Encounters in Borderlands

Borderlining Animals and Technology at Frankfurt Airport

SUSANNE BAUER
TIK Centre for Technology, Innovation, and Culture, University of Oslo, Norway

NILS GÜTTLER
Science Studies, ETH Zürich, Switzerland

MARTINA SCHLÜNDER
Max Planck Institute for the History of Science, Germany

Abstract   Focusing on a global hub of aviation, Frankfurt Airport, this essay examines encounters between animals and technology in airport operation. In order to understand how airport practices constantly negotiate the borders with local environments or even produce new ones, we draw on Gloria Anzaldúa's concept of "borderlands." Extending this notion from human to nonhuman inhabitants and passengers of airports opens up for novel possibilities to apprehend the affective dimension in the life-technology intersections at airports. In this sense, the airport is a site of multiple borderlands, producing intersections that include material and imaginative, sometimes violent, boundary drawing. We examine a broad set of multispecies borders and "borderlining" practices, their material cultures, and affective economies. What kind of local, historical legacies do airports struggle with and how do they cope with the underlying tensions of partially connected sites, sectors, and spaces? Throughout the essay, we historicize three encounters of the aviation infrastructure and its living environments and their affective economies: borderlining the airfield, borderlining the animal passenger, and borderlining the animal intruder. These examples highlight different modes of encounters, like clashes, coexistence, and care.

Keywords   airport ecologies, affective economies, migration, logistics, multispecies infrastructure

Oh, you could hear them. . . . Loud thumps. It felt like the airplane being pelted by heavy rain or hail. It sounded like the worst thunderstorm I'd ever heard growing up in Texas. It was shocking. . . . When I felt, heard and smelled the evidence of them going into the engines. I heard the noises. I felt the engine vibrations, of the damage being done to the engines. And I smelled what I described at the time, and I still would as a burned

bird smell being brought from the engine area into the conditioning system of the airplane.[1]

With these dramatic words captain Chesley "Sully" Sullenberger recalled his memories on the most prominent encounter between an airplane and birds in recent years: On January 15, 2009, US Airways flight 1549 ditched into the Hudson River after encountering a flock of Canada Geese close to La Guardia Airport. It prompted international media coverage, making Captain "Sully" a post-9/11 hero and the protagonist of a Hollywood blockbuster. US Airways flight 1549 revealed to the public that there are multiple spaces in the air: the habitats of animals and technological airspace as well as the legal layers installed to make air traffic flow smoothly.[2] Airspace has historically developed and was inserted into the skies during the twentieth century.[3] The result is a complex, technologically stratified structure of different layers and areas, like fly and no-fly areas, civil and military sectors, and different air traffic control networks (fig. 1). The technological nature of this space demands permanent maintenance—a fact that becomes visible upon breakdown, for instance due to computer glitches.[4] The closer you get to an airport, the more crowded airspace becomes. Airspace is by no means a void; it is populated by passenger and cargo aircrafts, military and private jets, helicopters, sailplanes and gliders, parachutists and drones—they all have to be coordinated in this space that is separate but also connected to the natural habitats of birds.

As long as there are planes in the air birds will get in their way; respectively the planes get in the ways of birds (a matter of perspective, actually). Airports are part of the global airspace but are also situated in local environments, and the boundaries between technological airspace and these environments are blurry. In this sense technological airspace and animal habitats are partially connected. We take inspiration from Marilyn Strathern's notion of partial connections, which allows us to describe relations of multiple partially connected spaces that operate as wholes for those inhabiting them.[5] Strathern's understanding of partial connections aptly describes and helps analyze the complex relations between spaces that overlap but are neither congruent, nor oppositional, nor yet clear-cut. Instead, they fold into each other in flexible ways, thus producing blurry boundaries and unpredictable potential encounters—as Sully, the crew, and passengers of US Airways flight 1549 painfully experienced.

We studied the tensions of partially connected spaces at Frankfurt Airport, a major aviation hub in Europe and Germany's largest airport. Its location in the middle of the

1. CBS News, "Flight 1549."

2. Interestingly, it was due to the help of airplanes that entomologists became aware of the hitherto unknown and incredibly large number of insects in the air. Raffles, *Insectopedia*, 5–12.

3. Pascoe, *Airspaces*; Banner, *Who Owns the Sky?*

4. A famous air traffic control glitch took place in London in December 2014. Topham and Quinn, "Flights Disrupted."
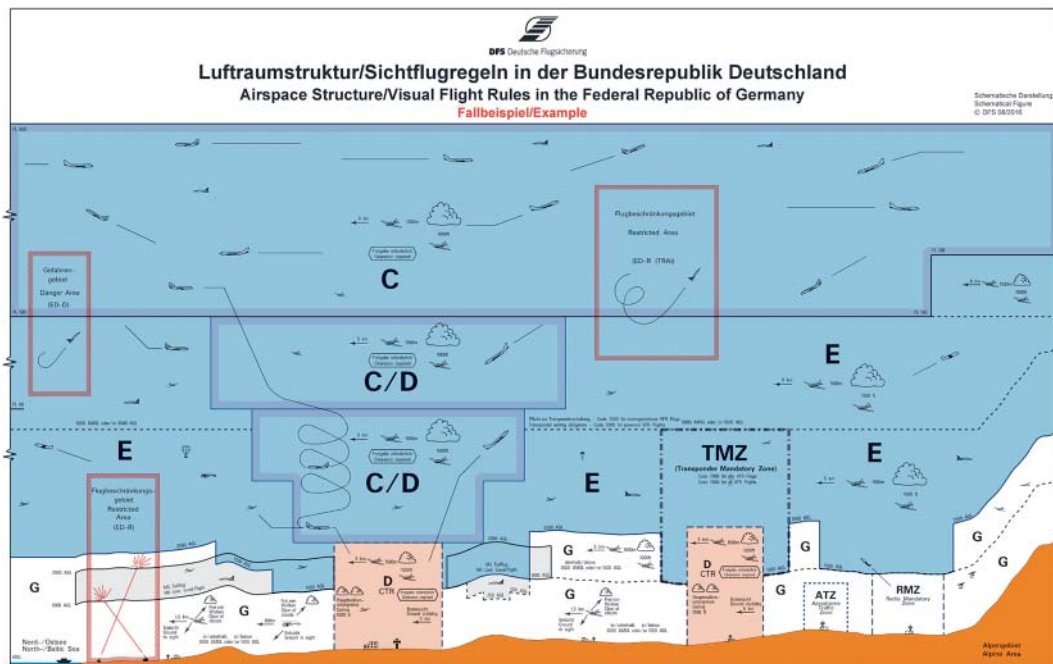
5. Strathern, *Partial Connections.*

Figure 1. Airspace structure in Germany. Available at www.dfs.de/dfs_homepage/de/Flugsicherung/Luftraum/luftraumstruktur_092016.pdf. Courtesy of DFS Deutsche Flugsicherung GmbH.

city forest as well as its strong interlacement with global airspace makes it a perfect site to study the enviro-technical dimension of air infrastructures.[6] In focusing on the airport's relations to the local environment, we take a different approach than cultural studies of airports that have emphasized the nonlocal dimension of airports as well as global mobility and permanent transition, describing them as "non-places" or as "spaces of flow."[7] We are interested in the airport as a place, in its very locality, borders, and relations with what is outside. Grappling with how airport practices negotiate the borders with their local environments, "borderlands theory" helps us to render perceptible the multiple tensions that are part of airport operation. In her seminal writings on US-Mexican borderlands, Gloria Anzaldúa describes borders as dividing lines but also as "vague and undetermined places created by the emotional residue" and in a "constant state of transition"—these borderlands are always in tension, but also productive, dangerous, and ambiguous.[8] Anzaldúa combines theorizing of borderlands with a poetic exploration of what it means to live in and navigate violent borderlands—a topic that

6. Pritchard, *Confluence.*

7. Augé, *Non-Places*; Castells, *Rise of the Network Society*, chap. 6; Gordon, *Naked Airport*; Schaberg, *Airportness*; Knox et al., "Enacting Airports." Apart from Dümpelmann, *Flights of Imagination*, few historians have paid attention to the landscape history of airports. Further exceptions are Sherwood, *Heathrow*; Dierikx and Bouwens, *Building Castles of the Air*; Adey, *Aerial Life*; Dümpelmann and Waldheim, *Airport Landscapes*.

8. Anzaldúa, *Borderlands*, 25.

has meanwhile regained increased media coverage due to the Trump administration's plans to build an uninterrupted, complete wall along the border. Anzaldúa characterizes this particular borderland as "*una herida abierta* [an open wound] where the Third World grates against the first and bleeds."[9] The US-Mexican borderlands have long been used as a socio-technical laboratory for border enforcement and its resistance. Although most airports are geographically not continuous with this borderland, they operate in a similar logic of othering by separating and segregating those who are eligible to pass, arrive, or stay from those who are "unauthorized."

With Anzaldúa we understand airports as places of intensified, projected borders and boundaries, where technical, environmental, but also complex political borders intersect and condense in one place. To make air traffic flow, multiple borders and boundaries are created or coordinated and maintained, such as geographic divisions between airport and its surroundings, as well as historical, legal, economic, social, national, racialized, acoustic, and security-related boundaries; these borders are often violently drawn and enacted. The projection of the heterogeneous qualities of borders on such a confined space creates specific tensions and produces material effects.[10] Take for instance the projection of the Schengen area on European airports like Frankfurt: Schengen is one example of a political space (or even system) that is projected onto the topologies of all airports that lie in the area, created by the Schengen Treaty.[11] This manifests for instance in fences, security zones, or airport prisons for illegalized migrants. Airports, in this sense, capture and perform the world in a nutshell, including the government and management of the body in airports.[12] They epitomize borders as places of intense socioeconomic stratification, of sorting passengers—human and nonhuman alike—in line with their inherited, achieved, and purchased privileges. Trusted traveler programs and their clients' expedited clearance at the border as well as access to priority lanes and gold/platinum cards of frequent flyer programs testify to this as well as the social, racialized, and gendered segregation of airport employees, such as cleaners, security officers, or flight attendants, as well as their unequal working conditions and wages. Airports as highly socially segregated (work)places are thus a case in point for Anzaldúa's definition of borderlands as "physically present wherever two or more cultures edge each other, where people of different races occupy the same territory, where under, lower, middle and upper classes touch, where the space between two individuals shrinks with intimacy."[13]

Unlike social anthropology and the social sciences that are concerned with the formation of subjectivities, fields like science and technology studies and environmental

---

9. Anzaldúa, *Borderlands*, 25.

10. Savi, "How Borders Come to Matter?," 182.

11. The Schengen Treaty currently encompasses twenty-six European countries without internal border control between them. Arriving from outside Schengen in Frankfurt, for instance, does not mean to enter Germany alone but also the Schengen area with consequences for further travel documents.

12. Adey, *Aerial Life*.

13. Anzaldúa, *Borderlands*, 19 (preface to the first edition).

history have not drawn extensively on Anzaldúa's work. Yet, we believe that her approach offers unique possibilities to examine the entangled qualities of multiple borders and the segregated borderlands that airports entail, in particular when it comes to the complex entanglements of human airspace and nonhuman habitats. Anzaldúa's borderlands concept specifically allows us to examine the ecological tensions that intensify at the airport. Instead of disassociating air traffic technology and its affects from its living environments we are interested in the naturecultures of airports,[14] precisely because they expose, generate, modify, fix, crack open, work on, and enact these boundaries and fringes. Multiple borders cut across animal habitats on and around the airport where they appear as inhabitants, passengers, coworkers, intruders—and imaginaries. To be sure, for readers familiar with Anzaldúa's work it might be problematic to apply her concepts to the study of nonhumans, specifically animals, because it could potentially trivialize the experience of border violence and racism that many human travelers face at airports and other borders every day. Expanding Anzaldúa's theory of borderland subjectivities and affective entanglements to the nonhuman realm and to animals might also resonate with long histories of animalization of colonial or racialized subjects and thus reinforce racist stereotypes.[15] Yet, Anzaldúa's project precisely undermines any hierarchization and binary orderings, as it goes against essentialist, biological, and fixed categories (such as sex, species, race/ethnicity), making space for engagements with mixtures that go beyond naturalized divides. In fact, her writings do not adhere to firm identities of human and nonhuman and deny identifying them according to Western categories as either mystical or realistic. Instead, she theorizes being "in between," "living on borders and margins," and "shifting and multiple identity."[16] Most important, we believe that applying Anzaldúa's borderland to the enviro-technical dimension of airports sharpens our attention to how border violence operates and is materially enacted in diverse ways at the airport at both its human and nonhuman sites.

Pájaros, cattle, cockroaches, turtles, burros, chickens, eagles, rattlesnakes, venadas-venaditas, oxen, scapegoats, serpientes, fawns, dogs, la llorona—Anzaldúa's borderlands are populated with animals. Her bestiary lives in all of her borderlands: in the physical as much as in the songs or dreams or tales and poems. Animals straddle all of the borders she is talking, singing, dreaming, writing, and theorizing about: the geopolitical border, the economic, cultural, racial, emotional, sexual, psychological, spiritual; they are never pure animals, or pure humans, or goddesses, or spiritual imaginaries. Rather than belonging to one space, they are all "in-betweens." In an interview Anzaldúa commented on the selective reception her work has received in academia. She noted that there seem to be "unsafe" elements in her book that are not easily addressed in academic journals and papers, particularly the spiritual borderland, the borders between

---

14. Haraway, *The Companion Species Manifesto*.
15. Fielder, "Chattel Slavery"; Haraway, *Primate Visions.*
16. Anzaldúa, *Borderlands*, 19.

the spiritual, the psyche, and the mind that have regularly triggered resistance from academics.[17] This might be one reason that the animals in her book haven't received a lot of attention even within animal studies or the posthumanities. Taking up Anzaldúa's focus on the in-between and her capacity to resist commonly accepted divisions and binaries, this article examines "borderlining" practices together with the affective economies that shape the airport's relation to animals.

Borderlining and Affect

Our concept of borderlining is not a quotation from Anzaldúa, but rather inspired by the openness, the ambiguity, and the volitional vagueness of her unruly, poetic thinking on the borderlands between humans and nonhumans. This concept aims to bridge and translate some of Anzaldúa's "unsafe elements" into academic writing, making them available and connecting them to academically more established concepts in the realms of STS, animal studies, and the environmental humanities. Thus, as a capacious concept, *borderlining*—contentwise—explores and describes the material and affective effects of a diverse set of purification and separation work between the technological and the ecological in the emergence of the modern airport; conceptually it allows us to think through the multilayered and often contradictory forms of interspecies relationality at technological hubs like airports. We will show how airports had to learn about the tensions of animals and jet aviation and worked on attempts to resolve them only to learn that they will persist and require the constant work of borderlining.

The concept of borderlining helps us to draw on existing concepts in science and technology studies, and to combine them in a novel way in order to grasp the specific enviro-technical makeup of airports. A great amount of airport operation, in this sense, is about borderlining, essentially understood as separation work:[18] cleaning up the sky and the ground in order to maintain and secure the technological airspace. Airspace is multiple, and the multiple spaces that intersect at the airport produce a particular form of messiness, which needs constant work of separation in order to keep air traffic functioning.[19] Because being partially connected means to be separated and connected at the same time,[20] borderlining is not something that can be done once and for all. It is a modern Sisyphean labor: endless in its very natures it is built into guidelines, regulations,

---

17. Anzaldúa, *Borderlands*, 247. Anzaldúa's animals surely are deeply entangled in the spiritual borderlands, a terrain that seems especially eerie for academia. There seems to be a strong disposition against the spiritual and cosmological disrespect within Western rational thinking. "Borderlands," "the new mestiza," and "la facultad" are easier to theorize with, or to integrate into the sleek architecture of academic papers and the strict rules on how to craft them than the animal-atravesados in the borderlands, half animal, half human, constantly changing their shape and sex, and unclear in their onto-cosmological status.

18. Latour, *We Have Never Been Modern.*

19. Here, we draw on Annemarie Mol's notion of multiplicity in analyzing how technoscientific objects are enacted as a result of simultaneous practices as well as on John Law's notion of technoscientific objects that are more than one, less than many. Mol, *Body Multiple*; Law, *Aircraft Stories*.

20. Strathern, *Partial Connections.*

observational practices, and surveillance. Borderlining, thus, is characteristic of the modern airport more generally. In this article we focus on those activities of airports that are directed to constantly cleaning up and sorting out the mixed, dynamic assemblage of technology and animal habitats. In Frankfurt this takes place in the wildlife departments, the work of veterinarians, rangers, firefighters, animal protection units, customs, ground operations, and cargo companies.

Borderlining, to be sure, means more than "boundary work,"[21] as it includes the affective dimensions of airport management, including the management of the bodies of passengers.[22] While commonly depicted as spaces of control, aviation infrastructures are at the same time traversed by affects and emotions. Building on Sara Ahmed's economic model of emotions, we understand affects as not residing within subjects or objects, but circulating between them.[23] "Emotions do things,"[24] and at the airport emotions are heavily involved in borderlining, that is, shaping borders with fences, traps, checkpoints. Anzaldúa's borderlands theory, in turn, helps us to make sense of the "emotional residues" produced through borderlining. We are particularly interested in how these affective economies generate different material cultures and how they embody animal affects and agency in situations of coexistence or clash at the airport.[25] Here, we draw on Vinciane Despret's work on subjectivities that challenges taken-for-granted differences between humans and animals, showing how humans and animals become capable of responding to each other.[26]

Despret's and also Donna Haraway's interspecies ethics correspond very well with Anzaldúa's relational approach to commonalities and differences. Unlike some animal studies scholarship that highlights principal similarities between human and nonhuman animals, Haraway and Despret respect principal differences between them by also acknowledging entanglements and interdependences. Both have explored an interspecies ethics built on the concepts of response and "response-ability."[27] Haraway has claimed that humans and animals develop a reciprocal attunement through their relations to each other as companion species[28]—an example from Frankfurt Airport would be magpies using wooden and human-made plastic and metal materials alongside each other to build their nests. For Despret an ethics of responsibility is built on the capacity of humans to ask animals the "right questions."[29] Asking the right questions is

21. Gieryn, *Cultural Boundaries of Science.*

22. Adey, *Aerial Life.*

23. Ahmed, "Affective Economies"; see also Adams, Murphy, and Clarke, "Anticipation."

24. Ahmed, "Affective Economies," 119.

25. Benson, "Animal Writes."

26. Despret, "Becomings of Subjectivity."

27. Haraway, *When Species Meet*, esp. 69–93; Despret, "Body We Care For."

28. Haraway, *Companion Species Manifesto.*

29. Despret, *What Would Animals Say.* These questions are pragmatic and situated and not interested in metaphysical problems regarding human-nonhuman animal issues (for instance the endless debates around the question of whether animals have language or not).

based on the ability to understand what particular situations ask of humans, how to respond in ways that trigger curiosity (from both sides), and being open to surprise. An interspecies ethics built on response-ability relies on translations and interpretations of particular situations. It is fully aware of the possibilities that situations might be interpreted differently by humans and nonhumans. Asking the right question, being curious, and being ready for surprise form a continual process of interaction, uncertainty, and being attentive. Hence, Despret's and Haraway's pragmatic (and pragmatist) interspecies ethics helps us to understand animals as affective, response-able beings within the airport borderland. It allows us to see how the airport has also learned to understand itself as a partner in an interspecies relation.

One result of borderlining practices at airports is that it demands from its inhabitants, users, and passersby the ability to work out adaptations. They have to cross back and forth between multiple border regimes, checkpoints and fences that cut through their habitats as well as linguistic and economic borders, demanding and enacting shifts in identities and practices. Code-switching and mode-switching are crucial strategies of adjusting to, coping with, or even survival in violent borderlands.[30] Airports as human and nonhuman borderlands produce troublesome and "alien" elements that disturb, interrupt, or coexist with airport infrastructure. We call them "airport atravesados," paraphrasing Anzaldúa´s notion of the atravesado, as "those who cross over, pass over, or go through the confines of the normal."[31] Our airport investigations show how borderlining practices at Frankfurt airport constantly produce such atravesados. The airport, in turn, is kept busy coping with them by means of ever more infrastructure building and specific affective economies of responsivity.[32] It undergoes a process of learning that coping with atravesados requires continued adjustments rather than trying to keep animals off the airport once and for all.

Researching these modes of borderlining required us to work across boundaries as an interdisciplinary research team. Our various encounters with borderlining practices, actors, sites, artifacts, and documents gave rise to a particular kind of mixed archive that emerged during our research on site and that is an archive of and in borderlands, including interviews, printed and archival documents, and visual documentation. Our site visits, in the first place, made us aware of the tensions and ambivalences that

---

30. Anzaldúa, *Borderlands*, 20, 59, 100–103.

31. Anzaldúa, *Borderlands*, 25.

32. A new and critical strand of infrastructure studies has expanded the idea of infrastructure much beyond its familiar meaning—the study of large-scale technological networks—by moving it to the social and cultural. This has led to a number of important conceptual innovations, by including social interactions, the nonhuman, and networks as forms of contingent infrastructure. See Star, "Ethnography of Infrastructure," and more recently Anand, Gupta, and Appel, *Promise of Infrastructure*; Carse, "Nature as Infrastructure"; Chu, "When Infrastructures Attack"; Elyachar, "Phatic Labor"; Howe et al., "Paradoxical Infrastructures"; Robbins, "The Smell of Infrastructure"; Simone, "People as Infrastructure"; Tousignant, "Insects-as-Infrastructure"; Wong, "Rumor of Trafficking."

traverse encounters between animals and technology at Frankfurt Airport. In what follows, we portray the airport as a multiple borderland, replete with practices of separation that also produce intruders, atravesados. First we examine the historical emergence of the airfield as animal-free environment and part of the global airspace; this is followed by a section on the coming into being of the animal passenger as a luxury product, still partially connected to the cargo category and always on the verge of becoming an intruder into airport operation; third we consider interspecies ethics and relations within the airport's multifaceted response infrastructures as they are put in place to manage collateral damage when animals clash with airport operation. We especially ask what kind of affective economies materialize in a broad-ranging set of borderlining practices? What kind of material culture do they produce? How are multispecies borders done? What kind of local, historical legacies do airports struggle with and how do they cope with the underlying tensions of partially connected sites, sectors, and spaces?

Borderlining the Airfield

> If wild boars or deer show up on the tarmac, it is not the animals that are the problem, but the fence. And if the fence is impenetrable, I don't have the animals on the tarmac. . . . Right now, we have a fence at the new runway that I love. It fits into the landscape, it's pure high-tech, and it suits me very well, personally. It's a single-row fence, if it were double-row, as the security guys prefer them, you create in-betweens. How, then, do I get into the in-betweens? How can I control the vegetation there? Do I have to use chemicals? These are some of the questions that usually come up when considering such measures.[33]

We are sitting in the car of airport ranger Thomas Müntze, cruising around Runway West, while he lectures to us about the importance of airport fences. On our tour around the airfield we come across different types of barriers, ranging from simple mesh wire fences to concrete walls. Müntze highlights the conditions that airport fences have to meet (fig. 2): Some animals like to dig, so the foundations of a fence have to reach deep into the ground; the fence has to be high enough, so that deer are not able to intrude into the airfield; of course, the material has to be stable enough to resist chewing, and the structure has to be fine-meshed to avoid small animals slipping through. The new high-tech fence also signals the exact location of where the fence has been ripped out, in the event of an intruder. Apart from thwarting human bystanders, political protesters, and terrorists from entering the airfield, the fence is specifically designed to keep out all kinds of animals, "from mice to elephants," leaving foxes ("I have given up on them") and birds as the two remaining species not challenged by the high-tech border.

---

33. Thomas Müntze (airport ranger at Frankfurt Airport), interview by the authors, Frankfurt Airport, 2014.

Figure 2. Ranger Müntze and an old fence at Runway West. Courtesy of the authors.

Building fences epitomizes borderlining at its most basic level as the work of separation materializes in these fences surrounding the airport. Enclosing and fencing off the airport has been a gradual process. In Frankfurt the airfield has continuously expanded over time, a trend that was (and still is) repeatedly challenged by nearby communities, resulting in different layers of fencing systems. These various modes of borderlining have been configuring not only the local political and social human landscape—the resistance against Frankfurt Airport expansions was a nucleus for the environmental movement and the green party in Germany[34]—but also the interspecies relations in and around the airport. They produce and leave behind specific affective residues and lead to reorientation and learning processes by some animals and parts of the airport.

Today's fences are thus part of a complex system designed to keep animals away from the apron. Every airport develops its own material culture of borderlining the

34. Dworog and Mende, "Residuen des Ordnungsdenkens."

airfield in order to cope with the environments into which it was initially inserted. In Frankfurt, this local border culture is closely related to the history of the city forest, a remainder of the hunting grounds of eighteenth-century aristocracy and clergy. Due to this hunting culture, the airport is still surrounded by a forest with one of the highest deer and game population in this part of Germany. It is "quite a busy place," according to ranger Müntze. It was in the midst of this forest that an area of one hundred hectares (almost two hundred fifty acres) was cleared for the airport in 1936. The airport, at this time, did not have a cordoned-off airfield, fences, or even runways; it was an open field geared for airships and small aircrafts—as well as for agricultural activities. Well into the 1950s, the airport was a member of a local farming cooperative cultivating vegetables, crops, and livestock. Looking at sheep especially helps to understand how the two spaces—animal habitats and the emerging airspace—coexisted and were partially connected: several hundred sheep were part of the livestock economy of the airport; at the same time they were engaged in airport operation and ground management, as they mowed the grass and compacted the soil through their movement, thereby facilitating the take-off and landing of aircrafts. Consequently, a farmer and a shepherd were part of the airport staff (fig. 3).[35]

Farmer, shepherd, and sheep disappeared though due to the massive expansion of airspace after World War II, fundamentally changing the equilibrium between the two spaces. In 1945 the new world power—the United States—chose the Frankfurt region as a strategically important center not only of the western zones of Germany but of the whole of Western Europe. They set up Rhein-Main Air Base to become the European hub for the United States Air Force, making Frankfurt Airport a center of operations during the Cold War. Significantly, this manifested in meeting the logistical challenges of the Berlin airlift by developing and testing schemes for aircraft operation and supply.[36] The borderlining of the airfield of Frankfurt Airport first became visible on a map that regulated spaces where sheep were allowed to graze. One of the first documents that outlines these borders is the "Plan of Sheep Pasture on the Rhein-Main Airfield," commissioned by the headquarters of the European Aviation Engineer Command in August 1946.[37] The first concrete runway at the airport is marked in red and the legend of the map explains that "No sheep will be allowed within 100 (feet) from taxiways and hardstands and within 1000 (feet) from both sides of runway."

The map points to an important historical turning point in managing the relationship between airfield and animals. By 1946, the rural economy had come into conflict with the new aviation system for the first time, yet the initial reaction was not to fence in the airfield. Rather, the US commanders defined "no-go areas" for animals, which the airport shepherd was responsible for guaranteeing. This short phase of relatively peaceful coexistence came to end soon thereafter with the introduction of the heavier and

35. Fraport Archive, VG 06/159, VG 06/31, VG 01/56, VG 01/74.
36. Erickson et al., *How Reason Almost Lost Its Mind*, 51–80.
37. Fraport Archive, VG 06/159, VG 06/91, VG 01/56.

Figure 3. Shepherd, sheep, and airship at Frankfurt Airport circa 1930s. Courtesy of HR/Hessisches Wirtschaftsarchiv.

faster jet aircrafts. Following a major accident in the late 1950s—a roe deer had run into the front wheel of a KLM plane—the German Federal Aviation Authority demanded that Frankfurt Airport avoid animal collisions on the airfield as a top priority. As a consequence, a new border was established: the airfield was completely fenced with wire mesh—and it has remained like this ever since. This fence created a new legal space, because the area within the fence became a private hunting ground. A wide range of hunting practices were applied to clear the airfield from all kinds of animals: from traditional shooting to drive hunting and ferreting. Later, lethal gas was even used in order to wipe out rabid foxes.[38]

38. Fraport Archive, Thematische Akten, Jagd, 2012/003-433 (1960–1978) and 2012/003-434 (ab 1979); see also Schriftwechsel mit städtischen Dienststellen 1.1.1956–31.12.1963, Forstamt Frankfurt, VG 06/127.

The affective economy of borderlining the airfield was initially dominated by a culture of killing, strongly shaped by a hunting tradition. Yet, "cleaning" the airfield of animals once and for all turned out to be more complicated than the airport operator originally envisioned. The fences needed permanent maintenance and control, and for a long time they were simply not technologically sophisticated enough to keep any species out forever—it was a long journey to ranger Müntze's standard of the high-tech fence. More important, fences could not stop those animals that turned out to be a major threat for the burgeoning aviation industry in the postwar period: birds. Initially, birds were confronted with the same killing technologies as their land-based peer-animals at Frankfurt Airport. In the mid-1960s airport ranger Friedrich Miehm installed huge Norwegian crow mass traps in the grass at the end of the northern runway.[39] To the ranger's surprise an airplane soon blew away one of the traps; regardless this measure did not succeed in diminishing the bird populations on the airfield. The same goes for various attempts and experiments to scare away birds with noise. Several phono-acoustic experiments were undertaken at Frankfurt Airport between 1958 and 1962. Employees of the regional ornithological station (*Vogelschutzwarte*), accompanied by technicians of the Telefunken Company, tried to scare away crows and starlings with mobile loudspeaker systems. The noise imitated the species' cry of fear.[40] Today, airports follow more standardized practices of borderlining avian intruders, which has given rise to a global market for specific scaring and killing technologies, including alarm pistols, dragnets, and monitoring devices, in the interim decades.[41]

Nevertheless in Frankfurt and elsewhere it turned out that the two spaces—airspace and animal habitat—could not be separated by short-term or one-time activities alone. In Frankfurt, the airport operator also became aware that deforestation had significantly altered local bird populations. The airfield had become a highly attractive open land in the midst of a forest, with bird hotspots like the River Main nearby. The open land quickly attracted bird species that had hitherto been rare in the woods, raptors like falcons and buzzards as well as other bigger birds like crows and pigeons. Parallel with experiments of trapping and scaring, Frankfurt Airport began to biologically control the airport's ecosystem by applying a specific seed mixture and fertilization to grasslands on the airfield.[42] This mixture was to change the composition of plant communities. The simple idea was that large birds and flocking birds would desist from entering the airfield because particular plant communities attract them less. As part of this ecosystem management approach the airport also modified its grass-cutting procedures. Instead of keeping the grass short like an English green, so-called long grass was

---

39. Keil and Miehm, "Vögel und Flugzeuge."

40. Keil, "Bisherige Versuche"; Anonymous, "Elvis als Möwenschreck." A local newspaper reported that at a London airport, construction workers had coincidentally found out that playing Elvis Presley's "Shake, Rattle, and Roll" at a high volume was highly effective in scaring away seagulls.

41. Belant and Martin, *Bird Harassment.*

42. Heyer, "Naturschutz und Düsenluftverkehr."

Figure 4. Tarmac and forest along Runway West at Frankfurt Airport. Courtesy of the authors.

allowed to grow. The long grass made it more difficult for raptors to find their prey, like mice.[43]

The creation of a "boring ecosystem" has been a long-term process of adaptation (and learning) by the airport—just shooting the animals would not solve the problem (fig. 4).[44] The meager and unattractive character of the whole airfield should "bore away" all predators, especially birds of prey. Airport grassland engineering included the use of a special mix of plants that would not grow seeds that could attract birds or mice. This in turn had consequences for the management of the airfield. Ponding had to be avoided, for instance, because it would attract birds. The creation of the boring ecosystem was a far more complex concept of bird-strike prevention, because it required managing and regulating the airfield from the "bottom up" and "ecologically" as a whole. The politics of boredom implies sophisticated regimes of control, observation, and surveillance. Initially, this systematic knowledge about bird-strike prevention was part of military research during the Cold War. Since the 1960s the airfield has turned into a high-security area—a complex borderland with regimes of control not only for humans

43. Fürbeth, "Flughafenökologie als angewandte Wissenschaft"; Hild, "Gutachten zum Thema Vogelschlag." This was no Frankfurt-specific practice. In 1980 it was suggested in the *Journal of Applied Ecology* to a wider audience. Brough and Bridgman, "An Evaluation of Long Grass."

44. *Boring ecosystem* is a term used by the airport ranger, explaining the ways in which the airport manages the ecosystem (Thomas Müntze, interview by the authors, Frankfurt airport, 2014).

but also for all kinds of plants and animals. "Boring animals away" in terms of bottom-up ecosystem management is also loaded with affect that is not bound to humans, animals, or objects alone but circulates among them.[45] In turn such technoscientific ecological borderlining contributes to enacting these multiple spaces—that coexist, overlap, or clash—and the intensified stratification of the airport borderlands.

Borderlining the airfield and managing the intersecting spaces can take many forms, including fences enclosing the area but also fences within the airport. The latest airport expansion involved elaborate plan approval procedures that also included attempts to settle conflicts over airport expansion by means of compensation measures. Some of the measures taken against possible bird strikes resulted in bizarre installations such as a "bird curtain," a meshed fence erected in an attempt to construct a border between a nearby pond and the new runway. Of course, birds can still easily fly above the fence, yet lawsuits weighed concerns and protests voiced by activist groups and local biologists against investments in bird-strike prevention by the airport operator. The "bird curtain" came to be approved as (legally) settling the conflict and fixing public concerns over airport expansion. Together with an untested infrared monitoring technology, the "bird curtain" materializes and contains the affective economies that come with the multiple spaces that partially connect at the airport. Killing has been one strategy put into practice in order to calm human fears about animals causing accidents on the airfield. Scaring and boring animals away from the airfield replaced killing in these affect-loaded practices of borderlining. In this way the airport constantly adapts not only to challenges that intruding animals pose to airport operation but also to the evolving political and legal demands. While the airport has gradually learned and adapted strategies to keep out animals or coexist with some of them, animals in turn learn and respond to this borderlining in their own ways.

Borderlining the Animal Passenger

October 8, 1974: I am on Deutsche Lufthansa flight 306 from Frankfurt to Genoa, departing at 1 p.m. Onboard the Boeing 727 are 140 passengers and 2,000 swallows. Approaching Genoa the aircraft descends very slowly. Experienced co-travelers are surprised, and wonder why. The cautious landing is due to the swallows. It is amazing how much care the captain invests in our feathered friends. I remember a sign at the door of the regional cargo office, saying: "We do it. Lufthansa." What is more, they are acting with care—splendid! In Genoa the organization is excellent, too. Silvano Stefanacci, the assistant station manager, opens the "swallow boxes" just fifteen minutes after landing. Like in Frankfurt everything happens in an unbureaucratic way, engaged, nearly tenderly.[46]

The author of these lines published in the magazine of a nature protection NGO, Rolf J. A. Gogné, was part of Flight Campaign South (Aktion Südflug). The bird airlift

45. Ahmed, "Affective Economies"; Despret, "The Body We Care For"; Weaver, "Animal Affect."
46. Gogné, "Ich flog mit den Schwalben," 18 (translation by the authors).

was one of the major species-protection attempts in Europe at that time. Involving several European countries, multiple airlines, railroad companies, and a stupendous number of volunteers, it carried more than a million swallows across the Alps to northern Italy and southern France. Due to an early onset of winter, volunteers had gathered the swallows in Germany and elsewhere, as they considered them too weak for their annual migration. After placing the swallows in boxes, volunteers handed them in at local train stations. From there they were brought to Frankfurt Airport's freight terminal and flown south. Flight Campaign South had broad media coverage and, thus, it killed at least two birds with one stone, if you will: for the airlines, the story of aircrafts helping out weak and exhausted animals fit smoothly into their marketing and charity campaigns. At the same time, it demonstrated that technology could provide for nature, making airspace a precondition for animal survival.[47] What is more, the exceptionality of Flight Campaign South as a humanitarian act reminiscent of Cold War airlift projects shows how the highly rationalized and optimized logistics of aviation are imbued with affects. Animal air cargo, and its specific culture of care and salvation, points to the deeper affective economies of logistics, manifesting in a complex material culture in those parts of the airport borderland that deal with animals on a regular basis, like customs or the freight terminal. This material culture anticipates and responds to specific needs of animals but is also shaped by the business-driven environment of airport operation. But how have these affective economies evolved historically in practice? How do borders separate and enact safe and unsafe spaces, for instance through veterinary regimes, customs, and economic regulation?

The borderlining of animals is partially connected to passenger-cargo in air freight and closely related to the longer history of animal transportation. Animals have long been carried and shipped around by rail, sea, and road—for several reasons (breeding, military, economic, scientific, and zoos).[48] It should not come as a surprise that they became air passengers, specifically air cargo, very early on.[49] In 1924 the breeding bull Nico was one of the first animals to board a plane on his way from Rotterdam to Paris. Breeding has always been an important reason that animals were shipped around the world (though this changed considerably with the establishment of artificial insemination and freezing technologies in the 1980s), but animal air cargo soon included a wide spectrum of groups: livestock, zoo animals, pets (from dogs to canaries), sport animals (racehorses in particular), laboratory animals, aquarium fish. With the massive growth of air cargo after World War II, the number of animals in the air exploded. Today, Frankfurt Airport has more animal passengers than human travelers, yet animals do not fit easily

---

47. As critics pointed out, however, the argument of technological superiority was misleading, as it forgot to take the "natural" behavior of migratory birds into account. For instance, they might be disoriented and confused, so they would not be able to follow on their own migratory routes.

48. Woods, "On Cattle Shipment"; Rothfels, *Savages and Beasts*; Ritvo, *Animal Estate.*

49. Allaz, *History of Air Cargo*, 128.

into the airport's operation and its routines and divisions being in-betweens, both cargo and passengers; they require continuous work to keep them from disturbing airport routines, both as to spaces and regulation. Thus, airports are also spaces of animal affect; as animated infrastructures they need to cope with and manage animal agency entering technological systems.[50]

From the early days of airports we find that big hub airports like Frankfurt established distinctive places in order to properly handle animals—as a specific kind of air cargo.[51] The practices of handling changed considerably over the years. When Frankfurt Airport built its first animal station in the early 1960s, it was located in a basement of the cargo facilities. Later the station was reconstructed on the ground level in the midst of a new cargo building. It was then called the "animal room" and Lufthansa Cargo circulated a special freight handbook that explained how to deal with animal passengers.[52] By this time, import, export, and transit zones were gradually introduced in the handling of animals by defining time slots for each group. Yet the increasing amount of official and legal requirements made it impossible to cope with animals in a room in the midst of the flow of cargo. Because animals literally got in the way of daily cargo procedures, the animal station was outsourced and rebuilt under the new label of Animal Lounge at the periphery of the cargo area in 2008. In the new building the spatially separated zones for import, export, and transit made it possible to handle animals as flows simultaneously. These projected borders traverse the Animal Lounge and help with basic animal needs while making animals cooperate with cargo flow.

Meanwhile the Animal Lounge has also become the largest border for traveling animals in Europe, giving rise to a border patrol for nonhuman travelers; with Anzaldúa one could call it *la migra veterinaria:* "My ID says that I am a kind of a sheriff," one of the veterinarians tells us when we visit the Animal Lounge. "Very much like the border police checking passports of travelers, I am busy with inspecting the travel documents of animals: all of them have implanted chips and we are scanning them and compare the barcodes with the documents."[53] The veterinarians at Frankfurt Airport are also responsible for containing the spread of diseases and epidemics, as part of a technological response infrastructure and (affective) regime of border control that replaced earlier practices of long-term quarantine. The European Economic Area in the 1990s increased tremendously the flow of animal cargo so that in contrast to former times animals were not allowed to board aircrafts without valid travel documents. This gave rise to the emergence of specialized animal cargo agencies, which processed an enormous amount of paperwork. While until the 1970s local veterinarians regularly had to visit

50. Hughes, *Networks of Power*; Benson, "Generating Infrastructural Invisibility."

51. Anonymous, "Arche Noah der Luft"; Kneerich, "Ich glaub[e], mich laust der Affe!" For the international development of animal air cargo, see Frenchey, "Look Who Is Coming by Plane!"

52. Anonymous, "Das fidele Huhn und sein Elefant."

53. Axel Heitmann (Animal Lounge veterinarian), interview by the authors, Frankfurt Airport, 2012.

Figure 5. Animal handling at Frankfurt Airport, undated. Courtesy of the Fraport Archiv.

the airport whenever needed, a stationary veterinarian border control was officially established in the early 1990s, and the number of employees increased continuously. In 2008, there were twenty-six veterinarians and sixty staff members at the Animal Lounge at Frankfurt Airport.[54] The expansion of animal air cargo also gathered other animal caretakers and experts, for instance from the Frankfurt Zoo, at the Animal Lounge who help the border patrol to cope with the handling of difficult species (fig. 5): opening the boxes of alligators, snakes, and spiders; calming horses or jet-lagged rhinos; feeding dogs and other pets their favorite diet; and ensuring tropical fish are not harmed by daylight (the employees thus use a black light). These techniques are required to keep animals alive and enable them to collaborate with the employees responsible for cargo flow.

Borderlining animals also takes place at the core economic border checkpoint: customs, where veterinarians regularly assist immigration officers with identifying endangered species.[55] Since the Convention on International Trade in Endangered Species (CITES), introduced in Germany in 1976, customs in Frankfurt has been responsible for checking to see whether any passengers are carrying or smuggling "illegal" animals or animal products mentioned in the yearly updated CITES appendix as well as in internal

---

54. Anonymous, "Eine Lounge für Tiere am Flughafen."
55. Jaclin, "Poached Lives, Traded Forms."

guidelines applied by airlines. Nonhumans are part of the border patrol staff, too. Dogs specialized in sniffing drugs, weapons, explosives, money, and the remains of endangered species help the human officers to detect illegal items that then are stored in a special room, the so-called *Asservatenkammer* (court exhibits room). Over the decades Frankfurt Airport has accumulated an impressive collection of stuffed animals endangered by extinction such as wildcats; animals like turtles or crocodiles processed into handbags, belts, hats, shoes, and musical instruments; and huge amounts of ivory (fig. 6). However, smuggling is not only limited to dead animals but also includes living animals. Often passengers are not even aware that they are smuggling while carrying a cute, beloved, or "salable animal like cats, turtles, or even spiders."[56] In this case, they usually end up in the Animal Lounge to await repatriation.

The Animal Lounge epitomizes the airport as a space of intensified and projected borders, as described by Anzaldúa. Not only do veterinarians and customs enforce and

56. Wirth et al., "Spinnen, Bären, Tigerkrallen."

coordinate national and European border legislation, in the Animal Lounge different species that are adapted to contrasting ecologies—air, water, land—converge and have to be managed in a tight space. Like on Noah's Ark, a popular image of the air cargo industry, species of all kinds meet in a single room. It is challenging to have multiple animal habitats in one room, and to move them around. The establishment of species-appropriate temporary habitats both in the cargo building as well as on the planes became crucial—and was a complicated task to achieve. The historical record is full of anecdotes and stories about stranded animals at the airport that needed special care and improvisations to create a miniature temporary habitat for them. For instance, the racehorse Nocturno that had to be "carried with a blue light driving transporter to the meager grassland" between the runways in order graze every night while waiting for his quarantine to be over; or the dolphin star Flipper that was provided with a special swimming pool (as a local journalist put it, Flipper "expressed his thanks by performing some of his stunts").[57] In early aviation, however, a great number of animals did not survive their trips, because they lacked minimal conditions of their individual habitat. In the rather rationalized language of logistics these animals were counted as "DOAs," animals that were found "dead on arrival."

Since 1969 the International Air Transport Association (IATA) began to standardize the procedures of animal transportation through guidelines—the Live Animal Regulations (LARs). The LARs are concerned with practical problems and they can also be understood as a handbook to manage multispecies borders and coordinate the partially connected airspace and animal habitats.[58] They provide in minute detail container requirements for the whole animal kingdom, such as stocking densities for specific species, tables with the acceptable ambient temperature ranges for animals, calculations of animal heat and moisture load during transport, a common description of adult animals, color, size, and the exact placement of stickers on the containers (figs. 7a, 7b). They also comprise the CITES list appendixes in order to help the staff identifying endangered species that are not allowed to travel. Most of the LAR guidelines, however, are dedicated to species-specific transport boxes; they are literally technical specifications. They have to provide the individual animal with the minimum of its vital needs: water for fish (in double plastic bags), air for land animals and birds, enough space for bigger species but also an effectual amount of confinement, specific containers for whales and dolphins who need air and water at the same time, and so on. The standards for these miniature habitats are regularly supervised and updated by an international expert committee.[59] Airlines are not allowed to let animals board that are not provided with an adequate mini-habitat or whose containers do not fulfill the required standard. Some animals are simply excluded from air transportation: nursing and

---

57. Kneerich, "Ich glaub[e], mich laust der Affe!," 77–78.
58. Güttler, Schlünder, and Bauer, "The Ur-Box."
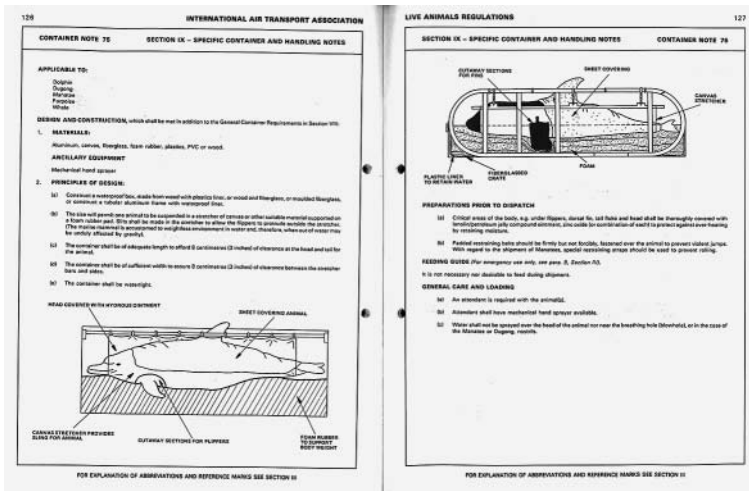59. Güttler, Schlünder, and Bauer, "The Ur-Box."

Figure 7a. IATA container requirements in 1977. Source: 6th edition of the IATA's "Live Animal Regulations."

Figure 7b. Killer whale at Frankfurt Airport, circa 1970s. Courtesy of the Fraport Archiv.

unweaned mammals for instance. Here, size as a related factor comes to play since younger and smaller giraffes that are small enough to fit into a cargo plane would often not be weaned. It is also part of the artificial microecologies of animal transportation that, during takeoff and landing, captains have to take the needs of their animal passengers in the cargo space into account. Horses especially are not able to cope with very steep (climb) angles during takeoffs.[60] Animal agency and their habitats are thus built into the material culture and practices of animal air logistics.

Managing these partially connected spaces of the airport borderland is also a matter of temporalities and economic stratification in logistics, similar to business travel or

---

60. Animal Lounge veterinarian, interview by the authors, Frankfurt Airport, 2014.

benefits for frequent travelers: with the beginning of the new millennium, Lufthansa Cargo reorganized its portfolio and animal air cargo was reinvented as "Live/td," a premium product.[61] "Td"—time definite service—is a promise on time that Lufthansa Cargo gives its clients and of course also cashes in on. Besides animals it offers "Cool/td" for pharmaceuticals, "Fresh/td" for food and flowers, "Safe/td" for jewels, banknotes, artworks, and organs, and Care/td for explosives and dangerous goods in general. For some animals, especially pets and horses, the Live/td program marked the beginning of animals being treated as premium passengers, who were no longer treated as standard cargo (like ornamental fish certainly are) but who were—like business-class clients—put on the most direct connections possible. However, compared to standard air cargo, animals were never business as usual. Before they turned into a time-sensitive premium product, animals were classified as "VIC," as very important cargo. Here, the animals (such as valuable racehorses or zoo animals) are certainly more passenger than cargo, joined in an interspecies ethics where responses to animal needs become enrolled in value creation. Meanwhile specialized shipping agencies take care of animal transportation for these premium products; they provide the mandatory containers (micro-habitats) and take care of the increasing amount of paperwork (vaccination records, passports, and other travel documents). Today, due to optimized routines most animals only spend a few hours in the Animal Lounge. As animals have gradually turned into a premium product, the animal station has become a strangely luxurious space. A first-class treatment for traveling pets (Live t/d premium) is not only responsive to animal welfare but also provides additional affective benefits for its owners like a photo upon arrival at the lounge, more space, and special requests while in transit (application of medication or a specific diet). The development of this product corresponds with the needs of the growing pet market where pet owners, driven by an economy of love, are willing to invest a lot of money in the comfort and safety of their non-human family members.[62]

Whereas the cuteness of pets and the eccentricity of traveling exotic animals are heavily used for advertising the air animal freight business, other animals are made invisible. For instance, animals are increasingly traveling as air freight due to the expanding need for lab animals in the life sciences. During our site visits we were not allowed to take pictures of traveling lab animals since they are usually killed in the course of experiments. In making the air travels of these animals invisible to the public, the cargo industry thus tries to avoid being involved in public debates with animal rights activists.

Borderlining animals as passenger-cargo has been driven by specific affective economies that result from the tensions emerging within airport borderlands: from animal welfare concerns to the establishment of new products for growing markets that more

---

61. Lufthansa Cargo, "Live—Our Special Product for Animals."

62. Degeling, "Negotiating Value"; Rock and Babinec, "Diabetes in People, Cats, and Dogs"; Schlünder and Schlich, "Emergence."

and more rely on particular animals: dogs and cats for pet owners, ornamental fish for aquarium enthusiasts, (race-)horses for breeders and polo players, and exotic animals for zoos. The expansion of animal air cargo triggered the emergence of new spaces like the animal room or lounge, new regulations and guidelines like the LAR, and new actors like the veterinarians functioning as nonhuman border patrol and animal handlers in the animal passenger-cargo sections of air logistics. In the Animal Lounge, and more broadly at Frankfurt Airport, we thus found a whole range of affective economies. For instance the economies of fear in relation to importing dangerous diseases, economies of love and care in pet transport, humanitarian aid economies of swallow transport to the south, and also the economies of knowledge and profit when it comes to laboratory or breeding animals.

Borderlining the Atravesado

At Frankfurt Airport on a Saturday afternoon in early September 2014 the head of the animal protection unit Rebecca McNeill took a call while overseeing a chicken transport.[63] A loadmaster in charge of an inbound flight from Los Angeles sought her advice: "Something is odd here. I got two cat cages, firmly secured but empty with an open door. No cats." "Ok, close everything down there, I cannot come over right now, so call the fire department." The airport's fire department has its own animal rescue unit, which sends firefighters to the aircraft. In the meantime, Rebecca McNeill had to deal with angry pilots, because the airline's routines of delivering the pilots' baggage quickly and first has clashed with the roaming cats found in the cargo compartment. The cats however reacted differently to their (alleged) rescue. Whereas one cat returned straight to the box, the other one kept hissing and spitting, throwing the firefighter's special protection glove underneath a container. After it eventually was caught and the box was handed over to a baggage delivery driver, the cat escaped again. Another call reached the fire department: "Cat in engine block of the aircraft tug." Altogether it took two hours until the house cat disembarked and the order of routine operations was restored.

Borderlining at the airport confines highly controlled spaces and thereby produces mobile intruders and multifaceted outlaws, which regularly happens in the intensified multiple borderlands of airports. Acting not exactly as foreseen in the narrow confines of these dividing lines of borderland regimes makes one quickly become an intruder, disturbing airport operation. Even animals traveling as premium products easily become intruders, which we, following Anzaldúa, call airport atravesados, those animals who cross over and thereby interrupt airport operations. Similar to classification practices that always produce their own deviations, it is the intense borderlining necessary for airport operation that produces its atravesados. Coping with these intruders produces a whole series of practices and response infrastructures that involve an entire

63. We reconstruct the work of the animal protection unit mostly from our site visits and interviews. See also Otte, "Zoo auf Zeit."

material culture in itself, as well as "preparedness" and techniques for handling and rescuing animals.[64] This mode of responsiveness is an important feature that has become infrastructural in airport borderlands where affective economies are constantly in tension.

This culture of response and responsibility is indeed embodied by the animal protection unit and materializes in equipment like protection gloves, which are part of an entire animal rescue kit that is maintained by the fire department (fig. 8). This kit is geared to manage clashes between animals and airport operation. Just like local animal populations, animals as passengers interfere with their assigned spaces in unforeseen ways, too. In order to be able to deal with these interruptions on the spot, two fire stations store giant tool kits in truck-size containers. The equipment embodies a specific knowledge needed in order to manage situations where animals interfere with airport operation. The department itself assembled the content of the container, an armament for intervention on the apron. It ranges from gloves with cut protection and blood, virus, and bacterial protective suits to red shields that are designed to manage an entire herd of pigs on the runway. All kinds of ropes and wires, shovels, grippers, and scoops can be found in the container, as well as boxes in different sizes to lock up dangerous animals and barrels for snakes or insects. A wet-dry vacuum cleaner can potentially help to pick up fishes. Securely fixing animal boxes, knotting and tying them according to animal safety standards is but one of the skills that the animal emergency staff are trained in. Written knowledge is also part of the tool kit. One shelf contains the International Air Transport Association (IATA) guidelines for animal transportation as well as an animal encyclopedia by famous Frankfurt-based zoologist Bernhard Grzimek. All of these items and tools are part of a material culture of preparedness, a set of materialized affective economies produced in (and circulated from) the borderlining practices elsewhere. Handling animals both with care and without disrupting airport operation is a major task also dealt with by IATA.

The iterative, incessant, and never completely accomplished character of this kind of knowledge is important when coping with the Sisyphean dimension of borderlining work. Because the realm of animal transportation is today shaped by IATA regulations, the head of the animal protection unit at Frankfurt Airport Rebecca McNeill is also involved in an elaborate system of courses, trainings, and certificates in animal rescue at airports. Since there is no formal training outside the airports and the staff usually come from different professional backgrounds, IATA developed courses, usually offered in English, French, Spanish, and German.[65] There are various certificates that the staff at

---

64. The notion of preparedness gained currency from post-9/11 US homeland security, governmental disaster preparedness to transnational pandemic preparedness. For pandemic preparedness, see Lakoff, "Risks of Preparedness."

65. For examples of courses and diplomas, see IATA, "Training Catalogue 2018," 67; IATA, "Special Cargo Handling Diploma."

Figure 8. Animal tool kit at the fire department of Frankfurt Airport. Courtesy of the authors.

the animal protection unit are required to hold depending on responsibilities. Courses in animal rescue include training with farm animals and group exercises working through specific scenarios. One of those scenarios was rescuing a circus hippopotamus drifting away and scared by the tourist boats on the Rhine River. The group of trainees had to come up with a rescue plan, including the equipment needed, the problem-solving strategies, and transportation for the hippo back to its home base. Thus, the very knowledge of animal protection staff is grounded in practical knowledges and highly local in its embeddedness in Frankfurt Airport's fire department, yet at the same time it is highly specialized and transnationally networked through IATA standardizations.

The animal protection unit's rescue kit is comprehensive in scope, meticulously ordered and a materialized and anticipatory furnishing for interventions to safeguard animals. Indeed, it embodies a material culture of separation work and preparedness to deal with animal interference in airport operations. Putting together this mobile animal emergency unit was animated by imaginaries of animal encounters that could routinely

or accidentally take place at this global hub of air traffic. The animal rescue staff should be able to face, safeguard against, or manage any creature that might intrude into airport routines—as stranded passenger or lost cargo but also local animals that show up from outside. As the toolbox shows, the experience-based knowledge of animal rescue evokes a different classification than common taxonomy developed in the history of biology. Rather it is ordered according to size, velocity, and behavior of animals of the same or different species, as well as the weapons that these animals use against other species, such as teeth, horns, grip, weight, claws, or poison. These imaginaries of deadly or disastrous encounters with animals (and the commitment to prevent them) animate the entire toolbox and the materials stored and held to be prepared for those encounters should they actually occur. This goes together with containers, boxes, and ropes that might be needed to enclose animals, with the goal of protecting the animals *and* also airport operation. Yet this also shows how the airport has aimed to become a responsive partner in an interspecies relation.

Because such preparedness also involves establishing places for the unforeseeable, one fire station even has an animal shelter. The shelter is named after St. Francis, the Christian patron saint who was famous for negotiating contracts between humans and nonhuman animals in cases of conflict about the questions of *convivencia* (conviviality) and of how to share a space. This asylum temporarily houses animals that are found alive at the airport—not animal passengers but airport atravesados that have no place in the standardized routines; for instance, veterinary regulations do not allow bringing some wild animals to the Animal Lounge. The St. Francis House (*Franziskushaus*) is equipped with various transport boxes, a terrarium, and first aid kit as well as water bowls and different kinds of animal food. The container is divided into a clean green area for paperwork and a red area for the actual handling of animal boxes. Animals outside boxes, for instance bees, are not allowed. The same goes for dead animals; they must be brought directly to a fridge in a nearby garage. The rules of the shelter are posted inside, together with information sheets listing normal values for vital parameters (temperature, breath, and pulsation) for dogs, cats, birds, rabbits, horses, foals, cows, calves, pigs, piglets, sheep, lambs, goats, and goatlings as a ready-to-use reference on how to care for each of these species when the asylum needs to shelter them. On the front door, a sign indicates whether the container is inhabited or not.

Quite literally in its name, St. Francis House is grounded in a culture of responding to and rescuing living beings. St. Francis traditions in Catholic parishes include benedictions of all animals, "from fleas to elephants." Not only did St. Francis speak to birds, he also tamed the wolf or, rather, made a pact between the wolf and villagers. Indeed, the figure of St. Francis embodies the management of interspecies ethics at the airport, by making contracts and taming unavoidable clashes between airport operations and animal life. Thinking with Anzaldúa it becomes clear that the "functional" and the "affective" sides of practices are indeed inseparable. There is a fundamental difference between St. Francis House and the Animal Lounge. Each serves as a temporary home for

animals, but in the cargo building they are cared for by specialized logistics agents as premium products of a global delivery business. Thus, animals can change their status from premium passengers to animals sheltered in the asylum of St. Francis House—but not the other way around. This animal shelter and the fridge are located in the high-surveillance area on the tarmac borderland. Those everyday rules of operation and their systems of ordering, separating, and regulating are revealing about the human-animal relations and the strange and at times violent pacts inherent in air travel. Just like the shelter for injured animals, the routine practice of quick and controlled removal of dead animals is a reminder of the incessant labor required to maintain the functioning of air traffic: both care and killing are part and parcel of airport operation.

Airport operation and the management of different spaces within the airport through intensive borderlining produces intruders that, in turn, demand action. To do so, other more precarious facilities emerged—places not geared to generate premium products but rather places that deal with collateral damage: preparedness tool kits, an animal protection unit, an asylum, and a fridge. They have become part of the unavoidable handling of airport atravesados, with some animals ending up dead in the fridge, at the asylum, or in the Animal Lounge's economy of care.[66] Precarious facilities at the edge of the tarmac, such as the preparedness kit, the asylum, or the care in the animal lounge, can be understood as residuals within the airport's affective economies, binding together animal protection, airport operation, and fear of, and also care for, animals.

Conclusions: Borderlining Animals at Airports

Coming in from the west and touching ground at the new runway of Frankfurt Airport, airplanes cross the Main River at a multispecies infrastructural hotspot, where avian and aviation infrastructures intersect. Many birds that fly along the river use the thermic conditions of a railway bridge that crosses the river to lift themselves up to the level of the approaching aircraft. Their routine usage of the place regularly causes bird strikes, as reported by local ornithologist Bernd Petri and also stated by the airport operator. The exact numbers are contested, and the imminent clashes make bird strike a serious public issue in the Frankfurt region. In fact, Sully's heroic maneuver inspired local writer Heino Schwarz in his novel *Only a Few Birds* to imagine an emergency ditch into the Main River.[67]

Technological airspace and animal habitats are partially connected in the sense of Strathern, while they function as wholes for those inhabiting them. Thus, they produce messy boundaries, requiring a specific form of separation work that we call borderlining. Taking our point of departure from the material culture—the fences, traps, and seed mixtures, the animal boxes, logistics, and regulations, the rescue tool kits, fridges, and asylum shelters—showed us that borderlining animals at the airport has always been Sisyphean separation work. Partially connected spaces are full of tensions and

66. Puig de la Bellacasa, *Matters of Care.*
67. Schwarz, *Nur ein paar Vögel.*

borderlining practices constantly try to minimize them, aiming for coordination and coexistence. Yet, the separation work that enables animals to reach their destinations is never accomplished once and for all but needs incessant work. Because borderlining is never fully complete, harsh encounters between animals and technology—clashes and collisions—are still possible and do occur. The affective economies related to borderlining animals at Frankfurt Airport are complex and ambivalent, ranging from fear to care and love, from scaring to killing and boring away, from purification to responsivity, and from improvising to economic exploitation.

Over time, hub airports had to learn that jet aviation needed animal-free spaces and then again that the vision of an animal-free space will never materialize. Interspecies relations cannot be resolved once and for all in the sense that nonhuman animals will disappear. Rather, the airport has learned that in a complex way these relations will persist—though in always changing forms and historical configurations. Borderlining, so busy with endless practices of separation, has become a relationship itself, a relation that acknowledges its permanence and that is based on the capabilities of all sides involved to respond.

The learning and responding taking place at the airport become visible in the emergence and practices of the animal rescue unit at Frankfurt Airport that works along an ethics of responsiveness—based on (situated) response. It is also present in the ways that a politics of boredom—making parts of the airfield unattractive for nonhumans—replaced an affective economy of killing and scaring. Boring animals away in an effort to reduce harm to them—and to humans and technology in case of a bird strike for instance—is not only driven by functionality; the airport, to some extent, attempts to also take animals' agency into account in a more responsive regime, even though this is done with the goal to confine the animals' interference with airport operation.

We have taken Anzaldúa's notion of borderland as a conceptual approach to understand the airport as a space of intensified border regimes. At big hub airports like Frankfurt a whole range of different borders is projected onto a limited space. As a consequence of borderlining and multiple spaces, the different worlds that grate against each other produce *una herida abierta*,[68] an "open wound," that is contained in the affective economies of what we have called borderlining. At the airport this open wound is constantly bureaucratized and normalized by means of management technologies. In this article we have demonstrated that the airport is a multispecies borderland that cannot be reduced to the tensions arising from potential clashes between humans and technological systems. Despite all attempts to manage tarmac ecologies or to introduce Live/td in logistics, animals inhabiting the airport or its surroundings—or even animals traveling as premium passengers—regularly interrupt the routines of airport operations, requiring preparedness kits and spaces for the unforeseen. These interruptions show that borderlining can produce airport atravesados that pass through airport

68. Anzaldúa, *Borderlands*, 25.

ecologies but do not fit in with the management of airport operations or the flow of passengers. As Anzaldúa has highlighted, borderlands are composed of more than the "actual" border technologies, but are full of imaginaries, multiple temporalities, and precarities. Airport atravesados inhabit this space in their own way, pointing to unresolvable tensions between imagined disaster and the routinized, rationalized coexistences of life and technology.

Anzaldúa has titled one of her chapters "Entering into the Serpent," quoting Silvio Rodriguez's song about the large "serpientes del mar" that carry in their transparent bellies "all that they can snatch away from love"[69] (affect, emotion)—and as soon as one can get rid of or kill one of them, these serpents reappear in much larger forms. Borderlining at the airport—the incessant work of separation that produces ever new atravesados—reflects the affective entanglements described in Anzaldúa´s borderlands theory. Similar to "entering into the serpent," one can understand our exploration of the borderlining activities at Frankfurt airport as an excursion into the large, transparent bellies of technoscience and their affective labor, into the effort to get hold of the "emotional residue" that characterizes places produced and marked by "unnatural" processes of borderlining.[70]

SUSANNE BAUER is a professor in science and technologies studies (STS) at the TIK Centre for Technology, Innovation, and Culture, University of Oslo. Trained as an environmental scientist and epidemiologist, her work in the social studies of science has examined calculative infrastructures and data politics in biomedicine and environmental health. Currently she engages in collaborative projects on digital infrastructuring, regulatory knowledges, airport borderlands, and logistics as technoscience.

NILS GÜTTLER received his doctorate in the history of science from Humboldt University, Berlin. His dissertation appeared as "Das Kosmoskop: Karten und ihre Benutzer in der Pflanzengeographie des 19. Jahrhunderts" (2014). Currently he is a postdoctoral fellow at the chair for science studies at the ETH, Zurich. His ongoing research focuses on the environmental history of the Frankfurt Airport and the Rhein-Main region.

MARTINA SCHLÜNDER is a scholar in feminist technoscience studies and the history of science. Through research methodologies that bring together historiography, ethnography, and archival research she explores and analyses the politics of technoscience in reproductive technologies; their broader implications in the history of eugenics, biopolitics, and feminisms; decolonial approaches to reproductive justice; the naturecultures of human-animal relationships; and critical infrastructures and borderlands. She is engaged in collective research and writing, including visual essays.

69. Anzaldúa, *Borderlands*, 47.
70. Anzaldúa, *Borderlands*, 25.

References

Adams, Vincanne, Michele Murphy, and Adèle Clarke. "Anticipation: Technoscience, Life, Affect, Temporality." *Subjectivities* 28, no. 1 (2009): 246–65.

Adey, Peter. *Aerial Life: Spaces, Mobilities, Affects*. Malden, MA: Wiley-Blackwell, 2010.

Ahmed, Sara. "Affective Economies." *Social Text* 22, no. 2 (2004): 117–39.

Allaz, Camille. *The History of Air Cargo and Airmail From the Eighteenth Century*. Paris: Christopher Foyle, 2004.

Anand, Nikhil, Akhil Gupta, and Hannah Appel, eds. *The Promise of Infrastructure*. Durham, NC: Duke University Press, 2018.

Anonymous. "Arche Noah der Luft: Das Flugzeug als Lastenträger." *Flughafen-Nachrichten Frankfurt/Main* 3, no. 1 (1953): 17.

Anonymous. "Elvis als Möwenschreck." *Der Flughafen* [company magazine of Rhein-Main Airport] nos. 2–3 (1963): 12.

Anonymous. "Das fidele Huhn und sein Elefant: Der Umgang mit Tieren im Luftverkehr." *Flughafen-Nachrichten Frankfurt/Main* 14, no. 2 (1964): 32–33.

Anonymous. "Eine Lounge für Tiere am Flughafen." *Frankfurter Allgemeine Zeitung*. April 12, 2008.

Anzaldúa, Gloria. *Borderlands/La Frontera: The New Mestiza*. 4th ed. San Francisco: Slinster/Aunt Lute, (1987) 2012.

Augé, Marc. *Non-Places: Introduction to an Anthropology of Supermodernity*. London: Verso, 1995.

Banner, Stuart. *Who Owns the Sky? The Struggle to Control Airspace from the Wright Brothers On*. Cambridge, MA: Harvard University Press, 2008.

Belant, Jerrold L., and James E. Martin, eds. *Bird Harassment, Repellent, and Deterrent Techniques for Use on and Near Airports: A Synthesis of Airport Practices* (ACRP Synthesis 23). Washington DC: Transportation Research Board, 2011.

Benson, Etienne. "Animal Writes: Historiography, Disciplinarity, and the Animal Trace." In *Making Animal Meaning*, edited by Linda Kaloff and Georgina M. Montgomery, 3–16. East Lansing: Michigan State University Press, 2011.

Benson, Etienne. "Generating Infrastructural Invisibility: Insulation, Interconnection, and Avian Excrement in the Southern California Power Grid." *Environmental Humanities* 6 (2015): 103–30.

Brough, T., and C. J. Bridgman. "An Evaluation of Long Grass as a Bird Deterrent on British Airfields." *Journal of Applied Ecology* 17 (1980): 243–54.

Carse, Ashley. "Nature as Infrastructure: Making and Managing the Panama Canal Watershed." *Social Studies of Science* 42 (2012): 539–63.

Castells, Manuel. *The Rise of the Network Society*. Malden, MA: Blackwell, 1996.

CBS News. "Flight 1549: A Routine Takeoff Turns Ugly." www.cbsnews.com/news/flight–1549–a–routine–takeoff–turns–ugly (accessed January 25, 2019).

Chu, Julie. "When Infrastructures Attack: The Workings of Disrepair in China." *American Ethnologist* 41, no. 2 (2014): 351–67.

Degeling, Christopher. "Negotiating Value: Comparing Human and Animal Fracture Care in Industrial Societies." *Science, Technology, and Human Values*, 34, no. 1 (2009): 77–101.

Despret, Vinciane. "The Becomings of Subjectivity in Animal Worlds." *Subjectivities* 23 (2008): 123–39.

Despret, Vinciane. "The Body We Care For: Figures of Anthropo-Zoo-Genesis" *Body and Society* 10, nos. 2–3 (2004): 111–34.

Despret, Vinciane. *What Would Animals Say if We Asked the Right Questions?* Minneapolis: University of Minnesota Press, 2016.

Dierikx, Marc, and Bram Bouwens. *Building Castles of the Air: Schiphol Amsterdam and the Development of Airport Infrastructure in Europe, 1916–1996*. The Hague: Sdu, 1997.

Dümpelmann, Sonja. *Flights of Imagination: Aviation, Landscape, Design*. Charlottesville: University of Virginia Press, 2014.

Dümpelmann, Sonja, and Charles Waldheim, eds. *Airport Landscape: Urban Ecologies in the Aerial Age*. Cambridge, MA: Harvard University Graduate School of Design, 2016.

Dworog, Sabine, and Silke Mende. "Residuen des Ordnungsdenkens in den 1970er Jahren? Kontinuitäten, Umbrüche, veränderte Bezugsgrößen: Die Fallbeispiele 'grüne Bewegung' und 'Flughafenausbau Frankfurt.'" In *Die Ordnung der Moderne: Social Engineering im 20. Jahrhundert*, edited by Thomas Etzemüller, 331–55. Bielefeld, Germany: transcript, 2009.

Elyachar, Julia. "Phatic Labor, Infrastructure, and the Question of Empowerment in Cairo." *American Ethnologist* 37, no. 3 (2010): 452–64.

Erickson, Paul, Judy S. Klein, Lorraine Daston, Rebecca Lemov, Thomas Sturm, and Michael D. Gordin. *How Reason Almost Lost Its Mind: The Strange Career of Cold War Rationality*. Chicago: University of Chicago Press, 2013.

Fielder, Brigitte. "Chattel Slavery." In: *Gender: Animals*, edited by Juno Salazar Parreñas, 19–36. Farmington Hills: Macmillan Reference USA, 2017.

Frenchey, John. "Look Who Is Coming by Plane!" *Popular Mechanics*, November 1958, 146–49.

Fürbeth, Herbert. "Flughafenökologie als angewandte Wissenschaft: Entscheidungshilfen für Planung und Betrieb." *Flughafen-Nachrichten Frankfurt/Main* 28, no. 4 (1978): 82–90.

Gieryn, Thomas F. *Cultural Boundaries of Science*. Chicago: University of Chicago Press, 1999.

Gogné, Rolf J. A. "Ich flog mit den Schwalben." *Wir und die Vögel* 7, no. 1 (1975): 18.

Gordon, Alastair. *Naked Airport: A Cultural History of the World's Most Revolutionary Structure*. Chicago: University of Chicago Press, 2008.

Güttler, Nils, Martina Schlünder, and Susanne Bauer. "The Ur-Box: Multispecies Takeoff from Noah's Ark to Animal Air Cargo." In *Knowledge in a Box: How Mundane Things Shape Knowledge Production*, edited by Susanne Bauer, Martina Schlünder, and Maria Rentetzi. Manchester: Mattering Press, 2019.

Haraway, Donna. *Primate Visions: Gender, Race, and Nature in the World of Modern Science*. New York: Routledge, 1987.

Haraway, Donna. *The Companion Species Manifesto: Dogs, People, and Significant Otherness*. Chicago: University of Chicago Press, 2003.

Haraway, Donna. *When Species Meet*. Minneapolis: University of Minnesota Press, 2008.

Heyer Friedrich, "Naturschutz und Düsenluftverkehr: Landschaftsgestalterische Aufgaben auf dem Frankfurter Flughafen." *Flughafen-Nachrichten Frankfurt/Main* 10, no. 3 (1960): 24–25.

Hild, Jochen. "Gutachten zum Thema Vogelschlag: Trotz Flugbetrieb ökologisch intakte Biotope." *Flughafen-Nachrichten Frankfurt/Main* 30, nos. 1–2 (1980): 104–8.

Howe, Cymene, et al. "Paradoxical Infrastructures: Ruins, Retrofit, and Risk." *Science Technology and Human Values* 41 (2016): 547–65.

Hughes, Thomas. *Networks of Power: Electrification in Western Society, 1880–1930*. Baltimore: John Hopkins University Press, 1983.

IATA. "Special Cargo Handling Diploma." www.iata.org/training/diploma_program/Pages/special-cargo.aspx (accessed January 26, 2019).

IATA. "Training Catalogue 2018." www.iata.org/training/Marketing/Flipbook-2018/mobile/index.html#p=1 (accessed January 26, 2019).

Jaclin, David. "Poached Lives, Traded Forms: Engaging with Animal Trafficking around the Globe." *Social Science Information* 55, no. 3 (2016): 400–425.

Keil, W. "Bisherige Versuche auf Flughäfen der Bundesrepublik Deutschland zur Vertreibung von Vögeln mit phonoakustischen Methoden." In *Le problème des oiseaux sur les aerodromes*, edited by René-Guy Busnel and Jacques Giban, 287–89. Paris: Institut National de la Recherche Agronomique, 1965.

Keil, W., and F. Miehm. "Vögel und Flugzeuge: Schutzmassnahmen gegen eine neuartige Gefahr." *Flughafen-Nachrichten Frankfurt/Main* 15, no. 2 (1965): 32–33.

Kneerich, Adelheid. "'Ich glaub[e], mich laust der Affe!' Sonderbetreuung für lebende Luftfracht. " *Flughafen-Nachrichten Frankfurt/Main* 25, no. 2 (1975): 73–80.

Knox, Hannah, Damian O'Doherty, Theo Vurdubakis, and Chris Westrup. "Enacting Airports: Space, Movement, and Modes of Ordering." *Organization* 15, no. 6 (2008): 869–88.

Lakoff, Andrew. "The Risks of Preparedness: Mutant Bird Flu." *Public Culture* 24, no. 3 (2013): 457–64.

Latour, Bruno. *We Have Never Been Modern*. Cambridge, MA: Harvard University Press, 1993.

Law, John. *Aircraft Stories: Decentering the Object in Technoscience*. Durham, NC: Duke University Press, 2002.

Lufthansa Cargo. "Live—Our Special Product for Animals." lufthansa-cargo.com/products-live (accessed January 29, 2019).

Mol, Annemarie. *The Body Multiple: Ontology in Medical Practice*. Durham, NC: Duke University Press, 2003.

Otte, Ricarda Lynn. "Zoo auf Zeit: Nashornleguane, Königstiger, und andere Exoten auf Reisen finden am Frankfurter Flughafen ein neues Zuhause—Zumindest vorübergehend." *Punktlandung/Flughafen-Magazin*, 2006, 38–39.

Pascoe, David. *Airspaces*. London: Reaktion, 2001.

Pritchard, Sara B. *Confluence: The Nature of Technology and the Remaking of the Rhône*. Cambridge, MA: Harvard University Press, 2011.

Puig de la Bellacasa, Maria. *Matters of Care: Speculative Ethics in More Than Human Worlds*. Minneapolis: University of Minnesota Press, 2017.

Raffles, Hugh. *Insectopedia*. New York: Vintage, 2010.

Ritvo, Harriet. *The Animal Estate: The English and Other Creatures in the Victorian Age*. Cambridge, MA: Harvard University Press, 1989.

Robbins, Bruce. "The Smell of Infrastructure: Notes toward an Archive." *Boundary 2* 34, no. 1 (2007): 25–33.

Rock, Melanie, and Patricia Babinec. "Diabetes in People, Cats, and Dogs: Biomedicine and Manifold Ontologies." *Medical Anthropology* 27, no. 4 (2008): 324–52.

Rothfels, Nigel. *Savages and Beasts: The Birth of the Modern Zoo*. Baltimore: Johns Hopkins University Press, 2008.

Savi, Melina Pereira. "How Borders Come to Matter? The Physicality of the Border in Gloria Anzaldúa's Borderlands/La Frontera." *Anuário de Literatura* 20, no. 2 (2015): 181–91.

Schaberg, Christopher. *Airportness: The Nature of Flight*. New York: Bloomsbury, 2017.

Schlünder Martina, and Thomas Schlich. "The Emergence of 'Implant-Pets' and 'Bone-Sheep': Animals as New Biomedical Objects in Orthopaedic Surgery." *History and Philosophy of the Life Sciences* 31 (2009): 429–60.

Schwarz, Heino. *Nur ein paar Vögel*. Berlin: epubli, 2012.

Sherwood, Philip. *Heathrow: Two Thousand Years of History*. Stroud, UK: Sutton, 1999.

Simone, AbdouMaliq. "People as Infrastructure: Intersecting Fragments in Johannesburg." *Public Culture* 16, no. 3 (2004): 407–29.

Star, Susan Leigh. "Ethnography of Infrastructure." *American Behavioral Scientist* 43 (1998): 377–91.

Strathern, Marilyn. *Partial Connections*. Walnut Creek, CA: AltaMira Press, 2004.

Topham, Gwyn, and Ben Quinn. "Flights Disrupted as Computer Failure Causes Chaos at UK Airports." *Guardian*, December 13, 2014. www.theguardian.com/uk-news/2014/dec/12/heathrow-london-air-space-closed-computer-failure.

Tousignant, Noémi, "Insects-as-Infrastructure: Indicating, Project Locustox and the Sahelization of Ecotoxicology." *Science as Culture* 22, no. 1 (2013): 108–31.

Weaver, Harlan. "Animal Affect." In *Gender: Animals*, edited by Juno Parreñas, 69–84. Farmington Hills, MI: Macmillan Reference USA, 2017.

Wirth, Isabel, Carolin Blum, Daniela Klaus, and Josefina Duda J. "Spinnen, Bären, Tigerkrallen: Der Zoll kämpft gegen illegalen Tierhandel." *Frankfurter Allgemeine Zeitung*, July 3, 2006.

Wong, Diana. "The Rumor of Trafficking: Border Controls, Illegal Migration, and the Sovereignty of the Nation State. In *Illicit Flows and Criminal Things: States, Borders, and the Other Side of Globalization*, edited by Willem van Schendel and Itty Abraham, 69–100. Bloomington: Indiana University Press, 2005.

Woods, Rebecca. "On Cattle Shipment." Unpublished manuscript, 2014.