, and zoonoses (Guégan, Ayoub, Cappelle & De Thoisy 2020; Tassin & Roda 2021), this environmental framing dominated media interpretations of the outbreak when Forest Guinean culture was not incriminated (Ginsburg 2014; McDonnell & West 2014). Like Jesse Bonwitt *et al.* (2018: 168), I heard some Guineans, especially in the Environment administration, wonder whether the ban (and perhaps the virus itself) had not been introduced to discourage poaching. In Guinea, hunting and trading charismatic species such as primates, elephants, hippos, and pangolins were banned in 1990 after extensive lobbying by environmental institutions. But the ban had been enforced within limits until the outbreak. The Code for Wildlife Protection and Hunting Regulations was revised in 2018 and the list of ‘integrally and partially protected species’ now covered those established by the international conventions to which Guinea was a party. These featured numerous bat species considered vulnerable or threatened, such as the fruit bat species known as *Eidolon helvum*, principally implicated as a putative reservoir host for Ebola. In 2015, anthropologists Fairhead and Millimouno (2017) had found the environmental destruction trope ‘so obviously flawed as to be laughable’ to people in Méliandou. But with time, it displaced other explanatory frameworks, although in subversive ways such as in the theory of a conservation lobby conspiracy.

More frequently, Forest Guinea state employees accepted the environmental hypothesis of Ebola more literally because it could be connected to existing framings of game depletion. The *fonctionnaires* of N’Zérékoré Departments of Environment and Forestry, whom I met on several occasions in their office and during One Health meetings, were prone to connect bats’ evanescence to forest loss. They explained wildlife decline through human deforestation, a simplified story amplified by environmental education and conservation programmes in Guinea since the 1990s (Fairhead & Leach 2003). In Macenta, the forest warden invited to testify to me by the Prefectural Director of Animal Farming had come to the conclusion that anthropogenic disturbances forced bush animals to retreat deeper into the forest or to leave it

altogether. Even if bats were not killed, he held that firearms overuse could scare away bats. James Fairhead and Melissa Leach showed in their research that local land-use practices (fire-setting, timber felling, fuelwood gathering, etc.) have long been blamed for environmental mismanagement – whether because of Forest Guinean ignorance, the delinquency of their social institutions, or population pressure (1996). The ‘antizoonotic semiotics’ of Ebola were reconciled by state employees with the environmental blame placed upon Forest Guineans and their culture. Accordingly, I heard another story for why bush animals were becoming rarer, which tapped directly into the ethnic politics of disgust. Bushmeat hunting and consumption were also blamed for having depleted populations of wild animals. ‘*On a tout bouffé!*’ (‘We ate them all up!’), the Department’s interim regional director said, his words accompanied by the roaring laughter of his colleagues. It was not only land-use practices, but also the Forest Guinean taste for bushmeat, all sorts of bushmeat, that accounted for the disappearance of game in the region.

These *fonctionnaires* travelled all over Guinea as they had worked in the Environment administration of different regions. Some of them knew bats to be plentiful in Haute Guinée, the savannah region north of N’Zérékoré inhabited by Maninka people. An extended value chain of wholesalers sourced bushmeat in Haute and Moyenne Guinée, from where it was transported through Forest Guinea, and across to Sierra Leone and Liberia (see FAO 2015b). The savannah-forest, or Maninka-Forest Guinean, opposition defied logic and was debated during PREDICT training meetings, which gathered employees from the Prefectural and Regional Departments under the ‘One Health’ umbrella. How could Forest wildlife be accused when most bushmeat consumed in Forest Guinea was imported from Haute Guinée? The two epistemic frameworks, the environmental and the ethnic, collided as Guinean professionals speculated about the alleged origin of the outbreak in the Forest region, where bush animals had practically disappeared. They offered many hypotheses to try to accommodate that incongruity. Were northern bush animals healthier because dry heat and savannah winds killed viruses? Did the infected animal come in reality from a northern Maninka village, which had maliciously exported it to Forest Guinea?

The open questions and the frictions within and across hypotheses did not stand the scrutiny of Dr Bilis. The vet doctor, a personality in N’Zérékoré where he had served as the Regional Director of Animal Farming for years, was convinced that bushmeat hunting, not forest degradation, had driven down bat numbers. During a One Health meeting, he decided to test whether participants had come to the same conclusion as him, which collated bits of information

on zoogeography and ethnology (the latter being a science which many educated Guineans were fond of). ‘Do you find vultures in Yomou?’ he asked. Yomou was a very isolated subprefecture southeast of N’Zérékoré, close to the border with Liberia, with a relatively homogenous Forest Guinean ethnic profile: barely any Muslim Maninka or Fula family lived there. Kpelle agent Paul diligently answered that there were no vultures in Yomou, as there was no animal carcass to scavenge on. Right, the participants nodded, animal carcasses were collected and eaten by local populations. Dr Bilis added that further north around Beyla, a Forest Guinea prefecture peopled by Konianké, the only group of Forest Guineans who practised Islam, vultures could be seen. The scavengers were able to prey on animal carcasses, the participants reasoned, because people did not eat the animals that they found dead. It was not acknowledged that, strictly speaking, consumption of animals found dead has scarcely been evidenced to occasion an Ebola outbreak (the handling of carcasses was only reported as a cause in a 1996 outbreak in Gabon by Georges *et al.* 1999). Bat populations were said to prosper in Haute Guinée, because ‘no one disturb[ed] them there’. The Muslim faith prohibits consumption of carrion and of a variety of animals (with fangs, birds with talons, mice, apes, etc). Many observing Guinean Muslims refrained from eating bushmeat in general, which is why, people rationalised, fruit bats could even be observed in the city centre of Haute Guinée’s capital, Kankan, where they famously hang in bunches from a mango tree in the hospital courtyard. To Dr Bilis, and by extension participants in PREDICT meetings, hearsay about carrion consumption, a posteriori validated by visual memories, became evidence of a pathogenic ethnic culture.

The bat explanation for Ebola’s first-time emergence in Guinea was both validated and questioned by Forest Guinea *fonctionnaires* and the N’Zérékoré middle class. Veterinarians, forest wardens, and animal farming experts reflected on the conundrum in light of a local ecology of evidence: their awareness of game disappearance meshed with environmental ideologies and postcolonial inequalities, forming diverse ‘epistemological bricolages’. In the process, the puzzling ‘antizoonotic semiotics’ of Ebola were reconciled with longstanding theories of forest degradation and a breaking down of the bushmeat category. Whether animals had relocated because of anthropogenic activities, or whether they had been ‘eaten up’, Forest Guinean people were, by extension, blamed for the emergence of Ebola. During *sensibilisation* meetings, this culturalist causality in disease transmission would gain further biopolitical operability when reduced to a problem of contact.

C. 'How to live safely with bats'

20,000 bats were to be sampled by the PREDICT Ebola Host Project in West Africa and tested for filoviruses. However, the consortium realised, as has become mainstream thought in ecology, that the risk of Ebola infecting human populations was anchored in dynamics which quite probably implicated several animal species, humans, things, and their relationships. As the project planned to inform risk policy, it turned to gathering evidence about the stuff of human-animal relations. During a first phase of the project, from 2009 to 2014, 'risk pathways' for zoonotic disease had been identified through modelling (Allen *et al.* 2017; Loh *et al.* 2015): processes were designated that increased the likelihood of a disease emerging in 'hotspots', such as land conversion and the animal production system. The picture of these 'viral hotspots' was fleshed out by a phase of 'qualitative research', from 2014 to 2019, when PREDICT employees were tasked with administering questionnaires and conducting group interviews. Further evidence about Ebola's disease reservoir was produced, translated, and transformed into operable tenets for PREDICT communications on 'how to live safely with bats'.

One of PREDICT's research protocols mandated qualitative research on 'contact with wild and domesticated animals and the factors motivating those behaviours'. Opportunities for contact were envisaged beyond the cut hunter story, seen in Chapter 1: the protocol encompassed 'occupational exposure in markets or extractive industry zones, ... preparation, consumption and other exposures to wild and domestic animal meat'. Such an expansion of the category of risk contact was enabled, according to a review of the scientific literature, by the vagueness of the notion of 'contact' (Narat, Alcayna-Stevens, Rupp & Giles-Vernick 2017). Social scientists found it 'deployed in multiple and inconsistent ways', spanning direct and indirect contact, and even social characteristics as proxies (*ibid.*, 841). This indeterminateness certainly works to redirect prevention efforts away from hunters. But it does not acknowledge the complex environmental configurations, determined by social institutions of production and reproduction as well as the Guinean history of postcolonial extraction, which Brown and Kelly (2014: 288) argue are implicated in 'creating the conditions for risky commensality' and pathogen circulation. A scalar sleight of hand is performed by 'contact': rather than deflecting responsibilities for complex ecological ills onto 'culture' like the bushmeat ban, the term extends risk to encompass proximities rather than people themselves, and simultaneously reduces risk to 'behaviour'. PREDICT's redefinition of what counts as 'human-animal contact' had implications for the research results.

Over 18,000 people participated in the qualitative research worldwide. Their answers seem to have fed, so far, into one scientific publication only (Euren *et al.* 2020). Dealing with ‘human interactions with bat populations in Bombali’ in Sierra Leone, the study sums up findings about two different sites ‘where human populations have had close contact with microchiropteran bats’ (ibid., 292), in a region where a new species of Ebola virus was found. One site is ‘a semi-urban landscape’ where the young male members of ‘a local “secret society” ’ have access to a grove where they hunt fruit bats, then sold ‘as a source of supplemental income’ (ibid., 295-8). The men are said to have not only direct contact with bats through ‘bites and scratches’ and with ‘their blood and viscera through slaughtering and butchering’, but also indirect contact through ‘inhalation and exposure to bat faeces and urine’, the latter a newly considered transmission pathway. Another, more unusual site is found in ‘households with ceiling bat colonies’ (ibid., 295). Their bat ‘infestation’ is attributed to defaults in the architecture of dwellings built by an international NGO for survivors of the Sierra Leone civil war. The permeable roofline of these dwellings allegedly provide roosts to colonies in public meeting places, households, and the pits of outdoor toilets. The notion of contact is very diffuse in this latter case: it ranges from being hit by a bat while going to the toilet, to faeces dropping on people in their sleep, or falling in drinking water. Even the persistent smell of urine seems to count as ‘contact’, evoking both miasmatic ideas and the threat of aerosolised contamination. The buildings may be said to fit Brown and Kelly’s (2014) definition of ‘hotspots’ of inextricable human-animal-nonhuman proximities. But the article fails to mention that many of the household owners were mutilated during the civil war, as I witnessed while happening to attend a PREDICT training session in the same location.

The article pictures a ‘risky zoography’ more complex than in earlier publications. Bushmeat hunters still appear at risk by virtue of their gender, age, and belonging to a secret society. By contrast, the inhabitants of infested houses are functionally described as ‘people living with household bat infestations’. The article furthermore acknowledges the role of assemblages of plywood ceilings, toilet pits, and the sticks used to kill bats in creating opportunities for infection. But despite reporting ‘having been told that all exclusion attempts to date had been futile’ (ibid., 295), the authors point out that people, through carelessness, lack of hygiene, and, possibly, exotic institutions, fail to erect strict boundaries between humans and animals. Euren *et al.* (ibid.) clarify for example that ‘contaminated [sic] water was reportedly used for bathing by at least one respondent and ... may be used by the community for other purposes as well’. Crucially, the ‘contact’ framing allows the authors to judge that ‘behaviours’

can be changed, and their interviewees seemed open to the arguments for disease prevention which the investigators did not fail to share during the study.

The article concludes by introducing PREDICT's community engagement strategy, which was devised in 2017 for populations targeted by the Ebola Host Project. A visual resource, entitled 'How to live safely with bats', was developed from Euren *et al.*'s findings to communicate on the 'benefits' and 'dangers' of sharing a landscape with bats: it thus focused on bat diseases rather than Ebola. Drafted in the United States, the booklet, nicknamed 'bat book', was tested and refined in Sierra Leone and Tanzania. In 2017, I attended a workshop in Makeni, Sierra Leone, where three 'communication experts' – one of them had lived in the capital of Freetown years before – had been flown in to discuss the draft. Two Sierra Leonean graduates in sociology were present. They had carried out qualitative data collection in Sierra Leone for PREDICT and would figure as authors in Euren *et al.*'s publication. It was to them that the US experts turned after presenting their draft, too long in their opinion. They asked the data collectors: what were, in their experience, the priority behaviours to be addressed to reduce the transmission risk? Promptly, the employees listed a series of practices: bat hunting, children hunting for bats, picking up dead bats, touching fruits eaten by bats, feeding them to domestic animals, etc. Their faces expressed revulsion as they talked, like Dr Bilis, about the consumption of animals found dead. A spokesperson from USAID chimed in to question the feasibility of cautioning against bat hunting given hunters' economic vulnerability: could it not antagonise the communities? This conversation did not address probabilistic questions of whether consuming a mango bitten by a bat represented a risk as high as that of consuming bats found dead.¹⁰ It also left unaddressed the historical and social connections that account for 'material proximities' between humans and bats (Brown & Kelly 2014) – such as, for example, the dependence of civil war victims on foreign aid for their housing. Instead, a consensual selection was based on the Sierra Leonean agents' disgust and the US experts' concern for acceptability. The process of producing behavioural facts itself was harnessed to produce norms, a translation facilitated by the vagueness of the notion of contact.

The flipchart that resulted from these discussions and would be used by PREDICT around the world contains six sections associating drawings with texts on the reverse side. The first section of the bat book, in line with the emphasis on One Health, gives an overview of why

¹⁰ According to an FAO report, 'the likelihood (taking into account the rarity of exposure) of Ebola disease transmission from one fruit bat to one human can be considered as very low' (2015a: 2).

‘bats are essential to our ecosystem’ by virtue of their contribution to pollination, seed dispersal, and insect population control. The second section opens with the statement: ‘bats are incriminated as reservoirs for viruses such as rabies and others’ and cautions that ‘killing them or disturbing their natural habitat can worsen disease propagation’. Animal culling, a disease management measure whereby animals are killed to limit the spread of an infection, is not only prohibited because bats are environmental benefactors, but because culling may have the counterproductive effect of enabling viral spread by destroying bat habitat. Hence, far from being ‘rogue’ animals to be eliminated, bats are turned into the unfortunate victims of ‘rogue’ hunters and tree fellers, as discussed by James Fairhead (2018). The consequences of disrupting their habitat are illustrated by a diagram, which displays a hunter figure in the novel form of a boy.¹¹ The child, who kills a bat with a slingshot, faces only one possible future. He may sell his prey to a saleswoman or bring it to his mother – but they both butcher the bat, spill its blood and, for some reason, send the boy rather than themselves to bed with a fever (and on to a very uncertain fate if he is sick with Ebola disease). This diagram is structured by arrows and prohibition signs, telling a mechanical and teleological tale of infection (Lynteris 2019b). But the series of proscriptions that follow the diagram refer to a motley list of domestic, farming, and culinary practices staged as various occasions of human-bat contact (not all evidenced as ‘risk behaviours’ by the Bombali article): touching dead or live bats for playing, leaving food or water uncovered, eating fruits eaten by bats, leaving cattle to graze under bat roosting trees, etc. As in the ‘infested house’ setting of Euren *et al.* (2020), ‘behaviours’ and moments of contact – rather than a person’s demographic characteristics – seem to expose people to the risk of contracting a disease from bats.

¹¹ The role of women and children in hunting activities in Sierra Leone and Guinea was highlighted by Bonwitt *et al.* (2017) and Douno, Asampong, Magassouba, Fichet-Calvet & Almudena (2021).

Section 2. Ways to Live Safely with Bats: The Basics

While bats have been connected to rabies and other diseases, killing or disturbing the natural homes of bats can actually make rabies spread to more people. Because of this, it's best not to kill, hunt, sell, cook, or eat bats.



Figure 14. Disease pathway diagram in the 'bat book' (USAID Predict, 2018)

Granted, the following flipchart sections acknowledge, as an echo of Euren *et al.*'s interviewees, that 'contact with live bats may be inevitable'. But lengthy advice is provided on the 'management' of this contact. Details are given on how to dispose of dead bats by wearing a face mask, gloves, and glasses, and burning it or burying it in a '1 to 2-meter-deep hole' before disinfecting the shovel. After contact with bat fluids, such as by strolling under a tree while a bat happens to urinate, it is advised to rinse the body zone under 'running water' for five full minutes. Techniques are suggested to rid infested homes of bats – such as by stuffing roofline crevices with fibreglass or newspapers (even though, according to interviewees again, 'rolled-up pieces of fabric and dense assemblages of brambles' fail to serve the purpose: *ibid.*, 295). The bat book gives precise recommendations involving a flurry of technologies and anticipates their scarcity by suggesting low-cost substitutes: surgical masks can be replaced by scarves, gloves by plastic bags, plywood by empty rice bags, and even mental counting can stand in for a watch. These substitute technologies of containment embed a definition of the audience's environment as characterised by infrastructural lack (Redfield 2012). They aim to make the

recommendations realistic and affordable: ‘behavioural’ contact could seemingly be hampered by material separations, and works of human (or African?) ingenuity.

Despite a lengthy text, the bat book poorly explains the hazard itself. Out of twenty-four pages, only the diagram and the accompanying text summarily justify taking precautions with bats. The Ebola disease, though present in the *sensibilisation* performance as will be seen, is not mentioned – only the rabies virus is.¹² ‘Living safely next to bats’ – rather than with them – is a question of ‘how’ rather than ‘why’, in keeping with the flipchart’s title. The notion of contact is left undefined, which levels out the variable degree of risk entailed by categorisations as incomparable as one’s professional identity as a hunter, one’s livestock feed, and one’s bad luck while strolling under a mango tree. This situation represents, in the terms of Christos Lynteris’s analysis of zoonotic disease diagrams (2019b: 42-76), an unstable compromise between cybernetics and spillover. Diffuse responsibilities for zoonotic disease are tentatively spatialised and socialised in order to be addressed. This hybridity is not without consequences for the thus enlarged pandemic public sketched by the bat book.

D. Risky zoographies

In 2018, PREDICT organised a *sensibilisation* campaign in the sites where bats had been sampled. Village discussions and classroom interventions took place. Prevention messages were broadcast in four languages spoken in the Forest (Kpelle, Kissi, Loma, and Maninka). The team was trimmed and Dr Bilis, five remaining agents, and I now solely carried out *sensibilisation* activities with the bat book. We were driven to central squares and community meeting halls to start just before 7 a.m., so people could be rapidly released and attend to their morning occupations (or receive the next four-wheel-driven ‘missionaries’ lined up, from Unicef or another development project). It was common for a crowd of twenty to forty people – women with babies, elderly people, men in their labouring clothes, etc. – to gather and offer us chairs and benches. After a brief introduction to PREDICT’s work, an agent who spoke the language dominant in the locality *sensitised* the audience for about 15 minutes, while the other agents sank into their smartphones. Afterwards, time was left for questions from the audience. They were translated into French for all the agents to contribute to a discussion about what Dr Bilis called the ‘reservoir notion’, and methods to pre-empt disease transmission from bats.

¹² Nonetheless, 99% of rabies cases in humans are caused by contact with a dog and scarcely any case of bat-human transmission has been reported in Africa (Warrell 2010).

‘Risky zoographies’ were debated in these *sensibilisation* sessions through competing descriptions of animals, their habitats, and of human power to intervene in their entanglements. Moving on to aspects of this exercise now, I suggest that it materialised risk, in relation not only to zoonoses but also in the social context – pre-existing and engineered – of interactions between PREDICT *sensibilisateurs* and their audience.

Adult men and women were usually eager to challenge the speaker with examples, questions, and role plays. They raised their hand diligently at the end of the PREDICT agent’s speech, embracing the school-like codes of *sensibilisation* to which development interventions accustomed them. ‘What if a child picks up mangoes bitten by infected bats? They don’t know anything!’ ‘What if a chick drinks from a puddle in which a bat urinated? Can it be eaten?’ ‘What if a child walks into that puddle?’ Many questions expressed disbelief, although their staging as short humorous stories also triggered laughter in the audience. Some social science literature contends that discourses about zoonotic diseases function as ‘organizing metaphors’ – something like allegories – for understanding sociality beyond the human (Brown & Nading 2019). Anthropologist Michael Jackson, in his work on Kuranko folktales in neighbouring Sierra Leone, also handled tales with animals as normative scripts for living an ethical life among the Mende. He showed that, in these narratives, animals epitomise anti-social behaviour (1977; 1982). Certain people are even said to be able to transform themselves into animals (usually night animals, such as owls, bats, etc.) to inflict harm on others. These stories convey the importance of keeping human and animal worlds cosmologically and socially separate.

The *sensibilisation* meetings alluded nevertheless to the impossibility of material separations. The audience’s interventions redistributed agency, in the encounters that lead to disease transmission, to nonhumans such as chicks, elements such as water, and irresponsible humans such as children. They seemed to deflect imputation of human accountability in the face of zoonotic disease threats, entangled as people are in practices of care and relations of dependence across species boundaries. The agents’ replies were relatively unsympathetic. ‘Mangoes should not be left to ripen on the tree but collected before they fall’. ‘Children should wear shoes as soon as possible’. ‘Chickens should not be left to wander but gathered in a pen’. Their answers turned the unruliness of elements, animals, and children into objects of human responsibility. They implied that human sociality is a discipline of drawing boundaries with nonhuman elements. The agents may have fallen back on reflexes hardened in the space of public health, contoured in colonial and postcolonial Africa by hygienist norms (Burke 1996; Le Cour Grandmaison 2014). Calls to discipline behaviours and observe sanitary rules have

historically policed the border between civilisation and savagery and been taken up by a development industry of *sensibilisation* and *conscientisation* in sub-Saharan Africa. However zoonotic risk *sensibilisation* convoked a broader assembly of agents, and a heterogenous array of relations of subjection and dependence (see also Porter 2012; 2019). This larger ‘pandemic public’ was not a passive product of One Health communication, but actively shaped and contested by participants in *sensibilisation* meetings.

PREDICT agents, to the extent that they wanted to *sensibiliser* – to inform and transform their audience – meant to do so through conveying an epistemic notion to them: that of ‘disease reservoir’. There was no better occasion than when people submitted a certain sort of question to *sensibilisateurs*. ‘Can the fruit of a tree that grew out of a seed dispersed by a bat be infectious?’ ‘Can the smoke of burnt bat transmit diseases?’ ‘Can burying bats next to a well infect the water?’ ‘Is it dangerous to bury dead bats in toilet pits?’ Dr Bilis named such interventions ‘if-questions’: they were concerned, to him, with situations the probability of which was minuscule in reality. He felt his duty was to first congratulate the speaker on asking a ‘scientific question’, which suggested an *intellectuel* – someone willing to query an issue in a detached way and to think through probabilities. These interventions may have seriously questioned the built environment, agricultural strategies, food habits, and climatic patterns that create the conditions for diseases to arise and spread. But only their epistemic content was addressed by the *sensibilisateurs*. Dr Bilis invoked the ‘concept of the hundred-first’ in relation to the ‘notion of reservoir’, and he encouraged the rest of the team to do likewise. The tenet could be summed up in a sentence: ‘not every bat is infected’. Even if the Ebola virus had never been found in one hundred bats, it could be harboured by the hundred-and-first bat. To convey this idea, agents qualified their statements using the modal ‘can’, translated in local languages. Bats *can* give diseases, but they do not necessarily do so. ‘Our ancestors may have eaten one hundred bats without a problem, the hundred-first *can* trigger an outbreak!’ Reducing risk to a matter of probabilities had the effect of bypassing thorny minutiae in the ecology of diseases, and to adapt the spillover theory of zoonotic diseases to an audience of non-specialists. The fact that bat populations might participate in a disease maintenance system does not mean, nonetheless, that they act as a functional reservoir, i.e., transmit the disease to intermediary hosts, or indeed to humans (Caron *et al.* 2018). Agents did not distinguish the dynamics of reservoir maintenance from those of disease transmissibility because, with no theoretical training in disease ecology, they derived their understanding from their sampling practice and its extractive logics, examined in Chapter 2. Their *scientifique* ethos, also addressed in Chapter

2, constrained them to ignore ‘antizoonotic semiotics’ and frictions within the bat hypothesis. As they told me, ‘we are *scientifiques*, and even if the risk is small, if only one person sells a bat and it has Ebola in it, what will the impact be?’

The *sensibilisation* efforts of PREDICT agents crystallise what I see as their desire to shift the ‘risk culture’ (see Boholm 2003) of their Guinean audience through epistemic and affective work. The agents intentionally dramatised interactions with mangos and bat poop: their plan was to alert their audience to something like a ‘risky zoography’. This objective was clearly laid out by Prof Koné, PREDICT country co-ordinator, who first elucidated the notion of risk to team members and officials invited to take part in risk communication training. Koné borrowed his central point from popular US risk communicator Peter Sandman, that risk is ‘hazard + outrage’ (Sandman 1993; Sandman and Lanard 2003). ‘Appropriate fear’ is, in this model, a commendable response to representations of risk situations. In Koné’s opinion, Guineans lacked outrage, and he made it a mission to ‘give outrage’ to the public. Unsurprisingly, given that he had studied in the United States, he looked to that country as a model. ‘Uncertainty is Americans’ greatest strength’, Koné repeated ad infinitum: Americans would, in his opinion, not minimise any risk because they were certain to be that ‘hundred-and-first’ befallen by misfortune. The agents were taught to insist that ‘eating bats was no good’, as the consequences of falling upon the hundred-and-first bat were very costly. Therefore, there was no question of condoning the consumption of bats if adequately cooked: in their negotiation with the ‘bushmeat’ category, PREDICT agents only drew the line at certain species. Responsibilities were redirected away from the government and its role in infrastructure development. The bat book may have symbolised the threat through heterogenous and dispersed moments of ‘contact’. But the *sensibilisateurs* were encouraged to centre their exhortation on bat consumption – whose ethnic politics we have seen.



Figure 15. Michel sensibilisant a group of people near Nyen's market in N'Zérékoré

PREDICT's *sensibilisation* carried the political undertext of 'disgust' and the ethical force of *scientifique* discourse. But ultimately, epistemological aspects were most strongly debated during sessions, and with dire consequences. The question of 'why avoiding contact' could not be evacuated and reduced to a question of 'how': the audience wanted to obtain credible explanations for Ebola disease transmission. After Michel opened the floor to discussion in Nyen, a N'Zérékoré neighbourhood hardest hit by the Ebola outbreak, questions poured onto him. A young man with a cap spoke up first: 'What diseases do bats have? Where do they take them from?' Quick-witted Norbert whispered in my ear as a way of translating: 'Where do they take diseases... He means *who* gives them diseases.' Michel lectured on the three diseases that they had been told were harboured by bats – rabies, tetanus, and Ebola – mumbling something about cycles and the 'reservoir notion'. Someone interjected: 'so this means that rabid dogs are infected by bats?' Leaving no time for an answer, the first youth continued unabated. 'In my classroom, there were many bats in the ceiling. Back then, we hunted and ate them, but none of us got sick. Does every person who eats bats get Ebola?' Michel grew visibly unnerved as he took a few steps back towards the veranda where the rest of us sat on the edge of our chairs,

and I started screening the space for emergency exits as they had taught me. ‘You told us not to eat fruits left by bats and not to touch their waste. You also said that bat waste can make fruit trees grow. Can we eat these fruits?’ Contradicting the bat book, Dr Bilis came to Michel’s rescue and neatly replied that ‘fruits do not keep the virus in them, only animals do.’ Seeing their colleague struggling, the other agents volunteered to reply in French. Omar broke his usual silence: ‘Did we tell you to avoid ducks? Guinea fowls, turkeys? If we talk about bats, it is because we did very advanced research on the animal.’ Norbert finally pulled out a few miniature bat books and distributed leaflets: ‘since they have questions, here are answers.’ The meeting was swiftly ended as we shook hands with the neighbourhood chief and squeezed ourselves into the Land Cruiser parked right nearby in case a prompt departure was needed to escape strife. Breaking the tense silence, Michel sighed angrily and translated what he had heard someone say in Kpelle: ‘They said stop to Ebola, so why do we come again and tell them that bats contain Ebola?... Those people came to *coller* [in English, ‘confound’] us, nothing else’.

Many *sensibilisation* sessions felt like routs, after which the agents hurried to take their leave from their official contact as civilly as possible. Persistent questioning, especially from young men, was met with defensive reactions and rarely received argued replies. Such interactions were informed by the legacy of the 2013-6 outbreak and reinstated the conflict of legitimacy between the young urban agents sent by the outbreak response, the elders, and officials who collaborated with them and the rural educated youth (Le Marcis *et al.* 2019). The zoonotic causality framework took centre stage in these disputes. It was an object of epistemic doubt as Michel’s translation suggests, for the word *coller* is usually used in teaching settings. To PREDICT agents, even though they preferred to focus on bat consumption, admitting that there may be gaps in the contact narrative would have been sheer imprudence. Any concession or incoherence would have fed doubt: Ebola virus might well be, after all, a human creation intentionally spread in Guinea. In the end, the ‘zoography’ that they introduced during *sensibilisation* meetings was not only risky to the extent that more-than-human agencies defeated human responsibilities and efforts to prevent infection. Debating matters of zoonotic disease also made for tense encounters laden with danger for the pandemic public thus constituted.

Conclusion

I was able to talk about the *sensibilisation* strategy during a refresher training for PREDICT *préleveurs* in Makeni with the project's principal investigator, a forty-something American vet doctor who studied viral haemorrhagic fevers in wildlife. After a lunch of fried rice, five minutes before he was to demonstrate the biosecure clothing protocol through what he called a 'PPE dance', he gave me a brief explanation of why their 'communication was uncoupled from the results of the scientific study'. As a disease ecologist, he himself judged the hypothesis of an Ebola bat reservoir 'fairly likely' rather than 'very likely' at this stage. But it was common knowledge, he added, that those animals carry diseases which they can transmit to humans. He did not judge it necessary to wait for the specific results of PREDICT research on West African bats to communicate. 'As we often say in PREDICT, we build the plane while flying in it', he said with an unashamed smile. One Health projects intertwine research and intervention, rather than follow a temporal script where scientific evidence, once established, informs implementation. The loosening of boundaries between scientific investigations and governmentality has extended to One Health from global health, where it is said to have entrenched a paradigm of 'experimentality' (Nguyen 2009; Rottenburg 2009). While critiques have excoriated the biopolitics of experimentality, I centre my account on the epistemological usage of the evidence thus generated.

It is not only that uncertain truths about the cause of Ebola are stabilised in the process of communicating about disease reservoirs. A notion of 'disease reservoir' gains conviction as post-Ebola and One Health projects conduct communication campaigns in hotspots. A collection of figures – bats, hunters, housewives, children, etc. – is incidentally enshrined as 'epidemic villains' (Lynteris 2019a). Some relationships between certain humans and certain animals are epistemically diagnosed as pathogenic according to local moralities and affects. This chapter has taken a fine-grained look at epistemic frictions between a local 'antizoonotic semiotics', grounded in the environmental knowledge and experiences of Forest Guinean populations, and bat-focused understandings of Ebola. Middle-class Guineans, in particular *fonctionnaires* in local administrations, accommodated their disbelief in the zoonotic disease narrative by blaming some species deemed specially 'disgusting', rather than bushmeat in general. They did so by entangling Ebola's emergence with the depletion of wild animal populations, a phenomenon long associated with Forest Guinean lifeways. I have highlighted how these understandings and moralities intersect with new epidemiological configurations of

risk. PREDICT's bat book translated indeed the scientific notion of disease reservoir into a question of contact, in a way which both hampered sociohistorical and infrastructural explanations for the emergence of Ebola, and diluted hazard into the many encounters between Forest Guineans and their immediate environment. In practice, the bat book produced 'a risky zoography' – spatial, social, and moral – through diffusing the responsibilities for contact with bats, and potential infection. Still, a flurry of misunderstandings, tongue-in-cheek stories, and aggressive posturing emerged during *sensibilisation* meetings. These can be read in conjunction with Guillaume Lachenal's (2015) critique of 'viral forecasting' in Cameroon. Such interventions do not aim to contest scientific knowledge per se. Much rather, in that they qualify human pretensions to totally control proximities with nonhumans, we could understand these incidents as performing, in some ways, the impotence of One Health science.

Chapter 5: Disclose

'It is the intent and purpose of PREDICT and the USAID Epidemic Pandemic Threat to make data as widely and freely available as possible; that said, it is essential that information sharing is accomplished without sacrificing confidentiality and intellectual propriety.'

PREDICT Consortium (2016a: 3)

In 2019, PREDICT final report brought to light 'pivotal discoveries' (2020a: 17; 76).¹ One was dramatically singled out: a new species of Ebola virus was found in two species of insect bats 'sampled at three different sites within 20 km of each other in the Bombali District ... inside human dwellings in small villages, where animals (poultry, goats, sheep) and crops (fruit, vegetables, oil trees) were raised for local consumption and sale' (Goldstein *et al.* 2018). As highlighted by Chapters 2 and 4, PREDICT research did not enact an ontological transformation of Ebola: it further entrenched the status of bats as bridges across a place-contagion, or ecological-epidemiological synthesis of the disease's origin. This chapter looks at the implications of PREDICT's viral findings for the sociopolitical process constituted by their disclosure, independent of *sensibilisation* activities. It questions the epistemological, social, and ethical value granted by *préleveurs* to the geographic locations of viral discoveries as they became 'place-saturated'.²

The quotation heading this chapter singles out two aspects of PREDICT's goal of making data available for 'effective disease control and public health measures' (2016a: 14): confidentiality and intellectual propriety. They are both connected to the sampling location, socially and politically. Confidentiality is an ethical provision: the identity of sample providers (farmers, hunters, traders, etc.) is protected from deduction based on the name of the sampling

¹ PREDICT's report is modelled on the 'discovery account', heroic, linear, and progress-orientated. This vision of science as a cumulative knowledge process was criticised by seminal works in science and technology studies (Kuhn 1962; Woolgar 1976). Anthropologies of science have also refuted the separation between the object-world and the subject-representation in favour of considering the plurality of worlds as ontologies (Law & Lien 2013; Pickering 2016). When this chapter uses the word 'discovery', it is not as my own analytical term but as an ethnographic perspective.

² I owe this terminology to sociologist of science Thomas Gieryn (2002: 113), who conceptualises 'place' in opposition to 'space', in relation to three features: a unique though elastic geographic location, a physicality combining architecture and environment, and specific meanings and values. I use 'locality' as a translation of *localité*, which designates in Guinea geographic entities referred to by their administrative name (a district, a commune, etc., are *localités*).

location. Intellectual propriety translates into a legal property clause: ownership of the samples is in most cases retained by the government of the territory where they were acquired. Such provisions for data sharing are regulated by memorandums of understanding, non-legally binding agreements between organisations and government agencies, which detail the process, timeline, people, and means of distribution normally involved in releasing findings.

The international economy of virus circulation has occasioned anthropological debates around the stakes, political and scientific, of the movement of virus samples and their sequences across spaces of regulation (Caduff 2012; Fearnley 2020a; Hinterberger & Porter 2015; MacPhail 2014; Ong 2008; Porter 2019). Since improvements in PCR sequencing technologies, viral information can be increasingly detached – ‘untethered’ in the words of Porter and Hinterberger (2015) – from its material support in samples. Viruses have been said to dematerialise, a phenomenon facilitated by the neoliberal principle of free circulation (Ong 2008). The process has met with political opposition, however. In 2007, Indonesia was the first country to formally claim sovereignty over its material samples of H5N1 when it refused to share them with WHO (Rourke 2020). Although the discourse of sovereignty was harnessed for a domestic political struggle in Indonesia (Hameiri 2014), the claim was couched in legal language and justified by the demand that vaccines and treatments derived from shared samples and sequences be made accessible to the population of impoverished nations (Ong 2008). The term ‘viral sovereignty’ has fallen out of use since, but after the Indonesian refusal, international legal instruments, such as the 2010 Nagoya protocol, have entrenched the principle that the transfer of pathogen samples must be negotiated with reference to the principles of access and benefit-sharing.

This chapter queries the relationship between the two limitations on free access in PREDICT data sharing policy, property and confidentiality. It follows Hinterberger and Porter’s contention that ‘sovereign claims invest biological materials with geopolitical attachments to both nation-states and continents’ (2015: 361) and looks in detail at how the legitimacy of exceptions to the ‘neoliberal logic of deterritorialization’ (Ong 2008) is framed and contested by decision-makers and scientists. Virus circulation control does not only concern states indeed. Anthropologist Lyle Fearnley has singled out another regime of control, this one related to viral sequences (2020a): a ‘scientific etiquette’ would grant temporary restrictions on access to information to enable the scientists who extracted the sequences to publish their data analysis first. Taking up Fearnley’s idea that multiple knowledge-regimes regulate the circulation of viruses, I propose that yet other norms than viral sovereignty and scientific

etiquette are activated by PREDICT activities in Guinea. I suggest that these local norms focus on confidentiality rather than property because they are concerned with the impact of virus discoveries at yet another scale than that of nation-states: in the very sampling locations where viruses are extracted. This scale is made visible by the names given to virus sequences deposited in databases: for example, one of the Bombali virus isolates deposited by PREDICT on GenBank is named Bombali virus/C.pumilus-wt/SLE/2016/Northern Province-PREDICT_SLAB000047. The machinery of wildlife sampling is embedded in this name: the place of sampling (Northern Province, Sierra Leone), the bureaucracy (lab code), the temporality (year of sampling) and the animal provider (the bat species *Chaerophon pumilus*). In discussing the release of PREDICT results in Guinea in 2019, I analyse the co-constitution of viruses as ‘technoscientific things’ (Hilgartner 2012) by the research apparatus. Place appears not only embedded in viruses but, looping back, viruses have the potential to remake place and its meaning in relation to the Ebola disease and the bat bridge.

The workings of confidentiality with respect to infection is a salient theme in ethnographies of HIV/AIDS in Africa and elsewhere (Butt 2011; Hemer 2015; Mackworth-Young, Bond & Wringe 2020; Rhine 2016). They suggest that the disclosure of one’s seropositive status has been taken up by global health institutions as a virtue. This chapter develops these insights and anchors the selective disclosing of viral findings at the intersection of two ethics of concealment, cultivated by international scientists, and people on the Upper Guinea Coast. I handle the disclosure of PREDICT findings as signals. This is not to mean, pace Keck (2020), that they reveal mutations of the Ebola virus and alert us to pandemic threats: as indicated in Chapter 1, PREDICT Ebola Host Project primarily looked for forms already known. Viral discoveries rather act as signals here within what we can see as a semiotic theory of secrecy, pioneered by anthropologist András Zempléni amongst others (1996). According to Zempléni’s study of ritual attacks among the Senoufo of Côte d’Ivoire, secrecy, in order to exist, needs secretion, i.e., the partial leaking of secrets through signals, or fragments interpreted by recipients of the secret as clues, evidence (*indices* in French) of the secret’s existence. Although helpful for thinking secrecy as a process, Zempléni’s physio-psychological conceptualisation of secretion may obscure the socially crafted character of signals. Rather than seeing virus-signals as involuntary slips betraying an omnipotent regime of knowledge-control, I situate them within a socioreligious anthropology of revelation (Galinier 2015; Mondragón 2015). Anthropologist Carlos Mondragón has shown revelation to connect indeed different spheres of experience in Vanuatu, the world of the living and a spiritscape. Powerful moments of

recognition, such as when masks are ritually displayed, enact a controlled revelation of some entities of the spiritscape normally concealed (2015: 42). This chapter suggests that virus-signals can function as such artefacts of controlled revelation across a dual cosmology, ethnographically conceptualised by my informants as the worlds of ‘public health’ and of ‘research’.

The first section of this chapter discusses the political and scientific transactions that, in Guinea in 2019, made publicising viral findings a risk to be managed, beneath the international dynamics studied by the scholars mentioned above. The second section shows how a ‘geography of blame’, and the risk of enshrining it, are taken into account in decisions over how to name viruses, and suggests that equivocation on the location they refer to is both an intended product of these decisions and a feature of their social life. I go on to focus on the social and power dynamics activated by PREDICT’s release of viral findings to the staff and myself. Finding inspiration in the dialogue between space and secrecy in the anthropological literature on the Upper Guinea Coast, I finally reflect on the meaning of the ‘place’ of viral discoveries to PREDICT US managers and Guinean staff, and the consequences of their control over the dissemination of findings.

A. A ‘diplomatic incident’

In July 2018, the government of Sierra Leone announced that PREDICT had discovered a new species of Ebola virus in five insect-eating bats and named it Bombali, after the district where it was discovered.³ On the day of the announcement, Guinea’s Agence Nationale de Sécurité Sanitaire (ANSS), founded in 2016 after the Ebola outbreak, convened a press conference in Conakry to communicate about the discovery. Urgency was invoked, even though the Bombali virus had apparently not infected anyone yet: the situation of the Bombali district, bordering southwestern Guinea, was deemed to present a risk of outbreak to the country. The news had few public echoes in the generalist and local press (AFP 2018; VOA Afrique 2018). In exploring the diplomatic and political negotiations that presided over the release of viral findings in Guinea, I look at the way they unsettle the two regimes of knowledge-control

³ The ministerial communication document insisted that no person had been infected (Government of Sierra Leone 2018). It was ‘not known whether the virus has the potential of infecting anyone’, but ‘researchers report[ed] that the virus has the potential to enter human cells’ and advised against bat contact.

outlined above – viral sovereignty and scientific etiquette – since the consequences of breaching the principle of confidentiality are envisaged at a national rather than international scale.

In September 2018, I met Dr Lamine Koivogui, a bacteriologist then director of Guinea’s Institut National de Santé Publique (INSP). A cholera specialist, he acted as one of the country’s leading scientists during the Ebola outbreak. He seemed unaware that the Bombali finding had been released in Guinea already. He repeated to me the advice he gave in July to Dr Sakoba Keita, the director of the ANSS, which had displaced the INSP as the only legitimate preparedness and epidemic surveillance agency in the country. ‘Go very slowly. We have just come out of an outbreak. If you say that another virus was isolated, this will disturb the population. You should postpone, leave it in the research context first. Maybe that’ll come to the public health context later, but let’s wait first’. Dr Koivogui’s discourse opposes what he called two ‘contexts’ and which I propose to treat as the realms of a dual cosmology underpinning the West African politics of health. On the one hand, the health ‘research context’ is a realm of expertise, where priorities are largely determined and funded by foreign organisations, where knowledge is virtuously withheld, and risk to health is a potential yet to be actualised (‘let’s wait’). On the other hand, there is ‘public health’, a political space where communication is virtuous when useful to the goal of containing actual health emergencies. Dr Koivogui drew on his experience in Lassa fever research and involvement in the discovery of the first African hantavirus, found in Guinea and named after the village where a rodent that carried it was trapped, Sangassou (Klempa *et al.* 2012). According to him, even though antibodies to this hantavirus had been detected in Guinean and South African populations (Witkowski *et al.* 2014), ‘there were not enough cases to announce an outbreak [sic], so we decided to leave it in the research context’ – and not disclose the discovery.

The Bombali virus was already found in Sierra Leone, named, and publicised before PREDICT detected it again. This happened in Guinea. In May 2018, *préleveurs* captured two insect bats whose samples later tested positive for the Bombali virus (UC Davis 2019). PREDICT US managers activated the data-sharing process one year later. The two US-based officers responsible for Guinea flew to Conakry for a formal briefing with the ANSS director. Dr Keita judged the matter serious enough to warrant a meeting with the Minister of Health and Public Hygiene. But upon receiving them, the latter ‘panicked’, in the words of Prof Koné. The Minister misunderstood the release as a *fait accompli* and imagined that the ‘bat book’, presented to him on the same occasion, disseminated the Bombali finding already. Undecided about the opportunity for a larger-scale release, he wrote a letter to the Guinean President and

requested that the PREDICT results be first confirmed by a national laboratory. For five days, the international managers waited to hear back from the President. But no reply came, a silence they interpreted as meaning that a public release was not authorised. The virus-signal had to stay within the research context.

As a justification for the non-decision, Dr Bilis and Prof Koné invoked the recent Ebola outbreak ‘trauma’. In public health, the category of ‘trauma’ has sloughed off associations with individual psychology (Lester 2013) and integrated with the discursive toolbox of politicians and organisations. With terms such as ‘stigmatisation’, it aims to take seriously the suffering of collectives who are not only affected by a disease, but also discriminated against by the policy response (Kleinman & Lee 2005). Sakoba Keita and Prof Koné sensed and feared a lingering ‘Ebola trauma’, which encompassed suffering and political critique, and which they deciphered in persisting rumours about the responsibilities of elites and foreigners in the outbreak. They anticipated that Guineans would not understand that the Bombali finding did not augur another Ebola outbreak. The notion of Ebola as a virus could be conflated with that of Ebola as an infectious pathology. In sum, a disclosure would ‘stress out people’, as Dr Koivogui warned. This view was underlined, as all those involved recognised, by a politically sensitive timing. Since the beginning of 2018, declarations from President Alpha Condé were interpreted as expressing his intention to modify the Guinean Constitution and run for a third presidency in 2020. A National Front for the Defence of the Constitution (NFDC) was created in April 2019 to oppose a third mandate. In June, the NFDC orchestrated demonstrations, during which two dozen people were injured in N’Zérékoré. This political context aggravated the consequences of a potential epistemic misunderstanding and deferred disclosure of a new species of Ebola virus for fear of social unrest. PREDICT Guinean managers worried that the ‘outrage’ they wished to inculcate would be directed at the government. But the US managers remained optimistic. They anticipated lengthy negotiations, as in Sierra Leone, where two years and a change of president had paved the way for the decision to release.

PREDICT consortium navigated the disclosure of viral findings by reckoning with West African states asserting their ‘viral sovereignty’ over what travelled from the context of research to that of public health. But in contrast with Indonesia and other Asian countries (Rourke 2020), Sierra Leone and Guinea did not claim sovereignty over animal samples. During the outbreak, several thousand human samples were flown to France, Germany, the United Kingdom, and the United States, and many more destroyed as the mobile labs sent by these nations were being dislocated (*ibid.*, 179-83). Journalists have denounced their exportation under relatively opaque

agreements, labelled in a way that did not always guarantee patient anonymity (Hecketsweiler & Freudenthal 2019). To Sakoba Keita, the material samples ‘were waste to get rid of’ (ibid., my translation), especially as there was a dearth of biobanking facilities to store large quantities of samples in West Africa at the time (Conton 2017). Since 2015, and as secure infrastructure has been built in the countries affected, some voices have demanded – in Sierra Leone at least – the repatriation of the material samples (Abayomi, Gevao, Conton & Katz 2018). By contrast, it seems that in the case of animal sampling, states did not invoke rights over material samples. There was an alternative vision of sovereignty: state control over information release. Unlike Indonesia, they did not ‘challenge the global power of [intellectual property rights]’ by refusing to share H5N1 samples because of inequalities on the pharmaceutical market, and thus ‘desecuritized’ the pandemic threat (Ong 2008: 126). The Guinean and Sierra Leonean governments obstructed the release of viral findings precisely because of security concerns. The sharing of virus samples and sequences is not only a point of contention for international biosecurity, scientific credit, and equitable access to vaccines and therapeutics. It is also a matter for the national security apparatus, as suggested by Carlo Caduff as well (2012). Guinean health policymakers deemed the health risk posed by a new virus too hypothetical for decisions to be made in the ‘public health context’. National security was more certainly challenged by the sociopolitical unrest that would ensue from publicising the finding.

The negotiations took a new turn shortly thereafter, in July 2019. The CDC journal *Emerging Infectious Diseases* released the preprint version of a research letter entitled ‘Bombali Virus in *Mops condylurus* Bats, Guinea’ (Karan *et al.* 2019a). The Russo-Guinean research team which authored it, headed by the Central Research Institute of Epidemiology (CRIE) in Moscow, reported detecting traces of the Bombali virus in N’Zérékoré and the neighbouring locality of Yalenzou. The publication created, according to PREDICT Guinean managers, a ‘diplomatic incident’. The Russian researchers had apparently failed to inform the authorities before publishing. I heard that the Ministry of Health knew nothing about their investigations on Guinean territory. Admittedly, the CRIE collaborated with two Guinean research institutes (IRBAG and CIRIT) which were not under the tutelage of the Ministry of Health but under that of the Ministry of Higher Education and Scientific Research. Still, no press conference was organised, and no media reported on the finding. The Russian researchers, and possibly their contacts from the Ministry of Research, in the end stayed in ‘the research context’.

This diplomatic incident happened as Russia was reasserting its industrial and political presence in Guinea since the 2010s, and unfailingly backed President Alpha Condé on the

international scene. Guinea, an historical battleground for geopolitical influence during the Cold War, took its independence from the French Empire in 1958 largely as a result of grassroots mobilisations under the banner of the socialist *Rassemblement Démocratique Africain* (Schmidt 2007). The young republic first turned to the Soviet Union for political support but played the influence of the USSR against the United States from the 1960s onwards (Posthumus 2016). To cement socialist collaboration, the Guinean government sent its best students to Cuba or Russia. The IRBAG and CIRIT directors completed their doctoral studies in microbiology in Moscow. Dr Bilis also studied vet medicine in Cuba, and Prof Koné took advantage of both systems in the 1980s by studying in Ukraine and in the United States. The Ebola outbreak opened the door for Russia to rekindle scientific ties with Guinea, where the Russian aluminium firm Rusal funded the construction of a Research Centre in Epidemiology-Microbiology and Care in Kindia. Journalists have reported talks of secret industry agreements between the two countries (Maclean 2019), and the centre's research activities are not publicised by media other than official Russian news outlets. It was against the secretive spirit of Russia's diplomacy that the Guinean scientists encountered in my fieldwork assessed the unauthorised release of the Bombali finding.

The release still deeply disappointed the international managers of PREDICT's Ebola Host Project. It unsettled their conception of scientific etiquette, and not only their view of viral sovereignty. As Amine, a PREDICT veterinary epidemiologist from Morocco, wrote to me, 'their diamond was out', because the Russian scientists had pre-empted their 'scoop'. Their publishing before PREDICT was not strictly speaking a breach of scientific etiquette. Neither set of data was public prior to disclosure, and the Russian researchers did not use PREDICT Guinean data in their analysis. In fact, the Russian and the American teams had no agreement, did not exchange information, and did not even have contact. But PREDICT managers may have felt that their data sharing policy, which they thought provided for virtuous and equitable exchanges, was being scorned. In accordance with the Nagoya protocol, the project had negotiated material transfer agreements with each of the thirty-one countries investigated (Bird 2020: 56-71). Brian Bird, the vet doctor heading PREDICT surveillance activities, described them in a book chapter (*ibid.*, 67) as a bureaucratic 'hindrance', potentially 'complicating scientific work', but nevertheless mandated by 'equitable considerations when undertaken in low-resource countries'. He further reckoned that PREDICT researchers were not trained in legal negotiations, 'nor [was] it in their basic job understanding that they need[ed] do so'. The Russian 'diplomatic incident' throws light on the degree to which PREDICT was nevertheless

attuned to the legitimacy of some form of viral sovereignty and understood its respect as a precondition of scientific etiquette.

PREDICT managers had to reckon with the fact that negotiations with governments and attention to the sociopolitical context could potentially thwart scientific advantage. In contrast with the apparent segregation of the two contexts for the Russian team, PREDICT nurtured a ‘public health’ interest alongside ‘the research context’. The consortium sought publicity for their activities through interviews, reports, and press releases. It aimed to transform research findings into public health knowledge, to be shared with health authorities and the populations in their countries of intervention. The ‘diplomatic incident’ revealed that information passing from the research to the public health world was not only a sociopolitical risk, to be negotiated as an issue of viral sovereignty: it could endanger the credit of producers in the ‘institutionally specific reward system’ that is scientific research (Merton 1973). The two regimes of knowledge-control over the circulation of virus samples were destabilised: sovereignty was waged over media releases rather than samples or sequences; scientific etiquette was breached without objectionable appropriation of results. Rather than property, confidentiality seemed to preside over the passage of virus-signals from research to public health in Guinea.

In addressing viral findings as a security question in national contexts, I moved beneath the wealth of work on the international geopolitics of virus sample circulation (Barker 2012). Viruses as signals appear loaded with risk, not only for politicians but also for scientists: virtual risk to public health, actual risks to social stability and to the system of research credit. The rest of this chapter interweaves these notions of risk as they were compared against one another by the collectives and individuals involved in producing virus-signals.

B. Naming viruses

Guinean officials and PREDICT managers assured me that the news about the Bombali virus caused ‘an outcry’ in the population of this district. While I could not find any report of discontent in the Sierra Leonean press, my interlocutors did not doubt that the virus name caused resentment. As Norbert told me: ‘the location was identified, this is what created problems. Now imagine if the PREDICT people in Sierra Leone would dare to return to Bombali after this?’ While rarely uttering the word itself, my informants drew on the logics of stigmatisation to qualify the consequences of naming a virus after a region where a virus of the same genus wreaked havoc a few years before. Anthropologist Paul Farmer (1992) framed this

accusation – in this case, fear of accusation – against the place where a disease seems to originate as a ‘geography of blame’, cautioning against the naturalisation of social forces and global inequities that produce outbreaks. Literature scholar Priscilla Wald (2007: 44-5) has further shown that the discourse of contagion temporalises and racialises blame by mixing evolutionary narratives on Africa as the birthplace of humanity (or Asia as that of civilisation) with notions of disease emergence. Much has been written about how geographies of blame operate as epidemiological doctrines perpetuating xenophobic framings of ‘diseases of place’, which motivate discriminations against people indexed as coming from these places (Dionne & Turkmen 2020; Sparke & Anguelov 2012), and high-density entanglements of animals and humans such as markets (Lynteris 2016b). Much less ethnographic reflection has been granted to the integration of geographies of blame as a risk factor to be managed in the process of naming diseases or viruses.

Worries over the consequences of naming viruses are actually common among virologists (Kupferschmidt 2015; Nature Genetics 2020). These are reckoned with by the international code of virus classification and nomenclature, of which article 3.17 demands that ‘new names [be] chosen with due regard to national and/or local sensitivities’ (ICTV 2021: 4). Virus nomenclature is regulated and approved by the International Committee on Taxonomy of Viruses (ICTV), a union of virologists established in 1966 to standardise virus classification. The ICTV code specifies that names for new species, such as the Bombali virus, should be constructed from ‘a few words as practicable, distinct from the names of other taxa’. But it does not specify which words should be used. In the pre-genomic era, scientists who detected the viruses responsible for known diseases often gave them the same name – based on the pathology, geography, or the animal in which the virus was found – thus coupling pathogens and disease. SARS-CoV-2 is a comparable disease-associated virus, although the Coronaviridae Study Group of the ICTV opted for giving it a name independent from the disease, modelled on the virus’s phylogeny (Gorbalenya *et al.* 2020). The group wished to support WHO, which gave a rather unspecific name to the COVID-19 disease, in line with the wide clinical spectrum of the disease, and to counter the geography of blame entailed by first monikers such as the ‘Wuhan virus’ or ‘China virus’ (WHO 2020). By contrast, the Bombali virus was characteristic of a new driving force in virological findings: an increasing number of viruses are found using next-generation sequencing technologies of environmental and animal samples, and their pathogenicity remains unknown. Not being associated with a disease, they are ‘phenotype-free’ and virus naming is differently informed (Gorbalenya *et al.* 2020: 537).

In his autobiography (2012: 56-7), Peter Piot, a Belgian microbiologist among the first scientists to observe an Ebola virus, in the DRC in 1976, reported debating with colleagues the name to give to their finding, one night over a bottle of bourbon. Because CDC tropical medicine specialist Joel Breman knew that ‘naming killer viruses after specific places can be very stigmatizing’, they decided not to name the virus after Yambuku, the first affected village. American virologist Karl Johnson (according to Piot 2012: 57) proposed naming the virus after a river, because ‘he felt that took some of the sting out of the geographical finger-pointing’. Looking at a map on the wall of their NGO headquarters, the scientists settled on the Ebola River (only realising later that it was not the closest river to Yambuku). In 1983, cell cultures showed that the two viruses which caused the 1976 outbreaks in the DRC and Sudan were not identical: they were named Ebola Zaire and Ebola Sudan (McCormick, Bauer, Elliott, Webb & Johnson 1983). This was followed by the discovery of additional Ebola viruses, in 1989 in the United States and in 1994 in the Ivory Coast (Kuhn *et al.* 2010). In 1995, the ICTV accepted the creation of several species of Ebola virus: Zaire, Sudan, Reston, and Cote d’Ivoire, the latter one amended in 2010 to Tai Forest. In 2008, another species was added – Bundibugyo virus – briefly referred to previously as *Uganda ebolavirus*.

Scientists know that naming viruses after locations cements the perception that these places breed the disease. Piot and colleagues opted for, quite literally, liquefying the stigma and fear attached to the terrifying disease by naming it after a river rather than after a city. But from the historical arc sketched above, it looks like nomenclature has nevertheless evolved towards bounded territories below the national level. The names of Ebola viruses all refer to the locations of initial outbreaks except that of Bombali virus, the first species detected in a host on the basis of phylogenetics only, and without causing an outbreak. In 2018, PREDICT virologist Tracey Goldstein and colleagues suggested that the species they found in Sierra Leone ‘should be named Bombali ebolavirus to reflect the location of first detection, which is consistent with the naming of other ebolavirus species’ (2018: 2). The new virus was however not named after the country but after the district where it was first found, like the more recently discovered Bundibugyo virus.⁴ Consistency is a contingent and non-homogenous achievement, whose historical trajectory leaves marks in the genus nomenclature. The trajectory of Ebola

⁴ The four positive animals were captured in a smaller-scale area, south of the 8,000 square-kilometre Bombali district. The locations of detection are publicly unspecified, they are simply designated by red stars on a map in the supplementary figures to the publication and look scattered across three chiefdoms in the Bombali district.

virus nomenclature mingles scientific diplomacy, the economy of sampling and experimentation, and individual preference.

To further understand how virus naming relates to place on the Upper Guinea Coast specifically, we can compare it to other practices that ‘spatialise’ Sierra Leone, studied by anthropologist Marianne Ferme (2001: 40-8). In the Mende land, villages, farms, and workplaces are named after their physical features, and after the previous settlements of their dwellers, existing village socialities, and yearned-for faraway places. Historical relationships are given a discursive form and embedded in the landscape. This practice encodes space on the basis of relations traced by the movement, real or dreamed, of people. The practice of naming viruses after places reverses this logic. Virus names do not ‘substitute a trace left behind for the practice’ (Ferme 2001: 40), that is, names for a spatial relationship. They substitute a placeholder for an elusive trace. The viral RNA contained inside a living being – bat, human, etc. – moves across space, and beyond territorial borders. As I often heard PREDICT staff say, the free-tailed bats in which the virus was first detected could have very well been captured in a district other than Bombali, or even in Guinea. The mobile genetic material was nevertheless made legible through laboratory practices deployed in a singular location, which integrated the GenBank name of the first Bombali virus sequence. This practice ‘engraves connections that may be accidental’, ICTV virologists have warned (Gorbalenya *et al.* 2020: 537). It also detaches viruses from their ‘viral habitat’, or wider ecological context (economic, political, agricultural), and pins them down to a single location, whose name comes to index and consolidate the framing of ‘diseases of place’.

This does not mean that virus names and location names completely concord in their social life. I liken virus names and declarations of viral discovery to signals in a Saussurean semiotics, also adopted by Caduff in his article on the ‘semiotics of security’ implied by the publishing of sensitive infectious disease research (2012). Caduff retains from Saussure the potential of signs to be iterable: they may break away from their context and acquire new meaning.⁵ Beneath matters of nomenclature inherent to virus names, I saw in declarations of virus discovery a risk of infelicity, i.e., of speech acts failing to transmit. Among PREDICT Guinean staff and their administrative partners, confusion often reigned indeed over where exactly PREDICT found

⁵ I note that a Peircean approach to the semiotics of virus naming would offer a different view on such declarations by questioning the way virus-signs refer to their object. We could, for example, discuss whether virus-signs *index* the bat(s) sampled in a location which test positive to lab tests because of a causal connection, or whether virus-signs *symbolise* the finding by way of a social connection that would depend on the interpretant.

viruses. In 2019, most of these people recalled that the Marburg virus, which is also responsible for a very lethal haemorrhagic fever, was sampled in fruit bats near a city called Koindu, in Sierra Leone (in fact, the five bats were dispersed over three districts: Amman *et al.* 2020). But the information was transmitted orally. Never having seen the location name written, and possibly confused by the many regional accents that inflect the pronunciation of localities' names, they seemed to locate the finding in various locations. It did not help that two localities with similar-sounding names, Kondu and Koidu, were located in the same part of Sierra Leone's eastern province, close to the Parrot Beak, a curved point of Guinean land jutting into Sierra Leone. Some even held that the Marburg virus was found in Koundou, in Guinea (sometimes written 'Koindu' and pronounced the same way). In Guinea, the spelling of many locality names is not consistent across administrative documents and maps and provides for obfuscation. But it might be that, following Ferme's insights (2001: 48), populations displaced across this patch of interlocked land named new settlements after the one they had left, and purposively punctuated the space of their migration by a series of like names. The fact that the first Marburg outbreak in West Africa made its first victim precisely in the Guinean sub-prefecture of Koundou (WHO 2021) raises interesting questions in this light. The social relationships between Koundou and other similar-sounding locations could generate epidemiological hypotheses for the as-yet unexplained aetiology of the first contamination: did the inhabitants of Koindu and Koundou nurture a network along which people, animals, and viruses might have travelled? This hypothesis ethnographically exposes the benefits of thinking with viruses through practices connecting social places, rather than in terms of geographic locations only.

Equivocation is a feature of the social life of virus names and is purposively seized on by the scientists involved in virus naming. In 1976, Karl Johnson was anxious to retain some ambiguity by naming the newly detected virus after a 250-kilometre-long river. The virologist had taken a similar decision for the Hantaan virus, named after a South Korean river, and the Machupo virus, called after a Bolivian river. Indexical ambivalence in virus names is not a coincidental by-product, but the intention of virologists harnessing the iterability of virus-signals. Mariane Ferme's remarks about the flexibility of Mende topography may help us understand the existential importance of such equivocation beyond the fact that it pre-emptly locations becoming stigmatised. According to her (2001: 40), ambiguity in the names of locations on the Upper Guinea Coast ensues from 'the region's troubled history, one in which the strategic concealment of one's real whereabouts and traveling plans could mean the

difference between life and death'. As confusion over the location where the Marburg virus was found shows, uncertainty was not necessarily overcome when declarations of viral finding designated locations at a lower scale than a country, a river, or even a district. Quite the contrary, uncertainty might be compounded by a habitus of obfuscation for security purposes. To explore this hypothesis, the next two sections leave the arena of scientists and politicians and foreground how virus-signals were 'secreted' by *préleveurs* in ways that end up configuring the disease landscape of Forest Guinea.

C. 'Secreting' viral findings

One afternoon in July 2019, I had a phone call with Amine, the postdoctoral fellow in charge of West Africa for PREDICT. The US-based managers decided to move forward with disseminating the findings although negotiations were still bogged down in Conakry. At the time, I still ignored what these results were but was told by Amine to remain attentive as this moment constituted a unique opportunity to 'collect data' concerning staff reactions for a joint publication that we planned to write together. I not only 'collected data' about the staff in the end, but cultivated an awareness of how I was myself embroiled in dynamics of revelation by and with my interlocutors (see Gonzalez 2012). Through self-reflexivity, I grasped, ethnographically and analytically, the texture of declarations of viral findings, social forms that travel across plural contexts of sense-making.

Amine may have believed that PREDICT managers' intention to release results was not known, but the field agents long suspected that they were hatching a revelation. They caught wind of Prof Koné travelling to UC Davis and even saw pictures of Amine's trip to Conakry on the Facebook profile of PREDICT's driver. In fact, revelation does not negate secrecy: quite the opposite. Secrecy is meant to create occasions of revelation (Taussig 1999). What matters is how the secret is made public, to whom, and at what time. The particulars of the revelation were a hot topic for debate amongst the agents: would the government oppose the release of positive findings? If they did, would the staff be denied that information, despite years of risky labour? I informed a few of them about the planned disclosure and nervously waited. A couple of days later, Amine called me again with yet another piece of news: Dr Bilis had shared the findings with the staff already.

Dr Bilis did not invite me because of my supposed ties to other researchers, such as 'the Russians'. During the one-week-long mission of Moscow CRIE researchers in N'Zérékoré, I

had not hidden from PREDICT my (largely unsuccessful) attempts to learn more about Russian zoonotic disease research in the area. I thereby positioned myself in an interstice between organisations that did not communicate with each other by virtue of their competition. Such an interstitial position has been said to ‘in fact, be epistemologically generative for research on secrecy’ (G.M. Jones 2014: 62; also Gusterson 1996), so I scrupulously documented my participation in frameworks of information sharing, which I manipulated like everyone else. I opened up and talked to Michel, one of the PREDICT agents I felt closest to and my categorical ‘husband’ in the PREDICT Guinean family that agents established through joking relationships. I told him in confidence that ‘I knew that he knew’ about the results. But he replied that he did not know. Dr Bilis had not spoken to them in a long time, for he was currently busy developing his farming business in Guéckédou. The farm being located a five-hour drive from N’Zérékoré, Michel reasoned, Dr Bilis must have lied to Amine about the disclosure meeting. The US managers were not supposed to know about their employees’ multiple sources of income and frequent travelling. Dr Bilis certainly intended to organise the meeting upon his return, so Michel advised me against reporting to Amine. We were here engaged in a process of secretion like that studied by Zempléni: Michel and I gave life to the existence of a secret – viral findings and the danger they constituted – by exchanging signals, whose direction defined externals (variously, myself, the agents, Amine) and internals (the agents, Dr Bilis and US managers, Michel and me).

Four days later, Dr Bilis invited me and the staff to meet at PREDICT headquarters in N’Zérékoré, before a planned *sensibilisation* session in the Nyen neighbourhood. The project was nearing its end, leaves were strewn around the courtyard of the office villa. Marie, a vet recruited for *sensibilisation*, had just returned from a long sojourn in Macenta for family and business matters. Once informed of our presence, Dr Bilis emerged from his office room and told everyone to take a seat, except the project’s driver whom he asked to leave. ‘In Guinea, every family has secrets. Things that you’d rather keep amongst yourselves. We had this going on, there was a... discretion imperative. Norbert, did anyone share information with you?’ Although I had told him the little I knew, Norbert answered: ‘No they didn’t’. ‘Good, this is how we verify [sic], by sharing confidential information’. Dr Bilis explained that he had met, a few days before, with four of the six PREDICT agents at the house which they rented together to inform them about the project’s findings in Guinea. He then summarily disclosed the discovery to everyone else, i.e., Norbert, Marie, and me: RNA from Bombali virus was found in two insect bats in the Guéckédou neighbourhood of Houndounin. But public communication

was not authorised, and consequently, ‘this was to stay our secret’, not to be shared with former staff, colleagues, or family.

As the meeting was dissolved and Dr Bilis left, Marie snapped: ‘all this is a *simulacre*’ (we might say ‘a sham’ in English). I first understood her comment as mocking Dr Bilis’s apologetic revelation that the actual revelation, the first meeting, had been concealed. But in accordance with Michel’s version, I later thought that she may have meant that the revelation of concealment itself was a sham, so as to protect Dr Bilis’s private undertakings. Was he pretending that he had never left N’Zérékoré and had we all actually been informed for the first time? My fieldwork began to resemble what anthropologist Sasha Newell, who queried street culture in nearby Abidjan, calls a ‘shell game’ (2019). The ethnographer may be the subject of deception in contexts where dissimulation is a common social modality. But at no point do they master all the frames of interpretation, and neither do their informants. Navigating the nested narratives made for hurtful revelations, and generated paranoia that these were themselves *simulacres*.

The next day, Michel uneasily recognised having lied to me. There had been a first meeting, where Dr Bilis claimed that there was ‘like a sacred Forest amongst [them]’. It was the second time that I heard the locution, which imposed an oath of secrecy on a group of people. In 2013, it was articulated in my presence by a health worker in N’Zérékoré Ebola Treatment Centre. She elucidated why her colleagues and she did not spread word of the trial of an antiviral on the centre’s patients. The sacred forest – a metonym for initiation societies – is a ritualised form of knowledge control. The term ‘secrecy’ derives from the Latin *secernere*, ‘to set apart’ or ‘to discern’ (Beidelman 1993). Anthropologists engaging with secrecy in West Africa have questioned the relevance of this analytical term. In many local languages, such a concept is lacking, and yet the production and transfer of knowledge are strictly controlled to ‘set apart’ social groups (Davidson 2010). In many Upper Guinean societies, secrecy even spills over, beyond the sacred forest, into ordinary life, where it permeates everyday interactions (Ferre 2001; Gottlieb 2000; Piot 1993). Anthropologists have composed fine-grained descriptions of the semiotic logics of mundane secrecy in the region. In the Forest Guinea context, Mike McGovern (2017: 83) has situated these dynamics in ‘a movement between trust and betrayal’: relationships with kin, and, even more, with outsiders to the family, the region, and the nation, would pose a danger which coalesces into narratives of betrayal and justifies an ‘ethics of discretion’. While the disclosing of viral results to PREDICT agents lends itself to such a

narrative analysis, such acts can be seen as embedded, in parallel, in yet another regime of control over scientific discoveries, different from viral sovereignty and scientific etiquette.

One can talk about a knowledge-control regime in that any product derived from PREDICT activities seemed classified information during my fieldwork. Not only could I (for obvious reasons) not have direct access to the raw findings or the sampling data. The Guinean staff were reluctant to give me access to the minutes from N'Zérékoré staff meetings, the slides of presentations I attended, the empty datasheets template, or the identification key for bat species. I even faced hesitations when asking for public *sensibilisation* material. My requests for documents, interviews, and my questions were not rejected, but I was often given elusive answers: the material was lost, unavailable or, most frequently, the person did not have the right to share. As it turns out, documents would either be granted me by someone else, or they would lie forgotten – within everyone's reach – in an untidy drawer.



Figure 16. PREDICT N'Zérékoré office headquarters and its garden

Through ethnographic attention, I learnt about the ways in which secrets are produced and maintained within such a knowledge-control regime. They were at least in part grounded in

legal obligations. The first employment contract signed by the agents included a confidentiality clause for all consultants. In the first year of the project, administration and recruitment were outsourced by Metabiota, the US company which preceded UC Davis in running PREDICT Guinea, to a Guinean service company called FootPrint. A standard clause, added by FootPrint to the contracts of every consultant, forbade the use or revelation of any confidential information that was ‘technical or regarding any other aspect of the activity, independently of it being written information or being available to the public’. The staff signed new contracts after Metabiota handed over to UC Davis, but the clause had strengthened a habitus more deep-seated than legal requirements, as it intersected with the ethics of dissimulation mentioned above.

Dissimulation preserved present and future resources in a context where ambivalence and ignorance prevailed (about staff obligations, about the scientific results of their labour, about a continuation of the project, etc.). As Dr Bilis put it, superiors ‘verified’ the reliability of their staff through testing their discretion. In doubt, secrecy – or even blatant lying – would not tarnish one’s professional reputation. I was told that sampling was never practised without full-body protection, but as we saw in Chapter 2, the employees’ mistakes were covered up and project managers were occasionally deceived. For months I heard that the collected samples were plunged into a cool box before being transferred to the nitrogen tank the same night, but I never saw a functional cool box, nor did I always witness the nitrogen tank transfer. What matters is not whether those were actual lies, but that I learnt to suspect that there was an ‘underneath of things’ (Ferme 2001) beyond my grasp (did the transfer happen later, in the dark of night?). This ambivalence prompted a process of interpretation, as happens in the context of everyday dissimulation among the Kabre in Togo (Piot 1993), that was not to be resolved through questioning on my part.

As a white student with no institutional affiliation that made sense locally, and with my livelihood not dependent on the project, my positionality embodied for many informants a risk of ‘betrayal’. The theme of betrayal is said by Mike McGovern (2017) to orientate Forest Guinean narratives that cast members of given ethnolinguistic groups as people likely to renege on their duties, such as typically Maninka and ‘white people’. My activities displayed an inquisitiveness at odds with Guinean speech norms. Until the very end of the project, some staff thought I may have been contracted out to report to their managers on their compliance with the protocol. I consistently explicated my ethnographic methods, but my outsider’s position assuredly granted me privileged access to Guinean and US managers, as my interactions with

Amine show. Staff took advantage of this rapport and asked me at times to act as a go-between. The first few months of fieldwork brought us close, and soon I was invited to all group meetings, training workshops, and afternoon tea. But I was deliberately excluded from the first disclosure meeting. Georg Simmel calls trust in a group's capability to keep a secret 'social solidarity' (2009 [1908]: 318). Dr Bilis's selection testifies that the social solidarity that underpinned the project rested on plural forms of solidarity: national and, above all perhaps, economic. The sense of sharing a group destiny through insecure employment might have directed the disclosing of the secret.⁶

But it may also have been that my ethnographic practice of circulating knowledge and engaging in the dynamics of scientific revelation inadvertently reinforced suspicion about the extent and depth of my research relations. One month before Dr Bilis's meeting, in June 2019, I presented the results of a rodent sampling study in N'Zérékoré. The CRIE team had pre-published, in May 2019, an article showing the high prevalence (23,3%) of Lassa virus in rodents captured in N'Zérékoré (Karan *et al.* 2019b). The authors concluded (*ibid.*,7): 'why has a Lassa fever outbreak not already emerged in N'Zerekore?' I thought that the team would be interested and printed out the article. Michel asked a few questions and scribbled down my replies: what was the percentage of positives at the central market precisely? The rest of the discussion was led by Dr Bilis and Mohamed – the latter, we remember, was in charge of zoonoses epidemiology at the National Department of Veterinary Services. They judged the study's conclusion improbable: given that outbreak response teams were prepared and positioned in every prefecture, it was unlikely that Lassa outbreaks would escape the attention of the ANSS (one case of Lassa fever had even been detected in Mamou in February). In Mohamed's view, the Russians certainly communicated their results to the ANSS this time and the 'outbreak' would soon be investigated. Dr Bilis and Mohamed's rhetoric connected the 'research' and the 'public health context', for once assuming the unimpeded circulation of information between the two realms. Their confusion over the object referred to by the signal – a pathogen prevalence, not an outbreak – shows the importance of context for determining the signification of iterable signals: if a finding was published and a signal thus passed the threshold of the 'public health context', people understood it as an event of public health significance, which only an outbreak could constitute.

⁶ This view would be confirmed by the fact that Dr Bilis resolved to invite me to the second disclosure meeting after Amine told him that he could.

To a certain extent, the process of revelation overshadowed the revealed content itself. In the revelations discussed, the one I orchestrated and the one orchestrated for me, the secret matter vanished behind debates over the exclusiveness of the information circulated. And yet such techniques of information control determine the epistemic content of findings.

D. 'Place-saturated' viruses

'What's the point? Place doesn't matter.' In his message conversation with me, some time before the revelation to PREDICT staff, Amine expressed his disappointment. PREDICT's 'scoop' was overtaken by the CRIE Russian team because the latter bypassed negotiations with the Guinean government. What Amine experienced as a scientific defeat annihilated PREDICT's interest not only in publishing, but also in organising a press conference and disseminating the finding in sampled sites (at least temporarily). To my questions as to why they would not communicate about the finding made in Guinea, Amine answered several times that 'where you find the bat does not matter.' This denial of the significance of place could be situated in relation to the way Ebola was configured by animal sampling and by Guinean *préleveurs*, respectively explored in Chapters 1 and 2. My aim now is to illustrate how viral discoveries were received in the places where bats were sampled, and with what ontological, epistemic, social, and ethical consequences for PREDICT managers and *préleveurs*.

The Guinean Bombali discovery did not unsettle the place-contagion synthesis of Ebola, which Chapter 1 has shown to converge on the figure of the bat, threatened by environmental change, hunted by Forest Guineans, and migrating across borders. 'Place does not matter', Amine specified, because 'bats move, they fly!' The vet, who had a background in epidemiological modelling, did not use the ecological notion of 'biogeography' or of 'ecological niche' (Escobar & Craft 2016), which refers, for environmentalists, to dynamically situated disease systems. He did not say that Guinea offered the same environment as Bombali to the bat species in which the virus was discovered. His response implied rather that a Bombali virus-infected bat could have flown from Sierra Leone to Guinea, and favoured epidemiological considerations of animal migrations across space as spreaders of infection.

This hypothesis was already replicated by PREDICT agents during *sensibilisation* activities: pointing at the horizon, agents introduced the new virus found in Sierra Leone, and

suggestively added: ‘bats can fly far’.⁷ But agents did not develop the theme of the migrations of disease carriers to blame foreigners, as is performed by the concept of contagion, which indexes the origin of diseases as foreign. Relocating the breeding of the potential disease in Bombali, a few hundred kilometres away from Forest Guinea, did not accentuate a xenophobic attitude towards Sierra Leoneans and their bats. As the agents explained during *sensibilisation*, Sierra Leoneans were ‘our neighbours’ and shared Guinean ways of life, a regional kinship rooted in a shared history and a shared environment. Yes, ‘our ancestors ate bats without becoming ill’, but Dr Bilis explained during a meeting: ‘before, [when travelling] from here to [the Forest Guinea locality of] Samoé, you could not see the sun. Now, [the savannah weather of] Kankan has come to Samoé. Everything changes, and Forest Guinea will soon be renamed.’ Bat migrations indexed a ‘place’ that was being transformed all over the region – in forest cover, temperature, zoogeography, etc. – rather than they were made to symbolise contagion as Amine implied. In fact, one could say that ‘place did not matter more’ because it had mattered all along, as an environmental, sanitary, and cultural locus of disease, and as a point of departure for contagion that was too near to be really blamed. For PREDICT agents, the bat, even when it moved, rather enshrined the ontological conception that Ebola inhered in a changing regional configuration.

Regardless, Amine did not question the relevance of PREDICT’s research and results before the Russian publication came out. The location of viral discoveries, understood as a political territory this time, unequivocally matters for scientists. Few data were available about the Bombali virus and its geographic distribution. A Finnish research team derived a publication from finding it in one single bat in Kenya ‘more than 5,500 kilometres from its original identification site’ (Forbes *et al.* 2019: 955). The Russian scientists detected it barely 400 kilometres away from Bombali, in N’Zérékoré and Yalenzou. Their publication did not specify numerical distances but the country where the virus was found. Entitled ‘Bombali virus in *Mops condylurus* bats, Guinea’, it merely clarified that the location was ‘far from [the] sites’ where the virus was previously detected (Karan *et al.* 2019a: 1775). As the national scale was privileged in assessing what counted as ground-breaking discoveries, PREDICT would not have been able to publish their finding in the Guéckédou prefecture (even though it was 200 kilometres west of N’Zérékoré, that is at a distance of the same order of magnitude as that

⁷ The species in which the Bombali virus was identified, the little free-tailed bat and the Angolan free-tailed bat, do fly far, but they are generally considered as nonmigratory species with an activity range of just above 10 km² (Noer *et al.* 2012). The southern Bombali district where the bats were sampled is, however, located almost 400 kilometres away from N’Zérékoré,

separating southern Bombali and N'Zérékoré). In virology publications, political borders matter more than ecological areas to define the contours of that deemed worthy of scientific interest. This is especially the case as they typically pay little attention to 'nonvirological factors' (Fearnley 2020b) such as plantation patterns and migratory flyways, and do not approach viral habitat with the relational complexity that permeates ecologists' research. But we might remember that Michel asked me about the prevalence of Lassa virus in the rodents of N'Zérékore central market when I presented the CRIE research. By contrast with Amine's reaction, 'place mattered' to how PREDICT staff understood Ebola, in relation to the ethical assemblage of vials, pictures, and tables examined in Chapter 2, in three ways examined in more detail below.

When informed about PREDICT's findings in Guinea, *préleveurs* always asked: 'where exactly?' They reacted distressed when informed that the Bombali virus was detected in Houndoni, a small village close to Guéckédou, located along the national road, in two bats captured 'on both sides of the road', as Dr Bilis added. They had time to ponder the discovery and its consequences as they regularly met for drinking tea during the long 'downtime' that characterised the last months of the project. They knew Guéckédou as a 'martyr city where people suffer a lot'. Populations underwent rebels' destructiveness during the civil war in Liberia, the bombing of Guinean forces in retaliation, and experienced life in refugee camps (Engeler 2020). The section of the national road in Guéckédou, dilapidated by the war and the rain, was an everyday cause for lament, as craters constrained cars and taxi-motors to perilous swerves. The city had been affected by outbreaks of cholera, a surge of HIV/AIDS exceptional for Guinea's hinterland, and it was the first city reached by the Ebola epidemic in West Africa. Houndoni itself was hard hit by the outbreak, in December 2013 already: from a population of about 300 persons, 32 inhabitants fell ill and only 5 survived. To PREDICT staff, a few of whom came from Guéckédou, places had a sociopolitical history. They were connected through webs of kinship and affinity, and as in much of sub-Saharan Africa, their existential infrastructure relied on the everyday labour of their inhabitants. The viral findings thus integrated, to them, an interpretative landscape more complex and layered than the one implied by Guinean decision-makers' fears of stigmatising certain localities. They wondered whether the Ebola outbreak might have thrived on Guéckédou's derelict infrastructure, or whether it had been introduced by the political elites, who neglected the area and seemed to torment its inhabitants? Structures and events were connected through encompassing aetiological narratives of diseases, dominated by the motif of a community of suffering. In a first sense, we

could say that virus-signs merged with the political construct of a landscape of affliction. They also strangely seemed to confirm the pertinence of selecting sites hardest hit by the human outbreak for investigating Ebola's animal origin, as addressed in Chapter 2.

Consequently, PREDICT staff approved of the decision that had prevailed among managers until then not to communicate in Houndoni about the findings. They felt it wiser to keep the connection between viral discoveries and location rather unspecified and to refer to the location in vague terms, such as 'in Forest Guinea'.⁸ Only Michel, whose team had been deployed in Houndoni three or four times, confided in me feeling responsible for sharing the information there that the Bombali virus had been detected. How could he conceal the news from their administrative partners, the guides, the families who hosted and cooked for them? In these places, the agents formed intimate ties and accommodated conventions of hospitality by embracing the role of the stranger. With this role came duties – ritual deference, resource distribution, etc. – whose respect was glossed by narratives of trust and betrayal. These stories oftentimes drew on the idiom of the avuncular relationship which frames Maninka 'strangers' as nephews who were, lately, renegeing on their responsibilities towards Loma 'autochthons', and Forest Guineans in general (McGovern 2017: 58). Betrayals entailed retaliation, and in the worst case, death for the traitors. Half of PREDICT's *préleveurs* were Muslim Guineans, most of them Maninka, who came from Guinea's other administrative regions. They dreaded more than anyone else the suspicion that they might have introduced the virus themselves. To carry out their activity, *préleveurs*, as we saw in Chapter 2, formed mimetic relationships that always threatened to turn them into enemies. A declaration of discovery could present a risk of scapegoating and reprisals but withholding information could also expose PREDICT staff. In a second sense thus, 'place mattered' as a locus of relational risk to *préleveurs*, who recast inhabitants in the familiar role of opponents to epidemic containment and its envoys.

In a third and final sense, virus-signals encoded the labour of PREDICT staff, and evidenced their professional virtues. Findings proved their skill in locating bats, as suggested by the metonymic relationship between bats' location and viral findings in a title of PREDICT's final report (2020a: 65): 'where you find the bats, you find the virus'. Very few bats were actually found positive for the Bombali virus, the most notable finding of the project in West Africa. PREDICT found three positives from over 4,700 animals sampled in Guinea, seven from over

⁸ This proposition could be carried out as there is currently no standard for specifying locations in scientific publications on viral findings. The CRIE article, for example, featured the GPS co-ordinates of the 'houses', 'granaries', 'school', and 'a gazebo in the yard of another house' where the positive bats were captured.

7,700 in Sierra Leone. Due to unknown, infinitesimal prevalence levels (the chance of detecting the Zaire Ebola virus in healthy wildlife was estimated to be less than one percent, PREDICT 2020a: 75), a very great number of animals were sampled, and colossal expenses incurred. Francis, who did not hide his cynicism when it came to the project, told me that he was ‘not surprised by the result’, given US investment in PREDICT’s research. In a way, he was relieved that their Guinean team, and not only the one in Sierra Leone, could boast about a viral discovery: it evidenced the quality of their *prélèvement* skills and their ability to extract bats from the right places (he had also started to doubt the quality of their samples after I enquired whether they were always stored in the cool box). Who knows, perhaps US managers would remember them when hiring *préleveurs* in a future project? Their scientific virtues were evidenced by the findings themselves, and the positive bats found in certain places came to matter as an index of *préleveurs*’ expertise and dedication to a rough labour.

The locations of viral discoveries became ‘places’ to PREDICT agents during moments of revelation, places which mattered. *Préleveurs*’ questions, moral dilemmas, and professional pride intertwine the different facets of Ebola that were constructed by their practices. The history of affliction which hang over the places where viruses were found was convoked by the discoveries. *Préleveurs* worried about having a moral obligation to reveal results because of the relationships they formed during sampling missions. ‘Positive results’ finally crowned their efforts to work exemplarily, and they were proud of their achievement. Viral discoveries were not only ontologically ‘place-saturated’ as a result of being made in bats which migrated across a region perceived as a community. They were also socially, politically, and ethically ‘place-saturated’ by the situatedness of *préleveurs*’ work.

Conclusion

PREDICT did disseminate its Forest Guinea findings in the end. In late August 2019, Sakoba Keita changed his mind about where the risk of information control lay. With the Russian team’s article published, a list of sampled sites and their co-ordinates in the Appendix, viral discoveries could escape their control and travel outside the infrastructure of *sensibilisation*. Prof Koné and Dr Bilis had just started touring all the project sites to announce the end of PREDICT in Guinea. As they were already on their way, they were sent a Q&A document and tasked with informing populations that even though ‘we don’t know if the Bombali virus has been transmitted to people or if it causes diseases in man or animal, ... results show that it can infect human cells’. Caught up in Conakry with my own goodbyes and last interviews before

leaving the country, I did not make the two-day trip back to Forest Guinea to join them. But I inferred from a few conversations how their audience reacted to the message. Many were afraid. They telescoped the disease-free pathogen and the disease known to be caused by the Ebola genus. The president of Koropara Ebola survivors' association angrily complained to me that PREDICT dared to publicise the discovery in Forest Guinea. Would the survivors of the 2013-6 epidemic not be stigmatised anew by such an announcement? Was the pathology not being dissimulated by the project? Was the past outbreak really over?⁹ If a new outbreak started, 'people would have doubts' about PREDICT's role in triggering it. Prof Koné's report about their last tour quoted the intervention of an elderly woman in Méliandou, who stood up during a community meeting to say: 'I'm scared. You see that we are all afraid. We are afraid because we cannot afford to continue your research and you are leaving ... Are these bats everywhere? More precisely, where do you find the positive bat? Are there many of them in Guinea?' Following Mondragón (2015), we witness the performative dimension of revelation in dramatic moments of visibility, when controlled revelations appear to control their participants. This invites us to finally reflect on the way in which Bombali, Houndoni, and other locations of viral discoveries are embedded, on the Upper Guinea Coast, in a cosmological geography enacted by public meetings.

Ramon Sarró's research among the Baga of Guinée Maritime (2007; 2020), like the works of Mariane Ferme (2001) and Rosalind Shaw (2002), grants techniques of secrecy a major role in protecting the Guinean landscape, social and ritual, from outside threats. Sarró explains that, at the end of the colonial period, converts to Islamic prophets roamed the country looking for devotees and 'rationalized the landscape' by clearing the sacred bush, destroying ritual huts, and building Islamic schools (2007: 263). Decades later, only Baga elders could still decode the signs scattered around a ruptured landscape and derived much power from this knowledge. In a 'second world next to the apparent one' (Simmel 2009 [1908]: 325), which elders could decipher, a manioc field was, in fact, a sacred bush, a mosque was a place of masquerades, and a football pitch was an initiatory camp. This idea of a dissociation between the space of ritual knowledge and the space of empirical experience, mediated by authoritative voices, can be productively engaged with in light of our description of virus-signals.

This dissociation rhymes indeed with how Guinean PREDICT staff and politicians conceived of the space of viral discoveries in which PREDICT evolved, and points to the impact

⁹ A concomitant outbreak of Ebola virus disease in the DRC added to their worries.

of that conception. The principles of intellectual propriety and material property, which traditionally underpin scientific etiquette and viral sovereignty in regulating the circulation of samples and sequences, were unsettled by the state's assertion of authority over the circulation of viruses as signals between the research and the public health contexts, and subsumed by the principle of confidentiality. The disjunction between the contexts of research and public health was further cultivated by the habitus of PREDICT agents, grounded in the Upper Guinea Coast politics of discretion and professional solidarity. As a consequence, the sociopolitical community living within Guinea's borders was actualised, dissociated, and protected from the space of epidemic potential formed by viral discoveries. 'Place might matter' differently to PREDICT US managers and Guinean *préleveurs* in the way they configured Ebola in relation to bats. Some information was certainly disclosed by *préleveurs*, like the Baga elders who leaked information about ritual places to the youth. But the Guinean pandemic public was by and large excluded from revelations. Information control ruptures the landscape, or rather, it obstructs something like a cosmological connection between the location referred to by scientific discourse and the empirical place experienced by inhabitants. Revelations are better thought of as moments when iterable signals fail to transmit, and generate obfuscation, remoteness, and fear that much is hidden underneath. In the heroic language of a subtitle from PREDICT's final report (2020a: 76), the viruses that the project searched for were but 'hidden in plain sight'.

Chapter 6: Anticipate

In August 2019, I invited staff to a discussion of some issues that arose in my anthropological research. Replicating the workshops held in PREDICT N'Zérékoré headquarters over the preceding two years, I planned to have the meeting followed by a lunch of fried rice. Through their interventions during my presentation, the agents yet steered the meeting in quite another direction: they wanted my appraisal of the 'positive and negative consequences' of their work. The discrepancy became patent when I finally introduced my most abstract research question, in a slide I had entitled 'scientific futures'. I intended to contrast the promise of science-based epidemic prediction with the everyday strategies of anticipation deployed by project employees for securing a future under conditions of epidemiological, political, and economic uncertainty. By way of illustration, I had selected a picture of Norbert, a good-humoured *préleveur* and vet from Kissidougou who loved to chat about his ambitions. Often jokingly introducing himself as 'his excellency the future Minister of Animal Farming', Norbert invested part of his pay into launching a poultry farming business, which he anticipated would qualify him for high-level political positions. In the shadowy photograph, which I took during one sampling mission at night-time, Norbert lay slumbering in his overalls while waiting for bats to leave their roost. I (quite clumsily) thought of the picture as a metaphor for his future-orientated fantasies. Reactions were not long in coming. 'A sleepy future scientist!' someone sneered. Dr Bilis laboured the point: 'PREDICT seeks to minimise the coming catastrophe, but here is a dishevelled agent, with an open uniform... Is this hygienic? PREDICT should not trigger what it seeks to avert'. Understandably, Norbert took offence at my using his picture in this way. It was not before the next day that excuses were exchanged, and we reconciled.

My blunder owes a lot to a misjudgement about the way the visual was most likely to be interpreted, and the power of biosecurity to obscure allegories. But it is also partly rooted in the polysemy of the French expression *futurs scientifiques*, the title of my last slide, which both means 'scientific futures' (the meaning I intended), and 'future scientists'. This chapter handles temporal frictions in the lived economy of virology research, as they were experienced by *préleveurs* identifying as *scientifiques*. It builds on the preliminary finding I presented to my interlocutors in August 2019, that several orientations towards the future – 'predicting' an epidemic catastrophe, providing for the near-future livelihood of one's family, planning for career advancement, etc. – were entangled in the timespace of animal sampling. I now take a closer look at how these distinct futures were related, politically and epistemologically. Indeed,

the incident during my presentation, and Norbert's anger at what he perceived as a betrayal, prompted me to further reflect afterwards on the mixed feelings – anxiety, responsibility, cynicism – of educated Guineans in relation to projects of future-making in the last years of Alpha Condé's presidency. As we will see, the everyday activities of *préleveurs* explored in the thesis, and the epistemologies they constructed, were tied to the way they orientated themselves towards the future, personally and collectively.

This last chapter draws on the anthropology of epidemic temporalities and other experiences of time in Africa. Recent ethnographies have engaged with the temporal experiences of scientists in Africa over the second half of the twentieth century (Geissler 2011; 2015c; Geissler, Lachenal, Manton & Tousignant 2016; Lachenal 2011; Tousignant 2013; 2018). Their stories about the ebb and flow of research funding and activities, and their feelings of hope, nostalgia, and disappointment, provide a point of departure to rethink Charles Rosenberg's dramaturgical model of epidemic times (1989). US historian Rosenberg proposed that epidemics are narrated as dramatic events, driven by a linear forward movement with a set beginning, middle, and end. Historians reflecting on epidemic narrations in light of the COVID-19 pandemic have noted that Rosenberg's model is a situated view (Fissell, Greene, Packard & Schafer 2020). It would invisibilise the experience of marginal communities and postcolonial locales (Geissler & Prince 2020; Lachenal & Thomas 2020; Sivaramakrishnan 2020). Heeding their call for more complex understandings of the temporal quality of epidemics, I find inspiration in anthropologist Wenzel Geissler's attention to the 'compression of multiple temporalities within lived-in space, open to continuous interpretation and contestation by multiple actors' (2015c: 144), which he witnesses in sub-Saharan sites of transnational science-making. As Chapter 1 has suggested, since the Ebola outbreak, scientific investigations and the global inequalities embedded in them have embroiled many Guineans, who are connected in some ways to the outbreak and epidemic surveillance, in layered temporalities.

There is one significant difference between the palimpsests of equipment and projects in the African labs considered by Geissler, and the materialities entailed by PREDICT's work. PREDICT did not aim to leave a lasting influence on science in Guinea through long-term capacity building, as French development and scientific co-operation, for example, have aimed to do for decades (Lachenal 2011). Accordingly, what makes PREDICT agents *scientifiques* may not have so much to do with the set of routinised practices and outdated equipment common to colonial labs, and more contemporary 'para-state science sites' (Geissler 2015b). As indicated in Chapter 2, their scientific ethos was in direct opposition to the supposed

illiteracy and superstition of most people in Guinea. Their defence of scientific claims against ‘beliefs’ would be further transformed by the epistemological training, management practices, and visions of epidemic time that travelled with PREDICT. I suggest that, in the end, this ethical work on their *scientifique* identity alleviated PREDICT staff’s propensity for cynicism about their employment in outbreak preparedness.

The chapter first portrays how Guinean *préleveurs* attempted to synchronise their life trajectories with the professional and economic futures opened by epidemics. It then looks at the training of PREDICT Guinea staff in understanding where emergent infectious diseases (EID) come from and in managing their personal time – and how this training was shaped by the Guinean arc of modernity. In the end, *préleveurs*’ dreams and professional decisions were underpinned by a temporal politics, which, the chapter concludes, reversed the ontology of EID and fed into how the middle-class anticipated further epidemics in Guinea.

A. Epidemic times

‘You will not die in PREDICT; all this is already history.’ Michel, Norbert, and I were sitting in a faux-velvet couch in the living room of Jean, a former PREDICT *préleveur* from Guéckédou, laid off after the project trimmed the workforce for conducting *sensibilisation*. Jean urged Michel to forget his grudges against Dr Bilis’s management style. He had to move on and turn the short-term contract into a milestone for future accomplishments, an act of temporal manoeuvring which the Guinean middle-class came to call ‘planning oneself’ (*se planifier*).¹ After leaving Jean’s house, we slowly walked along the unpaved road towards the city centre. Jean, who had resumed his internship at the Prefectural Department of Animal Farming, wondered out loud whether their hard work with PREDICT had been of any value. Even if viruses were found, would the government agree to disclose the findings? He worried as he anticipated that the Ebola virus disease would return to Guinea, as it had in all the countries it had stricken so far. Norbert went further: ‘while we are supposed to be predicting [epidemics]! If Ebola comes back, how will we look?’ Michel abruptly interrupted their musing: ‘Ebola must come back! (*Ebola n'a qu'à revenir !*) It’ll bring jobs to everyone’.

¹ While ‘self-planning’ is akin to what is glossed as personal development in English, and skill guides can be popular among the Guinean male middle-class, *se planifier* more narrowly refers to budget management in prevision of future expenses, such as for one’s marriage, one’s education, etc.

Michel's wish for Ebola's return may have been intended as a cynical jibe. But it conveyed his awareness of a new conjuncture for Guinean health professionals. The Ebola outbreak, and more broadly the advent of One Health and biosecurity in West Africa, offered opportunities to Guinean graduates in the sciences and medicine. In the 1990s-2000s, the epidemic of HIV/AIDS triggered an explosion of interest and investment in global health (Crane 2013), but that wave did not reach Guinea, comparatively less affected by the disease (De Cock & El-Sadr 2015). With Ebola, their turn had come. Scholars of global health in Africa show that the value of transnational medical research lies as much in health gains as in the biosocialities and regimes of exception it creates, which benefit livelihoods and local economies (Kelly & Geissler 2011; Prince 2013). After the Ebola outbreak, disease surveillance became a booming sector, with several humanitarian and scientific projects committed to strengthening West African health systems and supporting Ebola survivors. Guinean graduates consciously tried to fashion their professional profile to boost their employment chances. Doctors in human medicine and biology graduates were on the lookout for qualifications in public health. Vet doctors wanted to train in frontline epidemiology, wildlife surveillance, even public health if they could. They tried to channel their CVs for future employers, and not infrequently asked me for help in formatting them and drafting cover letters. The post-Ebola surge of projects furthered anticipatory strategies in line with what Lotte Meinert and Susan Reynolds Whyte (2014) have called 'epidemic projectification' at the height of the HIV pandemic. I now examine PREDICT agents' efforts at 'self-planning', a planning informed by the 'epidemic time' they experienced during and after outbreaks of infectious diseases in Guinea. Nuancing understandings of cynicism as a social poetic of disillusion (cf. Navaro-Yashin 2002; Steinmüller 2016), I suggest that epidemic temporalities, institutional and phenomenological, configure individuals' capacity for action.

Michel, a Kpelle biologist, hailed from a rural town near N'Zérékoré. A bright student, he was precautionarily sent away from his home village by his father on the night when the results of his entry examination for secondary school came in: he was first out of more than fifty students. Protected from envy – and the witchcraft that sanctions it – he was placed under the tutorship of a paternal cousin, who worked for the Ministry of Housing in Guinée Maritime. He later returned to Forest Guinea to study for a bachelor's degree in biology at the University of N'Zérékoré, where he graduated top of the year again in 2013. After a couple of contracts as a community health agent and a controller at an Indian steel manufacturing plant, he joined the 'Treatment Commission' of the Ebola response co-ordination in the Dubréka prefecture in

2015. His employment was facilitated by his having already worked, in 2012, as a hygienist in the Cholera Treatment Centre of Dubréka. The Guinée Maritime city displayed the last clusters of the Ebola outbreak in 2015. That year, for eight months, Michel tirelessly referred suspected cases, investigated epidemiological contacts, and sampled the bodies of people who died at home from an unknown cause.

He talked excitedly about his experience in the ‘emergency’. He vividly remembered the time when an ambulance was set on fire by young people following a demonstration in Dubréka against the Ebola response, in June 2015. He was not infrequently verbally attacked while he negotiated with the relatives of the dead to take *prélèvements*. Michel’s experience of the outbreak – or his memory thereof – did focus on the decisiveness of his actions in the compressed time of emergency, when ‘the outcome remains uncertain and action still promises to make a difference’ (Adey *et al.* in Samimian-Darash & Rotem 2019: 912). He acutely remembered having to mitigate grave dangers through his acts, though it was not the danger of infection itself that he prioritised (although, out of his four co-workers in Dubréka’s lab, two died of Ebola), but the danger represented by distrustful interactions. Nevertheless, the emergency and its consecration of action, from a phenomenological perspective, were suspended in his past. From 2016 onwards, Michel was more directly preoccupied by the institutional fallout of the Ebola outbreak: he planned for recurring emergencies and the associated job opportunities with no fear of the risk of attack. Using his pay, he bought a piece of land in Dubréka and built a four-bedroom house, where he wanted his mother to spend her old age. He sensed that his experience would qualify him for health project management, where he anticipated better paid opportunities than in lab work. Michel took a short course in public health at a Conakry private university, where he graduated first again. His devotion and merit were not rewarded when his hopes of joining the state service were dashed: he was not ‘matriculated’ in the health administration despite the Guinean state promise to enrol outbreak responders. Michel was very frustrated by what he perceived to be an ethnicised selection process detrimental to Forest Guineans, and he left Dubréka full of resentment. Luckily, this coincided with his recruitment by PREDICT as *préleveur*.

The prospect of regular pay for a couple of years fortified his resolution to further ‘invest in his future’. He bought himself a laptop, relentlessly applied to public health courses in foreign universities – in Burkina Faso, in the Ivory Coast, in Egypt, in France – and, towards the end of the project, to many jobs in health project co-ordination for international projects. Other PREDICT agents went into service business (Francis had a hairdresser shop) or trade (female

agents sold bedsheets or biscuits), but Michel saw no future in these temporary sources of cash. He started an oil palm plantation in his home village, since palm oil sold at a better price on trade markets than cacao or coffee. He did not intend this cultivation to profit himself but more so his relatives, whom he thought could become self-sufficient through their own labour on his plantation. Michel, the eldest of his family and the only one with formal employment, supported them with food gifts and the education of his siblings (his brother studied to become a health agent). His network of dependents expanded when his girlfriend bore him a son in 2018, a little too soon in his opinion. He sent her remittances for the child and her studies in a community health school, an education which many PREDICT agents paid to their wives. Michel always sent everyone less than asked for, with the explanation that ‘projects do not last forever’. In 2020, he joined the COVID-19 response in Conakry, before being contracted by a French foundation to train public lab workers in biosafety. After a few job rejections in 2021, and while waiting to hear about his application to Bioforce, a French-speaking humanitarian training programme, he wrote to me that he was ‘currently doing a little pharmacy’, another common prospect for biology graduates.

Michel’s calculations echo those of the youth met by anthropologist Michelle Engeler in her research on sociopolitical transformations in Guéckédou in the 2000s (2020). Young graduates there grew up in turbulent political circumstances and had few economic opportunities in sight, so they learnt to improvise with various income-generating activities. They simultaneously founded NGOs, engaged in petty trading, cash crop farming, and unpaid internships in local administrations, activities also undertaken by PREDICT staff during their contract. Michelle Engeler names her book after the ‘meandering’ quality of these life trajectories. She draws on the concept of ‘vital conjuncture’ (Johnson-Hanks 2002): short-timed durations where socially structured possibilities portend a potential for transformation. Michel similarly conceived ‘vital conjunctures’ from Guinea’s recent epidemic history. He came of age in a country affected by infectious disease. Cholera had triggered a humanitarian response in 2012, and so did Ebola in 2014-6, COVID-19 in 2020-2, and Ebola again in 2021. Michel’s professional involvement in epidemic management and preparedness endowed him with a professional capital which he managed – both to secure a wide family network, proportionally expanding with resources as in many African contexts, and to seize opportunities for career growth.

Outbreaks represented moments of potential, when Michel could orientate himself towards his future and the many ends that he strove for (see Bryant & Knight 2019). He did not see

plural horizons as incompatible and thus cultivated different orientations towards them: he still hoped for secure state employment, he counted on new outbreaks and job opportunities with international organisations, he dreamed of expatriating himself to study, and he speculated on cash crops. To adjust the concept of ‘vital conjuncture’ to this concatenation of futures, one could find inspiration in theoretical reflections on the radical indeterminacy of ‘events’, which has been drawn on to think through epidemic temporalities (Lynteris 2014a; Meinert & Kapferer 2015; see Roth 2020 for a review). Michel saw epidemic events as indeed opening up plural potential futures, as long as he synchronised his trajectory with the disjointed, emerging tempos of economic life and health crises through self-planning. Through sensibly allocating his resources of time, money, and connections, he could leverage his experience in emergencies to gain better-paid positions in health projects and possibly ‘matriculation’ as a civil servant – if he were able to alternate vocational training and private undertakings wisely.

PREDICT staff self-planning resembled the intertemporal acts of health workers and patients in projectified economies of global health. Particularly in countries with high HIV prevalence, people have learnt since the 1990s to juggle with their expertise and biocapital to turn projects into ‘therapeutic clientship’ (Whyte, Whyte, Meinert & Twebaze 2013), a long-term patron-client relationship with external donors aimed at generating a stream of resources. The subjectivities engendered by HIV/AIDS are nevertheless today aligned with what the disease has come to be: a long-term syndemic, managed and experienced as a chronic disease (Whyte 2014). Thus, projectification in HIV-affected countries is relatively decoupled from the epidemiological situation on the ground, as shown by Adia Benton for Sierra Leone (2015). As a result, epidemic epistemologies are rather irrelevant to people’s self-planning in these locales (see Lynteris 2014b: 29). But Ebola seems to differ: its sudden spread is more visible as the disease sickens and kills more rapidly than AIDS, and epidemic response takes the form of crisis interventions. The epidemiological temporality of the disease, its ‘viral speed’ (Nguyen 2017), induced, in the trajectories of Guinea-trained *scientifiques*, a bridge between anticipatory calculations and self-planning. Their cynicism, if some cynicism there was, was epistemologically grounded. *Préleveurs* indeed learnt to theorise modern epidemics and actively manage their time whilst working for PREDICT; this was an ethical and epistemological work that shaped their expectation of future outbreaks.

B. Theorising EID as Guinean *scientifiques*

‘Medicine, science, these are all risks for emerging diseases.’ In the same room I used for my presentation, Prof Koné elucidated ‘risk factors’ behind the emergence of new diseases:

Look, we do too many studies! Those who are good in science, they go far to get big bush animals, for the sake of research. And they compromise themselves if they do not act safely ... As soon as there is war in a country, we throw viruses as weapons. Our [bat] samples, no country wants them. If one sample has Ebola, everybody has their eye on you, because this is a biological weapon.

Biowarfare and scientific research were what Koné termed ‘intrinsic factors’ of disease emergence. In his speech they took precedence over ‘behaviour change’, by which he meant transformations in the food industry and biotechnologies, and ‘environmental factors’, which encompassed global warming, trade globalisation, and deforestation.² But an instant later, he moved on to a diagram highlighting mechanised transportation: ‘look at this plane, this vehicle, and the globe. The world has become a tiny village. If someone has Ebola in Guinea, they take the plane and go to the Antarctic or Australia; two days, and they spread the disease. If they have money, they travel around the world, they can distribute.’

Prof Koné, PREDICT’s country co-ordinator, drove a few times to N’Zérékoré to train PREDICT agents and delegates from local administrations in the newest approach to risk communication, with an emphasis on EID management. He intended these sessions to be like ‘exchanges among scientists’ (there he used the word *savants*), and so their content largely differed from the official zoonotic disease narrative of the outbreak, the culturalist version advocated by Dr Bilis, the bat book focus on ‘contact’, and the *sensibilisation*’s emphasis on hygienic consumption. The EID framework itself is already a synthesis between notions of civilisational change driving disease emergence, and understandings of contagion as the key conduit for pathogen spread – there is nothing surprising about its contradictions. The conflicting aspects of Koné’s discourse need to be resituated however in relation to the epidemiological history of Guinea. I hold that there are ethical implications in his intention that Guinean *scientifiques* appropriate his heteroclitic conception of EID causality. I bring Koné’s views into a dialogue with anthropologist Charles Briggs’ (2004) contention that Venezuelan

² These categories approximately reproduce those of the 1992 Institute of Medicine report on emerging infections, later refined by the CDC (Morse 1995). Only the vocabulary of behavioural science was employed in a wider sense by Prof Koné than Stephen Morse, for whom it almost strictly designated sexual practices.

indigenas, through their conspiracy theories for the cholera epidemic of 1992-3, ‘theorized modernity conspiratorially’, in contrast with public health officials. According to a much-rehearsed argument about the formation of political subjectivities through conspiracy theories and occult cosmologies, subjects make themselves modern by adopting global frames of reference for their ills (Geschiere 1997; Sanders & West 2003), frames which are nevertheless prevented from circulating globally through gatekeeping mechanisms (Briggs 2004). Guinean officials for their part circulated outbreak origin narratives deemed conspiratorial in Guinea, such as the idea that wildlife samples are ‘bioweapons’. We will see how they were able to ‘purify’ these stories of political critique and found a ‘community of complicity’ (Steinmüller 2010) upon them.³

Prof Koné, putting on the garb of the Muslim consultant from the capital, always wore a smart synthetic fur hat and an impeccable bazin ensemble at these workshops. His training style was engaging and non-hierarchical, but the audience made few interventions while he read his sixty slides per module in a voice in which dramatic intonations failed to match content. In the afternoon, participants were prone to some lethargy, as the poorly ventilated hall acting as a meeting room did not have air conditioning (the only AC system had been installed in Dr Bilis’s office, to which Prof Koné and he retreated during breaks in the training). Not infrequently, the heat and the purring of the generator, which had to be turned on for the projector to function, induced somnolence in older civil servants (and the anthropologist), who were served an egg sandwich at 10 a.m. and a rice dish for lunch.

³ Anthropologist Hans Steinmüller designates by ‘communities of complicity’ a form of sociality, in China, where belonging is expressed by gestures of embarrassment, irony, and cynicism, aimed at revealing that one knows when and where to voice disbelief.



Figure 17. Prof Koné training administrative employees in risk communication in Macenta's Prefectural Department of Health

Participation was at its highest on the first day, when the topic of emerging diseases was being covered. Prof Koné articulated an ambivalent discourse about them, which interlaced contradictory epidemiological histories. Participants would memorise his concise distinction between ‘truly new diseases’, such as Nipah virus disease, SARS, and the avian flu, and ‘former new diseases’, such as sleeping sickness, tuberculosis, malaria, and haemorrhagic fevers (although sleeping sickness and human malaria are, in fact, rarely considered emerging diseases by microbiology experts). But five minutes after this rendition of the narrative of unpredictable re-emergence, the presentation turned to reproducing the colonial narrative of conquest over a diseased world. Koné displayed black-and-white pictures of African children lined up for vaccination and commented: ‘our parents did not [want to] accept [vaccination], but this contributed to reducing infections.’ Instants later yet, he was ironic about the ‘malaria mafia’, by which he derogatorily referred to organisations acting against malaria, such as the Global Fund, the Unicef, and the World Bank. He summed up their action as ‘giving out mosquito nets and medicines’ to poor countries to bolster the Northern pharmaceutical industry. In his

opinion, only sanitarian investments in pipe networks could bring malaria under control, not the technologies such as vaccination he praised just before. Nevertheless, as he said in the same breath, ‘if you jail those who defaecate and urinate on the street, you destroy the reservoir, and there is no malaria anymore.’

Frictions within Koné’s discourse, between the triumphalist narrative of eradication and the resurgence of EID, between praising sanitarian reforms and indicting loose conducts, could be doubtlessly pinned on asymmetries in the circulation of disease narratives, what Briggs and Nichter have called their ‘biocommunicability’ (2009). Koné drew on published material developed for the United States: to illustrate his points, he had picked war-time propaganda pictures for penicillin from the CDC media library, and inserted a graph showing the falling rate of infectious diseases-related mortality over the twentieth century. The graph was taken from an article ‘On the trends in the health of Americans during the 20th century’ (B. Guyer, Freedman, Strobino & Sondik 2000), but Prof Koné assured his audience that it was ‘valid elsewhere’.⁴

Beyond questions of the authority of US epidemiological narratives presented as universal, there remains great uncertainties concerning the shape of disease curves in Africa. Historical epidemiologists have long debated the relation between demography and epidemiology on the continent (Fetter 1993; Turshen 1977; Webb 2013). Prof Koné’s distinction between ‘true novel diseases’ and ‘former novel diseases’ pointed in the direction of counterfactuals to the EID theory. It is not only that many diseases which have recently wreaked a high death toll in Africa did not emerge recently. Historians have also traced much of the twentieth-century burden of infectious diseases in West Africa back to colonial penetration and extraction (Akyeampong 2006; also Farmer 2020). In Guinea, flies would have followed the horses sent by the French armies to bring down the Wassoulou emperor Samori Touré and brought diseases (sleeping sickness and onchocerciasis) which wiped out entire villages in their wake (Courtin *et al.* 2008). Though not ‘imported’ diseases, yellow fever, smallpox, typhoid, and epidemic meningitis killed more people during colonial times. The 1918-9 influenza pandemic reportedly reached Forest Guinea through the colonial trade of palm oil that connected the region to Freetown and its harbour (Béavogui 2001: 175). After the World Wars, West African ‘tirailleurs’ who returned from European battlegrounds are thought to have introduced bacterial diseases, such

⁴ This a doubtful statement, since, as a gross measure of comparison, epidemiologists have recently – pre-COVID-19 – related half of all deaths in Africa to infectious diseases, compared with only 2% in Europe (Fenollar & Mediannikov 2018).

as syphilis and tuberculosis, which further spread with urban growth and the mining economy after independence. The Seventh Pandemic of cholera would have reached Conakry in 1970 with Guinean students who travelled back from the Soviet Union (Echenberg 2011: 112-4). In 1994, its resurfacing was attributed to the concentration of Sierra Leonean and Liberian refugees in NGO-manned camps and the poor sanitary conditions there (ibid., 130). Guinea's epidemiological history – and its scholarly narratives – in fact invert the EID paradigm, historically and spatially. Many 'novel diseases', 'truly novel' and 'former novel', seem to have entered or spread in the Upper Guinea Coast owing to colonial intervention; they did not emerge in African locales and then spread to Europe and North America.

Prof Koné did not explicitly articulate these counterfactuals, which would have led him to conclude that there was nothing novel about the geography of EID in Guinea, and potentially make a postcolonial critique of communication material. He mobilised instead salient yet conflicting aspects of his experiential knowledge to make sense of the material he collected (and had likely been sent by PREDICT US managers). This epistemological patchwork can be seen as materialising the opposing dispositions of Prof Koné's epistemic community, in accordance with works on the anthropology of ambivalence (Jovanović 2016; Petrović 2018). Koné and his *scientifiques* colleagues were in fact caught between their nostalgia for authoritarian interventions in Guinea, and their attraction to the EID framework as a universal theory of risk.

On the one hand, Koné appealed to the collective memory of the older generation in the room, when he extolled earlier eradication campaigns. He recounted how, in an undated past, nurses came to 'palpate pupils' lymph nodes every Thursday' for sleeping sickness screening and helicopters flew over Conakry to 'spray' – presumably DDT insecticide – on his neighbourhood. Afterwards, 'you would see no mosquito for one month!' and malaria would temporarily vanish. These memories hint at the alleged efficacy of dictatorial health policies under the First Republic of Sékou Touré, as underlined by an elderly administrator who chuckled: 'But today, democracy is here!' Medical anthropologists underline the violent, 'necropolitical' legacy of the sanitarian management of epidemics of sleeping sickness, smallpox, and leprosy precisely through such campaigns (for Guinea, see Gomez-Temesio & Le Marcis 2017). The Ebola outbreak management reproduced their 'disease-focused' rather than 'patient-focused' response to epidemics. The epidemic response rhymed with other forms of state violence, such as the detention of political opponents during the regime of Sékou Touré, and by the regime of Alpha Condé as he geared up for a third mandate in 2019. But Prof Koné

and the workshop participants nostalgically looked on large-scale preventative efforts against endemics and contrasted them with the self-interested plots of international public-private partnerships (see Kamat 2008; Masquelier 2001). They formed a community of complicity that revelled in sharing their nostalgia together.

Prof Koné did not so much blame the oppressive structures of colonisation, war, and neoliberalism which, according to epidemiologists, have provided a favourable context for the emergence and spread of Ebola in his country (Bausch & Schwarz 2014; Wallace & Wallace 2016). He preferred to look at the EID theory as a universally applicable theory of risks and emphasised ‘intrinsic factors’, which inhere in biotechnologies. He presented cancer treatment, tissue transplantation, energy drinks, and genetically modified organisms as breeding resistant microbes and new pathogens. It did not matter to him that cancer treatment was not generalised in Guinean public hospitals, that organ transplantation was not performed in the country, that food was mostly produced through small-scale family farming, and that there was hardly any information about the use of GMOs in Guinea. His discourse flattened the space of modernity, a globalised place where biotechnologies seemed to circulate evenly. Guinea seemed to belong to this space by virtue of having seen the emergence of Ebola in West Africa, a paradigmatic EID. When mentioning the risk of biowarfare, Koné employed the first-person plural rather than the third-person plural: ‘we throw bioweapons’. With a mixture of shame and pride, he confessed his preference for air conditioning and his taste for the energy drinks that he blamed. Awareness of belonging to Conakry upper class only seemed to come as an after-thought, when he added that ‘Guineans ... *if they have money*, they travel around the world, they can distribute’. Prof Koné included his Forest Guinean audience, which resided in peripheral cities, in the community that he thought lived with biotechnological modernity. He thus played on the nationalism and dream of modernisation which drove support for Sékou Touré’s health policies. Nostalgia fused with their appraisal of technological risks in that they both gestured towards Guinea’s belonging to the modern world order.

Prof Koné and the Guinean middle-class employees and bureaucrats who attended the meetings did not deride rumours about epidemic origins. They did not see the idea that scientists could trigger an outbreak by sampling wild animals as irrational. As suggested in the Introduction, the conspiracy theories that circulated about disease origins in Forest Guinea indicted foreign aid workers, the Israeli mining magnate Benny Steinmetz, and Alpha Condé’s genocidal intent. Like those of the *indigenas* met by Briggs (2004) in Venezuela, these rumours point to the extractive logics of global capitalism and structural violence. Venezuelan officials

nevertheless refuted them, voiced culturalist explanations and blamed the unsanitary customs of *indigenas* for the cholera outbreak. Although, as we saw earlier, PREDICT officers endorsed a culturalist version of the zoonotic disease narrative at times, Prof Koné – an epidemiologist by training – had an intimate knowledge of its impasses (he shared his personal disbelief with me in the privacy of his Conakry office several times). In large meetings with fellow *scientifiques*, unlike Venezuelan officials, he sketched narratives of biowarfare and pathogen manipulation not so dissimilar from the epidemic-time, unconventional explanations for the epidemic’s origin. His socio-economic background, professional activity, and self-identity as a scientist still purified such constructions. Koné and his colleagues allowed purified rumours to circulate as scientific claims: they legitimated them by removing the critique of the international political economy entailed by conspiracy thinking, and consecrated them as evidence that they were, after all, also ‘modern’.

Through the cynical laugh which punctuated his speech, Koné signified the ambivalence of his own power position, as a Guinean man who earned his PhD from the United States and had been working with international organisations thereafter. He succeeded in enrolling the other workshop participants in this complicit posture, as the choral laughter which echoed his snigger indicates. He refused to indict modernity as a situated product of Northern industrial history and overtly accuse foreign powers of spreading diseases. By rationalising EID as the consequence of a supposedly global change in lifestyles and widespread resort to biotechnologies (including energy drinks), he performed himself as a cosmopolitan subject, and invited others to follow suit. Such epistemologies became the common sense of a community of complicity which participated in and thrived on the economy of scientific extraction that they partially denounced.

C. Managing time

PREDICT managers did not restrict their teaching to disease origins. It was not only their workers’ outlook on modernity and its ills which they fashioned, but also their professional ethics. They were never short of proverbs and life tips: ‘By failing to prepare, you are preparing to fail.’ ‘To govern is to foresee.’ ‘Five prayers a day, this is planning.’ ‘Tell yourself that you have sixty years of normal life, so plan consequently. What comes after is God’s gift.’⁵ By

⁵ Many educated Guineans keep an anthology of aphorisms in their personal notebooks, borrowing as much from European and American sources of the last centuries, as from Islamic faith and self-help manuals.

posing through such aphorisms as examples of foresight, Prof Koné and Dr Bilis transformed PREDICT workshops and routine meetings into venues for proselytising aspects of the ‘time management’ of management studies to project employees. Without presupposing that PREDICT workers were subjugated by a supposedly foreign ‘disciplined time’, I now examine techniques of time management at PREDICT Guinea and highlight their stratification in relation to the modernisation discourse of post-independence Guinea.

It has been noted that development interventions foster in their workers and recipients an aspiration towards a ‘developmental future’ (Davidov & Nelson 2016). Temporal micro-practices such as timeliness effect this, by contrast with a so-called local time. Such temporal classifications have been increasingly questioned by works in the anthropology of time (Bear 2016; Pels 2015). They have been studied as historical interventions themselves, which manifest inequalities in the inclusion of certain groups to the narrative of modernity. I am interested here in how these historical classifications interlace with people’s techniques and ethics of time. In N’Zérékoré headquarters indeed, Dr Bilis was the major advocate of the time of ‘punctuality’. By virtue of having lived abroad for seven years (in Cuba, whose revolutionary discipline he praised), Dr Bilis felt compelled to act as a temporal broker between the ‘African time’ of PREDICT Guinea and the ‘American time’ of PREDICT California headquarters.⁶ He was responsible for the enforcement of ‘time management’ (*la gestion du temps*), a mission he implacably executed. You were not ‘on time’ if you arrived ‘one minute before or one minute after’ the given time, as indicated by his own phone clock. He apologised when meetings started ten minutes later than planned and acted offended when the project driver came to pick him up earlier than ordered. His conception of timeliness did not align with the social production of temporal alignment through tasks, but with a ‘disciplined time’ measured by technologies. Historian E. P. Thompson (1967) saw this orientation as interconnected with the transformation of working habits during the British Industrial Revolution. In this Guinean context, ‘punctuality’ was incessantly disturbed by ‘emergencies’, a word Dr Bilis always pronounced with an air of importance to designate a report or an update he had to submit to the US headquarters. ‘Emergencies’ would disturb his careful planning and delay even short meetings with the staff by up to several hours (for which he did not apologise). Through timekeeping technologies and tools of acceleration such as ‘emergencies’, the PREDICT project sought to inhabit and reform the temporal habitus of its staff (also see Piot 2010). As *scientifiques*, they

⁶ Whilst PREDICT was not a development project but a scientific investigation, it adopted the model and rhetoric of development-orientated projects.

were not only to occupy a social status or master epistemic content: they were to demonstrate a temporal ethics.

Perpetual admonishment to punctuality did not find much staff support. ‘Respect for time planning’ was a bone of contention over responsibilities for delays in activities, debated at length during debriefing meetings, according to the timed meeting minutes I was able to consult (one report started with the sentence: ‘the field manager and the eleven agents were all present in the room at 9.20 a.m.’). The agents argued over whether, during a sampling mission, they had arrived ‘on time’ at some administrative office if they had to wait for the subprefect to finish his lunch. More shockingly to staff, Dr Bilis scheduled missions looking at calendar days without taking weekends and bank holidays into consideration, ‘since there are no Sundays in this project’, he said; he treated missions themselves as emergencies. PREDICT agents might have arrived in a village on a Saturday but were not able to work before the Tuesday since formalities demanded that they meet local authorities on the Monday. Dr Bilis euphemistically called this: ‘to be victims of our hastiness’. ‘Disciplined time’ failed to synchronise with Guinean social and administrative temporalities, on which the project depended for its completion.

These tensions resulted in haste alternating with periods of downtime for the project staff. They waited on a daily basis: for meetings with Dr Bilis at the office, for the subprefect to return from his lunch, and for bats to leave their roost at dusk. Meanwhile, they indulged in what Adeline Masquelier termed the ‘art of waiting’ through forms of time micromanagement (2013: 473). PREDICT agents enlivened their idle time through drinking tea together, and through playing draughts or Candy Crush on their phone, watching episodes of Games of Thrones, chatting on Messenger, going out to buy snacks, and posing for pictures in front of the four-wheel drive. These were creative and eventful usages of time, which the agents did not suffer passively. However, such practices of waiting were underlain by the feeling of being in a state of ‘waithood’. This was foremost the case during the long weeks in-between missions when the agents were *on standby*, an English locution adopted by the Guinean middle class living off stints of short-term employment. They had to wait for the next phone call announcing that funding for the next mission had been transferred, that their much awaited *per diem* would be paid, and that they had to prepare to leave the next day. Waithood could prolong itself, as in 2017 for close to eight months, when the project consortium underwent an organisational transition and no mission was planned. Irregular payment of salaries during that time accentuated the precariousness of agents. They put travels, business, and farming work in

abeyance, since they could, in theory, be mobilised at any time. Deprived of their freedom of movement, they felt deprived of the possibility to scan their connections for other opportunities or oversee the progress of side streams of income.

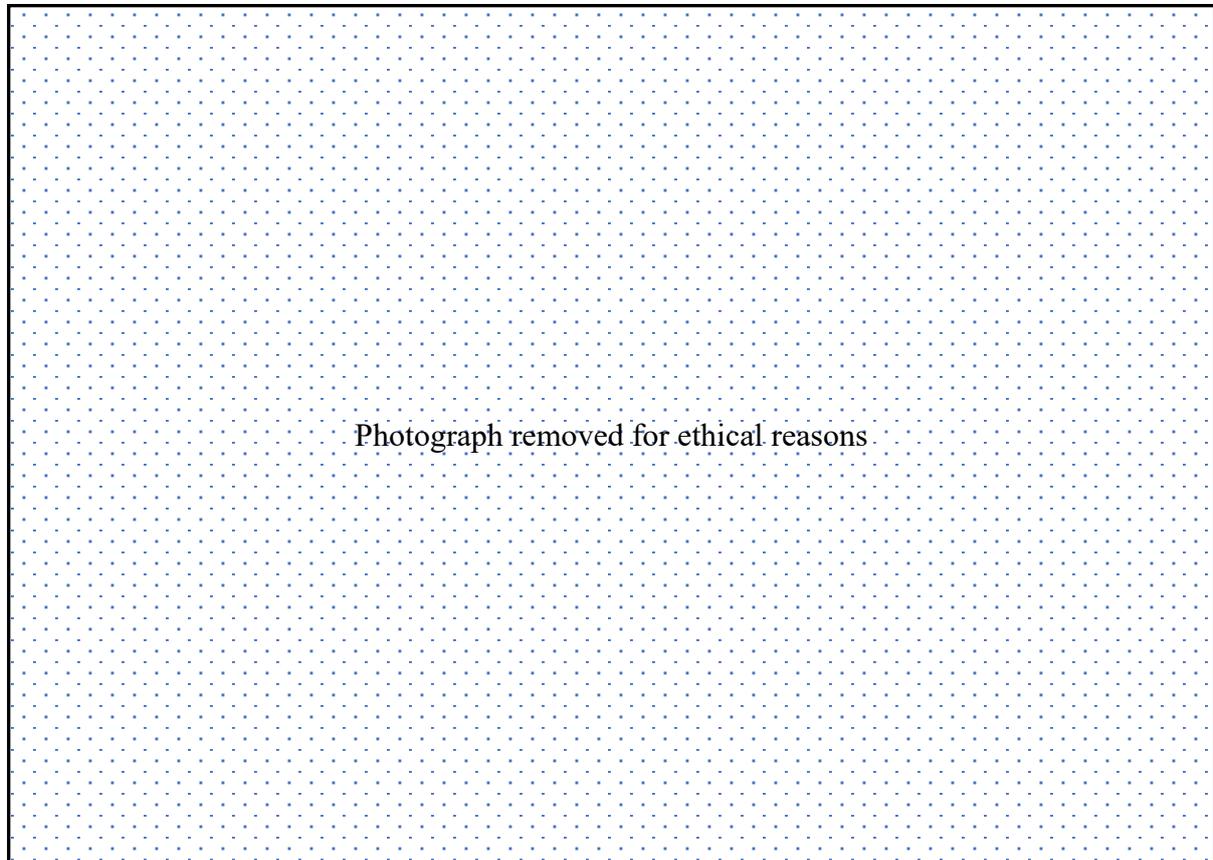


Figure 18. *Francis taking a rest at Norbert's house after a meal and before the next activity*

Project time was a disjointed time where sudden accelerations ruptured periods of imposed stasis. In themselves, temporal compressions were not unknown to PREDICT agents, who had always practised the West African 'arts of waiting' through unfavourable socio-economic conjunctures. But they were irritated by the arbitrariness of time fluctuations, which seemed intent on subjugating their personal agendas. Dr Bilis often took advantage of an agent's *standby* time to have them carry out logistical tasks that no assistant had been hired to fulfil, such as purchasing office utilities (and a beer for the boss). Young male agents could also toil in his garden, where he vowed to grow European varieties of tomatoes. Francis kept pictures of Dr Bilis's beautiful garden on his phone, which he showed me with some bitterness after his contract was not renewed. In the industrial economy observed by E. P. Thompson, 'disciplined time' would have introduced a distinction between the employer's and the employee's time. Time employees spent in the factory was 'homogeneous, empty time' (Benjamin 1969), its

value ‘reduced to money’ (Thompson 1967: 61). Dr Bilis’s orders did not reproduce this industrial ethos: they more closely approximated patron-client relationships, historically common in the region. In West Africa, social juniors (derogatorily called *petits*) were frequently employed as factotums for big men, a labour for which compensation was not quantifiable but usually expected as protection (Shaw 2014). Anthropologist Daniel Hoffman (2011) has observed that patron-client relationships have come to resemble labour contracts in post-Fordist economies, with security not rewarding labour as it did in the times of slave raiding. The staff indeed spent time on professional tasks indistinct from (their manager’s) private life but these did not even secure future opportunities, as indicated by the non-renewal of the contract of Francis, Dr Bilis’s first aide and his friend’s son.

It looks as if PREDICT hands-on staff were not actually asked to cultivate an ethos of self-distinction as ‘developed persons’ (Pigg 1997). After lunch break, Dr Bilis openly noted the drowsy looks of workshop participants, insisting that only the three persons who had drunk instant coffee – Prof Koné, the white anthropologist, and himself – were awake. Francis exclaimed that he did take a coffee, and ‘those who didn’t are all villagers!’⁷ Instead of a temporal rift between people inside and outside the project, the Guinean cosmopolitan managers performed a ‘denial of coevalness’ with their lesser travelled workers (Fabian 1983). Drinking Nescafé signalled that one orientated oneself to the requirement of active participation, not corporeal togetherness, as in many Guinean gatherings. Such a mechanism of social differentiation replicates those analysed by historians who have written about ‘Africanised’ technoscience after decolonisation (Hecht 2002; Lachenal 2011). In former colonies, the African workers in French institutions were expected to develop the qualities of timeliness, tidiness, and obedience to rules through manuals, lessons, and interactions with expatriates. But even when they succeeded, racial and ethnic hierarchies were reproduced amongst workers, and between African employees and French managers. PREDICT did not operate with white expatriates on site, but the same logics of hierarchical differentiation through ethical markers were at play.

One could read this conundrum in conjunction with the ‘crisis of modernity’ diagnosed in Africans’ ‘inclusive exclusion’ from global networks (Comaroff & Comaroff 2004), and the feeling of abjection they would derive from it (Ferguson 1999). Anthropologist Brad Weiss

⁷ In Guinea, instant Nescafé is a desired token of modernity while local coffee from the Macenta region, a cash crop introduced by the French colonisers, is looked down upon.

(2004), writing about the effect of neoliberal policies in Africa in the 1990s, has proposed that people perceived modernity as portending disjunctive possibilities. The powers of the market embroiled them in extractive relationships while denying them the equity and security that they aspired to. In that vein, PREDICT workers could be said to be denied agency in their orientation towards the future, even if their work purported to cultivate an anticipatory attitude towards future outbreaks. This denial was even more painful as Guinea has long trodden the line between ‘spearhead of change’ and ‘eternal maverick’ (Knierzinger, Engeler & Ammann 2016). In the twentieth century, Guinea was at the forefront of political resistance to Northern powers, whether the French colonial empire or the Western bloc, and appealed to the Socialist International and pan-African sentiments, distinctly modern collectives. Guinea was also courted by transnational mining companies, and since 2010 has based its economic growth on the extraction and export of underground resources. But pressures from mining businesses, the World Bank and, lately, the global economic downturn have heightened the financial dependence of the country and generated sociopolitical tensions. Ferguson notes that in the 1950s, Zambia used to produce the copper needed for a modern form of world connection (telephone lines and power cables), but a couple of decades later, electricity in townships on the Copperbelt was intermittent due to broken copper power cables (1999: 243). One could similarly note that many vials of bat blood were dispatched from N’Zérékoré with the goal of predicting and preventing epidemics of EID, and yet Forest Guinea had the highest prevalence of HIV in Guinea and, in 2021, it was there that viral haemorrhagic fevers resurfaced.

A more granular, spatially differentiated perspective on the contradictions of Guinean modernity might yet do more to illuminate tensions around changing conceptions of labour and time. Revolutionary leader Sékou Touré framed Guinean nationalism as a movement toward a future of progress, which was not linear but compressed. As he wrote: ‘[national] unity for its own sake will never be an end in itself, but rather a method of acceleration’ (1967: 89). Independence would emancipate Guineans both from ‘backward’ animist customs and the colonial mentality. The youth was to act as a vanguard of the African socialist revolution, and Touré criticised both bush initiation in secret societies and colonial schooling. The consequences of this ideology were most strongly felt in Forest Guinea. In his history of 1960s-70s Forest Guinea, Jay Straker (2009) has shown that Forest Guineans, or *Forestiers*, were construed as a menace to the modernity and the development of the nation-state. This construction could have been undermined by the fact that Forest Guinea boasted comparatively high school enrolment and agricultural production in the country. Consequently, the region’s

‘culture’ – its religion, elders’ authority, and secret societies – was cast as an oddity to be fought against. Guineans, particularly intellectuals, were self-conscious that they represented racial otherness on the international scene, even within the socialist union touted by Touré. Hence, they played down their own apparent inferiority through casting Forest Guineans as backward foils. Forest Guinea’s intellectuals themselves were made to feel uneasy towards their ethnic identity. They sought to expunge it through converting to Islam, hiding initiation tattoos, or changing their names. This work of self-othering put them in a double bind, between the world order and Guinean modernity, that Mike McGovern has called ‘double double consciousness’ (2012b).

This second perspective highlights the challenges of temporal fashioning in PREDICT. The staff ethnic make-up balanced Forest Guineans (Kissi, Loma, Kpelle, Mano agents) and Maninka staff, a compromise that was not justified by politics but by the necessity of plurilinguistic competency for working in the various communities of the Forest. Dr Bilis himself was Loma, while Prof Koné was Maninka. In their management practices (if not in their discourse as we saw in Dr Bilis’s ethnic geography of carrion consumption in Chapter 4), neither endorsed the ethnic stratification underpinning Guinea’s modernity: no one publicly commented on the skills of staff based on their ethnicity. But the PREDICT Guinea project, a Guinean-led structure, inherited post-independence cleavages around the claim to modernity and the legacy of Forest Guineans’ ‘double double consciousness’. This legacy was activated by the multi-ethnicity and staff equality furthered by NGO projects. It was not ‘disciplined time’, but social mechanisms of differentiation which ended up subjugating the workers – whatever their ethnicity, social class, or geographic origin – and trapping them in a regime of waihood. Finally, the Guinean micropolitics of time played into the political ontologies that shaped the way PREDICT workers waited for the next outbreak.

D. Emerging diseases in emergent countries

On the first day of a PREDICT workshop, participants shared their puzzlement that the same word, ‘emergence’, referred to ‘emerging diseases’ (*maladies émergentes*) and ‘emergent countries’ (*pays émergents*). They were not familiar with the polysemy of the term: ‘Guinea is an emergent country, we know this’, said an elderly representative from the Regional Department of the Environment. ‘It already exists and takes a different form. But what about Ebola?’ The workshop organisers consulted Wikipedia’s online encyclopaedia to disentangle

the two meanings of ‘emergence’. Dr Bilis explained that emergent diseases, ‘truly novel diseases’ and ‘former new diseases’, behave erratically: like Ebola they disappear, but only for a while; like influenza they mutate to become more lethal, and like syphilis they re-emerge under new circumstances. Epidemic emergence was unpredictable and defeated attempts at prevention. By contrast, Dr Bilis clarified that emergent countries like Guinea were departing from their current state and embarking on a development dynamic, so as ‘to become like the others’. There was a teleology in the emergence of countries that differed from that implied by the emergence of infectious diseases. Christos Lynteris (2018) has discussed in this regard how China’s status as a land of ‘emergence’ transfigured the political ontology underpinning perceptions of China as a source of pathologies. Building on the EID training and the temporal practices explored above, I reflect here on the ethnographic salience of the relationship between disease and political ontologies for my informants. I suggest that for the Guinean middle-class that envisaged the return of Ebola in 2019, political ontologies overwrote EID ontologies in configuring their expectation that epidemic preparedness would fail.

In fact, the historical experience of Forest Guinean participants contradicted the political emergence whose exegesis was made by Dr Bilis. The writings of anthropologist Mike Govern about the imagination of historical change in Forest Guinea since the 1990s (2015) suggest that Forest Guineans did not have a linear conception of collective history. They would rather frame it in cyclical terms, and distinguish cycles based on a continuum between two extreme poles: ‘liberty’ and ‘security’ (*booyema* and *ziielei* in the language of the Loma, a major Forest ethnic group). When individual gain engenders the insecurity of the majority, people face a cycle of liberty-*booyema*; but when authoritarian regimes enforce security and stifle entrepreneurial spirit, they see security-*ziielei* as taking precedence. The inverse relation between *booyema* and *ziielei* hints at an always-already present liberalism and its consequence for Forest Guineans: precariousness. From 1984 to 2008, liberalisation and democratisation under the regime of Lansana Conté were not experienced as a progressive development but as ‘a return to an earlier, precolonial, political-economic configuration’ characterised by insecurity (McGovern 2015: 248). McGovern rejects the unreflective use of the blanket term ‘fast capitalism’ to designate the perception of changes at the end of the twentieth century in N’Zérékoré: there was nothing new about a time of increased insecurity and private undertakings. But he does raise the point that in the 1990s, changes started operating at a faster speed in Forest Guinea, with civil wars and the beginning of iron ore mining operations. Heightened unpredictability, in part because of a labile stock market, resulted in social tensions, with more frequent intercommunity killings

in the region. It would seem that Guinea's emergence, and phases of *booyema* in the Forest, actually tallied with ontologies of emerging diseases, as inescapable ills cum opportunities. The emergence of Ebola testified, to people, that their country had long been included in modernity.

In the 2010s, epidemic governance even seemed to take precedence over economic crises in the Guinean middle-class perception of history. The 2013-6 Ebola epidemic inaugurated a series of outbreaks of EID in the country: COVID-19 from March 2020, Ebola again from February to June 2021, a case of Marburg fever in August 2021, and a Guinean patient misdiagnosed with Ebola in Côte d'Ivoire in August 2021. Anthropologist Carlo Caduff has analysed such seriality as a pattern in the mass media discourse about the 'next pandemic' (2019). He argues that the media industry and microbiologists need to maintain a 'constant sense of newness' (2019: 44). This is enacted by 'pandemic prophecies' (Caduff 2015) – scientific statements that divine signs of an impending plague in epidemic episodes – which nevertheless fail to trigger a pandemic. The permanent deferral of closure would sow the seeds of emergency fatigue, whereby decision-makers are tempted to forestall declaring outbreaks (MacPhail 2014). According to this literature, outbreaks act as epidemic signals that punctuate the present while postponing the real apocalypse to the future. But in Guinea, declaring a series of epidemics had a different purpose, in the view of many people. They held that Alpha Condé's regime used, or in their terms 'politicised', epidemics to impose drastic measures of containment every time, opportunistically closing borders and delaying elections when it suited him. The former president invoked the outbreaks to explain the failure of a bursting economy (Guinea boasted more than 10% GDP growth in 2016-20) to translate into palpable improvements in people's lives. The COVID-19 pandemic and breakdown in supply chains certainly led to a rise in commodity prices in 2020-1. This compounded the difficulties of many Guineans, already struggling to eat, go to school, and access healthcare in one of the poorest countries in the world. Condé still touted in public speeches that Ebola was not only a curse; it was also an 'opportunity' for the country (Diallo 2014), an expression I heard many workers from the health sector utter in 2017-9, too.

Outbreak preparedness did not function as 'a process of systematic erasure, which ... makes it possible for individual episodes to follow a logic of return and renewal' (Caduff 2019: 53). Put simply, in Guinea, the trope of the 'next epidemic' did not overwrite the last one. Every epidemic event was understood as a potential repetition of the 2013-6 Ebola outbreak, which coincided with a time of *booyema*: bounty for the few embroiled in extractive industries, and insecurity for most. The 'future catastrophe' had happened in the past, and the 'next epidemic'

was not conceived as a potential end-of-time but as a return to this past. Since the inverse relation between ‘security’ and ‘liberty’ was cyclical, recurring epidemics threatened people with the repetition of the Ebola epidemic event, which implied health and economic insecurity, political repression, and the enrichment of the elite.

That ontologies of political time configure disease ontologies is important to understand, for it drove the way PREDICT and the Guinean health sector practised preparedness, and by extension disciplined their workers. The future PREDICT convoked differed from the teleology of progress cultivated by development NGOs (Davidov & Nelson 2016). These seek to bring about an evidence-based change in economic livelihoods or population health, whereby metrics need to prove that tomorrow is quantitatively better than today. Their vision of a ‘future positive’ degrades the present into something that is to be worked on (Mosse 2004: 640). But as we saw in Chapter 4, in Guinea PREDICT’s workers did not promote this progressive change, whereby the present would represent a transition from a diseased past towards a healthier future. Even if they used the apotropaic rhetoric of prevention, they relied on another type of transtemporal comparison, not with the present but with the immediate past. The future that PREDICT convoked in *sensibilisation* was neither the apocalypse imagined by pandemic scenarios, nor the continuation of a backward present as in prevention: it was a repetition of the past Ebola outbreak. In a word, what PREDICT offered was a tomorrow that would not look very different from today, and by all means would stay different from a certain yesterday.⁸

That PREDICT Guinean managers framed the present moment as one suspended ‘in-between’ outbreaks, potentially caught in cycles of preparedness, is revealed by Prof Koné’s thoughts about a recurrence of Ebola: it was most certain. He found evidence for it during PREDICT’s communication activities in sampling sites, where he assessed that the belief that Ebola was ‘fabricated and brought’ to Guinea had a prevalence of about 70%. Not only would Ebola return but, he thought, its impact would be far worse as ‘people w[ould] say: “they want to screw us again.”’ Koné drew a causal connection between the disease origin narratives that people gave credence to and the risk of epidemic recurrence. In his opinion, scepticism towards the zoonotic disease narrative did not motivate populations to adopt preventive practices, nor

⁸ This future has commonalities with that of post-conflict interventions, such as implemented in Sierra Leone and Liberia in the 2000s (Bolten 2012; Ferme 2013; Shaw 2014), and on a local scale in N’Zérékoré in the aftermath of the 2013 interethnic killing.

facilitate the implementation of control measures in case of an outbreak.⁹ Prof Koné assessed the success of prevention by the credit granted to the origin story that PREDICT endeavoured to inculcate in Forest Guineans. Chapter 4 indicated that epistemic uncertainty and social tensions largely precluded the official narrative from gaining hold. Hence Koné was pessimistic in his reading of the situation: he saw that ‘people go back to their old ways. They eat anything again ... There is a reversal, a return to the past’. The future Ebola outbreak would have the same causes and consequences as the past one.

But origin stories and their circulation only mattered insofar as PREDICT staff considered the likelihood of another epidemic emergence. When envisaging the return of Ebola, PREDICT staff and more generally health workers and educated Guineans preferably directed their anticipatory thoughts to the matter of epidemic spread, and drew the same conclusions about a most certain recurrence. During PREDICT workshops, participants vied to provide the most compelling examples of disrespect for hygiene and infection prevention measures that they had witnessed in the health system and elsewhere. Doctors did not use gloves for their consultations. The handwashing stations placed in front of health centres during the outbreak had dried out or were simply filled with water. Even chlorine, a basic home staple during the outbreak, was ‘nowhere to be found anymore’. Prof Koné rhetorically asked: ‘Ebola was an opportunity to introduce good hygienic practices, but have they lived on?’ A unanimous ‘no’ resounded in the crowded room. Theirs was a trenchant critique of the health system, which they judged likely to amplify future outbreaks, exactly as it did in 2014. In the experience of participants, enduring tendencies in the habits of Guineans defeated attempts at preparing for outbreaks, or rather condemned such attempts to being waves of preparedness that would wane and pave the way for future outbreaks. Historical cycles impeded their country’s emergence. Their pessimism was not only grounded in the cyclicity of crises, whereby the health system, like hygienic practices, was likely to return to an earlier state. They were familiar with the historical rhetoric of rupture, ‘emergence’ and ‘opportunities’, always being trumped by the continuation of the same, or rather, by the concatenation of pasts and presents. This is exemplified by Norbert, a Kissi vet ten years older than Michel, with whose life trajectory we symmetrically close this chapter.

⁹ The relationship between ‘belief’ and ‘health practice’ was statistically documented in studies of the role of misinformation in preventative behaviours during the 2018-20 DRC Ebola outbreak (Kasereka & Hawkes 2019; Vinck, Pham, Bindu, Bedford & Nilles 2019; see Richardson *et al.* 2019 for a critique).

Drawn to the profession of vet from a young age, Norbert studied at the ISSMV. Upon graduating, he opened a private practice in his hometown, Kissidougou. After being recruited by Dr Bilis to PREDICT, he was as keen as Michel to invest his salary to guarantee his future livelihood. Like many private vets, he pursued the project of poultry farming: if scaled up, egg and chicken sales could rapidly yield high profits. He had laid the foundations of his farm on the outskirts of Kissidougou, but interrupted the construction for lack of funds, and moss was already building up on the half-built ruin. Simultaneously, Norbert toyed with the idea of opening a second vet practice in Macenta, and of joining the Ministry of Animal Farming. He anticipated financial and networking costs to gain the Ministry's agreement to open another vet practice. The status of civil servant would help, although public vets were theoretically prohibited from having private ventures. Many vet *fonctionnaires* actually offered their vet services from the Prefectural Department where they were posted, on top of receiving their monthly salary, developing their farm, and possibly getting their share of the expanding One Health project economy. To appeal to the latter, Norbert thought of reactivating his animal farming NGO, the *Association for the Promotion of Animal Resources and Environmental Protection*, founded ten years earlier and introduced through letters to embassies and international organisations.

Futures were not inherently disjunctive for the Guinean middle-class. Their enterprises straddled the private and the public sectors. If they were simultaneously nurtured, plural visions could have a cumulative potential. In West Africa (Lachenal & Mbodj 2014) and Guinea (Ammann 2017; Engeler 2020; Philipps 2017), neoliberal dreams and fantasies of a distant, emergent, future (Guyer 2007) all but replaced postcolonial aspirations to stability and inclusion. Preparedness-orientated projects and the health sector entrepreneurialism of the 2010s coexisted with the aspiration to state employment that had structured the Guinean economy since the 1960s-70s. As Norbert's example shows, the educated Forest Guinean middle-class did not 'meander' (Engeler 2020) between futures that were equally open. Allegedly allocated after written examinations, entry into the public service was not even guaranteed by colossal bribes but depended on the intercession of people in leadership positions. Michel diagnosed ethnic favouritism behind his non-matriculation in a state position, and attributed job rejections from international organisations to his Kpelle ethnicity and lack of patrons in powerful networks. Jean had 'missed his chance' to work in the Ebola response with Médecins Sans Frontières when the Prefectural Department of Health claimed crisis communication as its prerogative and positioned its interns and employees. Norbert had once

been offered a state position as payment for vet services by a Ministry director. Forest Guinean graduates grounded their resentment that certain futures were out of their reach in what they perceived as discrimination against them. As Norbert once summed up with a bit of humour, ‘in Guinea, those who have supports do not have a vision, and those who have a vision do not have supports.’

For the Forest Guinean middle-class, the project of preparing for future outbreaks conjured a future which elicited, we have seen, cynical desire, reasoned fear, and feelings of powerlessness. My ethnography works as a corrective to a possible idealisation of ‘emergence’ as fostering radical orientations to uncertain yet liberating prospects. In fact, the ‘vital conjunctures’ they wished would move them forward were underlain by a mechanism of stratification. A spirit of entrepreneurship, characteristic of *booyema*, never replaced the Guinean state nepotism characteristic of *ziielei*, but overlapped with it. Futures came as compounds of opportunities: the success of private initiatives hinged on patronage by the state, which might itself depend on ethnic belonging and networking. People did not expect that plural present futures would yield singular future presents. On the contrary, the intertemporal act of self-planning was about mobilising ‘vital conjunctures’ to realise several visions at once – or, possibly, none of them. Educational investment and professional experience could not be relied on to constitute a prepared labour force. PREDICT managers may well have established lists with the names of their former *préleveurs* and trainees, and circulated them to national and local authorities, should future needs arise in outbreak communication and bat sampling. In the case of another outbreak, the workshop participants anticipated, PREDICT training certificates would weigh little: ‘they will ask [foreign] experts to come!’

In Guinea, the ontology of emerging infectious diseases as ‘indeterminate entities’ (Caduff 2014: 300), viral swarms breeding unpredictable mutations and apocalyptic ‘next outbreaks’, yields to more directly palatable political ontologies in directing people’s anticipations of future outbreaks. The 2010s-20s epidemics are situated, within a cyclical conception of history, in an unprecedented time of economic growth and biopolitical precariousness in Guinea, epitomised by the 2013-6 Ebola outbreak. Although agents might wish the outbreak had augured the political emergence of their country, they expected only a return of the same conjunctions they knew already – liberty and insecurity, or repression and security. Outbreak preparedness – and its teleology of deferral – appeared compromised by the impossible emergence of reliable institutions in Guinea, that could yield futures different from the one sanctioned by decades of nepotism.

Conclusion

PREDICT staff faced a predicament: they needed to accommodate their dreams of professional progress as ‘future scientists’ with the epidemic doom posited by ‘scientific futures’, a dependence which we could expect to foster a cynical attitude towards post-outbreak projects. The affective politics of anticipation have been studied by anthropologist Gisa Weszkalnys (2014) in relation to prospective oil exploration in São Tomé and Príncipe, in West Africa. Since the turn of the twenty-first century, in booming nascent oil economies such as that of STP, a multitude of institutions and regulations have been founded for corporate and public-sector ethics to remedy the anticipated oil curse, so that the oil sector would be well governed and transparent. Weszkalnys diagnoses a problem of ‘anticipation’s excess’: in STP, suspicions flourished as to the probity of anti-corruption NGOs and the authorities’ respect for legal requirements. ‘Such suspicions are, in some sense, an important index of anticipation itself ... [It] cannot readily be ... eliminated ... Rather, ... suspicion occasionally appears to be multiplied by efforts to control it’ (2014: 228). The anticipatory work of PREDICT waged the same affective logic: suspicion was not so much a collateral effect of animal sampling as its very fabric. Going back to the opening vignette of this chapter, it might be that Dr Bilis mocked Norbert’s get-up, but his remark betrayed anxiety over both the biosecurity of his practices – a peril for the future – and his unprofessional appearance as a Guinean *scientifique* – an immediate peril for the agents’ contract with an American consortium. The preparedness apparatus was liable to bring about what it sought to avert, Dr Bilis seemed to imply.

Ambivalence towards one’s involvement in oppressive structures has been seen as central in forming political communities characterised by cynicism, disbelief, and disinterestedness (Hermez 2015; Petrović 2018; Vine 2020). But if cynicism was not absent from the private confessions of PREDICT agents, I suggest that the Guinean structuration of epidemic temporalities might have helped *préleveurs* liberate themselves from this effect of ‘anticipation’s excess’. The project sought to enlist participants in epidemic preparedness as modern scientists with proven ideas about epidemic causation, disciplined and timely workers. But the legacies of Guinean postcolonial history continued to reverberate at the interface of project management and training, and pervaded its epistemic, ethical, and temporal fashioning. The staff’s appreciation of EID theory was infused with nostalgia for authoritarian public health; and their attempts to appear punctual and modern were thwarted by their socio-ethnic status. These paradoxes were informed by a Guinean ontology of modernity as a circular time

where nepotism colludes with entrepreneurialism. This is an ontology of political time which reverses the rhetoric of EID preparedness. Future perils are not convoked and deferred by the preparedness apparatus. They lodge in what is seen as the country's failure to break away from historical cycles, embodied by the functioning of preparedness itself. PREDICT staff expected that the 'next pandemic' would look like the past one, with possibly no benefits to them despite their calculations; and so, they could not really be cynical.

Conclusion

Nonhuman animals have long been associated with epidemic origins. Many disease specialists and other people see them as somehow responsible in triggering outbreaks and spreading them. In recent times, specialist discourses such as One Health have attempted to balance these accusations and asserted that the health of humans, animals, and the environment are inextricably entangled. However, animals remain widely seen as ‘epidemic villains’ and accordingly targeted by infectious disease research, attempts at population control, and culling policies (Lynteris 2019). Bats have come to take a central place in these representations and techniques of government.

Bat specialists explain that bats’ exceptional characteristics, such as their longevity, infrequent reproduction patterns, and ability to flight, predispose their immune system to host many viruses without becoming sick (Keck & Morvan 2021). Ecologists attest that these characteristics expose bats to being more affected than other species by ecological changes. From the perspective of the history of medicine and science, it nevertheless remains to be explained why and to what effect bats have been substituted for rodents and birds as emblematic ‘disease reservoirs’ in the course of the twentieth century (ibid.). There has been perhaps an echo, in some of the work done by naturalists and more recently virologists and ecologists, of eighteenth-century myths of vampires in Europe (Marmet & Julien 2021). The flying mammals are the object of a rich and contrasted imagery, which variously depict them as foes or heroes, and which has doubtless irrigated the scientific discourse about bats (see Lynteris 2022 for a nuanced discussion of rats). Recently, the COVID-19 pandemic heightened the debate about the role of bats as disease reservoirs in relation to coronaviruses (Holmes *et al.* 2021). Conservation scientists worry that an expert discourse and local prejudice could telescope in some parts of the world and jeopardize bat conservation. This appears to be the case in some parts of China for example, where people have sought to evict bats from dwellings, killed bat colonies, and tried to pass on legislation for an ‘ecological culling’ of bats in the wake of the pandemic (Bittel 2020; Lu *et al.* 2021). Such events reflect continuities in framings of animals as disease carriers, and hint at transformations in their object.

My work is the first ethnographic investigation of how bats are locally implicated in epidemic origins by and through the practical work of sampling animals. I have primarily shown how the discourse of ‘epidemic origins’ is encapsulated by the ‘truth about Ebola’ in Guinea,

which was first struck in 2013 by an epidemic that took unprecedented proportions. I have highlighted the making of the ‘truth about Ebola’ by animal *préleveurs*, and how these professionals deal with their own ambivalence about the cause of the outbreak. I support and situate in a Guinean context one of the arguments put forward in a volume on zoonoses edited by Lynteris (2019: 1): notwithstanding a lack of certainty about the role of bats in maintaining and propagating Ebola, and even more so in causing the 2013-6 Ebola outbreak, the hypothesis that bats carry, spread, and transmit Ebola has become common currency. I have specifically indicated that the concept of the Ebola disease reservoir is malleable enough to accommodate environmental, culturalist, and ecological readings of the disease aetiology. The bat comes to act as evidence that Forest Guinea is, or overlaps with, the Ebola reservoir because of multiple associations.

It would be wrong to imagine that the hypothesis that Ebola originates in bats is a homogenous and unequivocal narrative of vilification, an important nuance to the argument set out above. The scientific disciplines concerned with identifying the cause of Ebola outbreaks foreground the figure of the bat, and of certain animals seen as wild more generally, in plural and contradictory narratives. Investigations of the role of bat species in sustaining Ebola are driven by several epistemological frameworks, which overlap and clash with one another. Nevertheless, the ecological configuration of disease drivers, the epidemiological construct around bushmeat hunting, and the public health understanding of contagion converge into making the bat a focus for emerging infectious disease research. This is not a story of a universal science translating into local understandings and misunderstandings about the role of bats. Guinean animal *préleveurs*, through their practices and discourse, accommodate and inflect the bat narrative in certain directions. They elucidate the emergence of Ebola in Forest Guinea through their take on pathogenic bat consumption, the conservation narrative about bats as victims of forest degradation, the diffuse notion of contact with bat fluids, and popular tales of cunning bats. These multiple facets are refracted in their quest for the animal origins of Ebola: *préleveurs* privileged bats and sought to capture and sample the greatest number possible. In the end, bat origin stories are not devoid of epistemic inconsistencies.¹ They collide and fuse in

¹ The bat narrative may be said to obscure alternative stories of Ebola origins, which the dissertation has not covered at length. A scholarly explanation is presently rising, in the light of the COVID-19 epidemic, which integrates the bat to a larger story indicting industrial deforestation, mining, and shifts in land use. None of my interlocutors spontaneously connected these issues to Ebola, but it may also have been that my embeddedness in PREDICT activities did not help elicit such interpretations.

the techniques and socialities of animal sampling, and ultimately consolidate the view that bats harbour Ebola as a scientific fact.²

Or perhaps we should say that the view that bats harbour Ebola cements as a fact *scientifique*. It is not only the scientific activity of *préleveurs*, but also their ethical labour as Guinean representatives of *science* which, ultimately, make this narrative prevail over doubts about Ebola's animal origins, including their own. The bat could not be said to be vilified in the vernacular narratives that circulate in Forest Guinea, and PREDICT Guinea did not accentuate accusations against the animal. The project's activities rather mobilise causal links and moralities that point to the responsibility of Forest Guinean people in starting and spreading Ebola. Forest Guineans are supposedly inherently resistant to outbreak containment, allegedly play a large part in deforestation, and are unwilling to change their food practices. They are, more or less implicitly, and because of their polymorphous engagement with and the impact of their activities on bats, designated as 'epidemic rogues', in the terms of Jame Fairhead (2018). My dissertation has connected this attribution of responsibility or blame to the context in which PREDICT operated in Guinea, a location shaped by the global health industry of experimentation, the colonial history of pest eradication and animal extraction, and Upper Guinea Coast narratives of covert militias. The practices, discourses, and aspirations of PREDICT *préleveurs* in Forest Guinea reflect this background and inflect the meaning of their search for the 'truth about Ebola'. PREDICT staff wish to be model project employees, English-speaking advocates of the One Health vision, and modern Guinean *scientifiques*. They dream of modelling a Guinean society that would comprehend and act on risks – unlike Forest Guineans – as they understand *scientifiques* to do. They hope to translate their ethos into a springboard for professional opportunities. Their success seems to hinge on how committed they are to imputing the origin of the epidemic that befell their country to an encounter between a Forest Guinean and a bat. This suggests something important: in matters of zoonotic disease risk as in other risks, the discourse of responsibility enacts a two-pronged morality. It echoes longstanding stigmas and blames specific collectives for their way of life; but it also reflects an aspiration for a 'modern' response to 'modern' ills. My dissertation has tried to elucidate the

² There are commonalities between these multiple tales and those about the role of wild birds in influenza (Fearnley 2020; Keck 2020). I have highlighted a crucial difference: because Ebola RNA and live virus have rarely been found in bats so far, place – a location marked environmentally, politically, socially, and affectively – takes on a greater significance than the virus itself in bat-focused narratives.

ways in which epistemologies are intimately imbricated with moralities in the scientific processes that assign epidemic responsibilities to animals such as bats.

My work has made a second defining contribution in its reflection on the interdependence between the search for epidemic origins in animals and insecurity. I have paid attention to the ways in which living with insecurity in Forest Guinea pervades the everyday labour of animal *préleveurs*. Layered experiences of uncertainty are revealed and heightened by epidemics and the institutions that seek to prepare for them. I could say with anthropologist Hayley MacGregor *et al.* (n.d.) that *préleveurs* accommodate ‘intersecting precarities’ as they carry out sampling operations. They weigh up and manage the fallouts of several forms of precarity on their activity: their exposure to infection through handling wildlife, their vulnerability to verbal and physical attacks, and the risk of losing their job for professional misconduct. I have shown that *préleveurs* do not passively suffer these vulnerabilities. They actively negotiate them, in part by drawing on their experience of uncertainty, grounded in Forest Guinea’s integration in regional and global networks. Different historical spaces of insecurity coalesce in the practice of animal sampling.

However, I have also emphasised, in that respect, that the formation of origin epistemologies through large-scale animal sampling does not only compound insecurity: it is conditioned by insecurity. The work of PREDICT is underpinned by the hazard tied to thinking about hotspots, and actively normalises the existence of a zone at risk of epidemic emergence in Forest Guinea. A political and economic conception of national welfare is reflected in the making of hotspots to be investigated by sampling as a matter of priority. The risk of an infectious disease emerging in Forest Guinea is the product of calculations which level the influence of ecological habitat, economic precarity, and political instability. Hence rolling out mass sampling in places like Guinea is structurally tied to forms of insecurity. I have illustrated ethnographically how this vulnerability leads to a qualified unemployed labour force being available for short-term contracts in rough conditions. Sociopolitical vulnerability also explains the importance of political and economic patronage in the enactment of Guinean infectious disease research. In the end, the tense fieldwork conditions that *préleveurs* so often complain about are not only correlates of animal sampling. Insecurity enables the making of theories about animal origins. PREDICT appears imbricated with regional patterns of insecurity, which strengthen in return the epistemologies showcased by the project.

I have finally highlighted the unsettling potential of the epistemic labour that accompanies sampling and the forging of the bat narrative, which the dissertation's title 'Insecure epistemologies' hints at. Research on zoonotic diseases destabilises experiential knowledge of the Forest Guinea landscape and its dangers. PREDICT staff and partners are made to question and recalibrate their prior frameworks for understanding disease origins. The professionals trained by PREDICT in Guinea learn to regard the modernity they aspire to as homogeneously pathogenic. The residents of sampling sites feel anxious as they are exposed to viral discoveries, and uncertain about the nature of the epidemic threat and how much exactly is known about it. Such a sense of insecurity has been investigated in anthropology. Scholars consider that disaster preparedness and terrorism, for example, are tied to affects which are produced and managed by governments, by the economy, or by a government of selves (Choi 2015; Masco 2008; Watanabe 2021). In the case of PREDICT activities and communication in Guinea, it is not so much that the project or the government rely on affects to make the threat of Ebola's return exist in people's everyday lives. Forest Guineans know the threat all too well and direct the anxiety they are made to feel against the intentions and actions of their rulers. The suspicion always looms over the sampling enterprise that the government and foreign interests might have triggered the Ebola outbreak and would benefit from another epidemic. Sampling activities activate fears that the people involved in outbreak preparedness inject pathogens into animals, and irritation that the government co-opts foreign institutions for this work. As a consequence, bat epistemologies are not only insecure in that, in the wake of animal *préleveurs*, stories of epidemic origins proliferate and make people feel unsafe. They are even more insecure in that these affects loop back and reinforce doubts about the intentions and interests of those *préleveurs*, who seem to want others to believe in the bat hypothesis perhaps more than they themselves do.

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The chapters pointed to the imbrication of biosecurity protocols, conservation policies, veterinary education, and landscape transformations in the making of hotspots and animal origin narratives in certain parts of the world. Chapter 1 pictured the most relevant ways in which knowledge about Ebola's aetiology is assembled in Forest Guinea, and more broadly West Africa, in the wake of the 2013-6 epidemic. Several bodies of knowledge are constituted by scientific disciplines that have historically formed specialist discourses about 'origins': ecology situates the origins of diseases in certain places, epidemiology associates them with the mechanics of contagion, and immunology locates them in interactions between a virus and an

organism. The figure of the bat was shown to operate as a bridge between ecology and epidemiology, between Ebola as a disease of place and Ebola as a contagion, and to be foregrounded by animal sampling operations which present as a search for the origins of epidemics. Chapter 2 introduced Guinean *préleveurs* in their animal capture activities and examined how they redefine their employment as a quest for the ‘truth about Ebola’ in their dialogue with Guinean authorities, Forest Guinean populations, and US project managers. I showed what I call ‘acts of camouflage’ to frame the relationship between the extracted samples and the samples’ social, political, and environmental milieu: they give epistemic and aesthetic form to the representativeness vested in samples. Those acts mitigate various insecurities to which *préleveurs* feel exposed and interlace these insecurities with the notion that Ebola originates in bats. Chapter 3 described how *préleveurs* negotiate their vulnerability and that of bats in their field laboratory. It questioned the alleged novelty of the One Health framework: the staff of sampling projects experiences continuities between One Health, conservation policies, and the colonial and postcolonial enforcement of boundaries between racialised individuals and certain animals. Through these continuities, bats appear pathogenic not only because they are said to harbour emerging viruses, but because their ‘negative charisma’ – itself shaped by social hierarchies – naturalises their harmfulness, and their harmability. Chapter 4 centred on how *préleveurs* translate and accommodate different kinds of evidence about bats as disease reservoirs in the *sensibilisation* campaign they carry out with PREDICT after the end of sampling activities. Despite a widespread sense that bats are disappearing from Forest Guinea and cannot have infected humans, PREDICT agents urge Forest Guineans to take responsibility for diffuse forms of contact with bats. I highlighted how new configurations of risk are rendered amenable to the public of risk communication through the social and epistemological labour of *préleveurs*. Chapter 5 turned to the regulations, politics, and moralities that influence the disclosure of viral discoveries by PREDICT and other projects in Guinea and Sierra Leone. I pointed out that these can remake the meaning of places for *préleveurs* and the people who live there, and that the (supposed) concerns of the latter shape the practice of disclosure. Nevertheless, the precise relation between a virus, a place, and a bat in configuring Ebola remains obfuscated in official communications with the public. Chapter 6 focused finally on the sessions in which PREDICT staff and local partners are trained to understand where emerging infectious diseases come from and how to talk about them. It enquired about the ways *préleveurs* articulate understandings of EID with their own orientations towards the future, personal and collective. I suggested that their ethical labour as Guinean *scientifiques* works to alleviate the cynicism they might have felt whilst sensing that

professional opportunities hinge on the return of epidemics. Beyond this ethical labour, however, the political history of Guinea, and a pervasive sense of clientelism, unreliability, and insecurity, feed into their expectation that epidemics will recur, and that *préleveurs* will possibly not benefit from them.

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The dissertation has contributed to the growing literature on the social assemblages that prepare for outbreaks worldwide. It has examined the material, epistemological, sociopolitical, and affective consequences of framing certain diseases as emerging threats to global security (Caduff 2015; Keck 2020; Lakoff 2008; Porter 2019; Samimian-Darash 2013). My material supports one of the underlying claims of the anthropology of preparedness: the shape and strength of preparedness assemblages hinge on the infrastructure and relations that they can harness in given contexts. I have extended this argument to include the knowledge about epidemic origins that underpins outbreak preparedness. I have suggested that this knowledge is as precarious as the social arrangements that make it. The epistemological basis, technological realisation, and political management of the science based on animal sampling are penetrated by the vulnerabilities, experienced and projected, of the people embroiled in it. Nonetheless, the politics and ethics entailed by its discourse of epidemic origins do not fail to question people's lifeways and alter their projections into the future.

My dissertation seems to be one of the few works dealing with outbreak preparedness in Africa (except Keck & Lachenal 2019; Lachenal 2015; MacGregor *et al.* n.d.; Thiongane 2020), and the first in-depth ethnographic study of a group of individuals employed in an African country by an institution the explicit aim of which is to pre-empt outbreaks of emerging diseases. I have provided a granular understanding of the everyday workings of preparedness and offered a different analytical perspective on the consequences of epidemics in Africa. My account certainly takes stock of a general understanding, documented ethnographically and statistically, that epidemics expose weaknesses in the health system and social welfare. Epidemic containment and anticipation may aggravate economic difficulties and worsen access to health services, even more so in places with enduring inequalities and systemic violence (Nguyen & Peschard 2003; Singer & Rylko-Bauer 2021). Building on this insight, social scientists have foremost critiqued the social and health impact of preparedness policies in African localities. Historian Guillaume Lachenal has pointed out that preparedness is 'nihilistic' in that it deters from investments in public health (2014; 2015). He has also suggested with

Frédéric Keck that the actors involved ‘perform [epidemic] simulation[s] without believing in the reality of the epidemic to come’ (2019: 26). Anthropologists Oumy Thiongane (2020) and Hayley MacGregor *et al.* (2022), reflecting on the COVID-19 epidemic in Africa, have recently argued that preparedness fuses with epidemic control measures and accentuates people’s precarity. I similarly question the consequences of epidemic preparedness. The second part of my dissertation has raised the possibility that such institutions have indeed a negative effect or no effect on the lives of Forest Guineans.

But by focusing on how people make sense of animal sampling and viral forecasting, epistemically, experientially, and ethically, I have enlarged the perspective beyond what we could, critically, conceptualise as the function of preparedness. Chapter 2 proposed in this respect an explicitly nonfunctionalist analysis of the doings of animal *préleveurs* in Forest Guinea. This has meant considering the meaning of preparedness in its context, an approach pioneered by Keck in his study of the intersection between Buddhist rituals, ornithology, and influenza surveillance (2020). I have addressed the ways in which *préleveurs* gesture to a realm of signification and aesthetics beyond epidemic preparedness, and even beyond disease prevention – to the threats that they and their parents have had to anticipate in Forest Guinea for a long time. This has entailed, and this is another contribution of this dissertation, exploring rather than taking for granted the notion of emerging infectious diseases, and holding up for inspection the idea that Ebola did originate in a Forest Guinea bat. In this, my approach approximates that of recent works on the locations that make the geological time called the Anthropocene (Mathur 2015; Moore 2015). I echo their view that the Anthropocene is a phenomenon, as geological as it is social, which transfigures certain places through interlocking climatic phenomena, institutions, and scientific theories – even where people oppose or accommodate the idea on their own terms. Similarly, emerging infectious diseases rework the public health, the education system, the legislation, and consumption patterns of places such as Forest Guinea. They reframe the ecological, spatial, and socio-economic makeup of hotspots.

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In August 2019, sampling and *sensibilisation* missions had come to an end, but there still was work for Mohamed in Conakry. The few remaining PREDICT staff were ordered to send all the samples still at the Haemorrhagic Fever lab to the University of California Davis. Thousands of samples were now to be packaged and shipped in accordance with the United Nations regulations for the transport of dangerous goods. *Prélèvements* were a most valuable product

of PREDICT specimen collection. The project claims to have discovered, over ten years, 958 novel viruses in them (PREDICT 2020a). But among the results highlighted, there are also enhanced capacities for lab diagnosis and surveillance, and global databases and data sharing networks for zoonotic viruses. PREDICT made its sampling datasets available on USAID Data Development Library. It contributed to developing HealthMap, an online world map for digital surveillance where sampling data and disease alerts can be visualised and overlaid on maps indicating viral hotspots. Finally, the project designed SpillOver, a ‘viral risk ranking’ web application for animal viruses informed by the project’s discoveries, publicly available databases, and a risk factor framework (Grange *et al.* 2021). From 887 viruses ranked, the spillover risk scale ranks the Lassa virus first, just above SARS-CoV-2. As the platform’s creators note (Puiu 2021), the COVID-19-causing virus ranks lower than Lassa, which causes a haemorrhagic fever and kills about 5,000 people a year, because ‘key information about SARS-CoV-2 is still missing.’ The number and range of host species of SARS-CoV-2, and thus its spillover risk (beyond the pandemic that has already happened), are still unknown – an argument that concludes a plea for investing in mass sampling. The creators of SpillOver admit having developed a ‘credit-like’ score for viruses (UC Davis 2021), and consciously draw on the rhetoric and technologies of banks and insurance companies. The language of insurance seems to operationalise the zoonotic disease risk with technical precision. It also makes it palatable to financial markets. And in fact, PREDICT consortium member Metabiota has partnered with global insurance firm Munich Re to launch PathogenRX, its own epidemic risk insurance for American businesses.

To PREDICT Guinean *préleveurs* however, the project’s most significant result is not a crowdsourcing platform for data sharing. It is more straightforward: ‘PREDICT has proved that Ebola comes from bats.’ I heard that statement over and over in 2019. I also read it on the social media accounts of former PREDICT employees in February 2021, during the recent Ebola outbreak which started near N’Zérékoré. The Guinean government prudently did not issue a bushmeat ban this time. Still, state representatives, influential leaders, and former *préleveurs* blamed what they called a resurgence of the disease on contact with wildlife and bushmeat consumption. It may have been that, quite quickly, the CERFIG invalidated the wildlife origin hypothesis, and suggested human-to-human transmission of the virus caused the outbreak. But most of the people active in the Ebola response evoked the ‘animal reservoir’ of Ebola. *Sensibilisation* agents recommended that everyone in N’Zérékoré stay away from bats. It had become a fact that Ebola came from bats.

Shortly after, over two years after the end of PREDICT, Michel posted a screenshot on his Facebook account. In excerpts from the project's 600-page long final report (2020a), he had circled in red his name and his face, in a photograph that showed him *sensibilisant* a classroom. Michel captioned: 'I would like to write this name "MICHEL H." in the GREAT BOOKS of SCIENCE.' Many former *préleveurs* posted encouraging comments in response. Norbert was the most eloquent: 'I remember Koropara, Soulouta, etc. *Courage* and let's stay patient. One day, they will say that it was not easy, but it worked.' They uncovered the truth about Ebola.

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