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THE WILD INDOORS: Room-Spaces of Scientific Inquiry

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> Each world *whilst it is attended to* is real after its own fashion; only the reality lapses with the attention.
>
> —William James

In the basement of the London School of Hygiene and Tropical Medicine, along the narrow outdoor passageway where students and staff store their bicycles, a series of small vaults run beneath Gower Street. Designed as coal bunkers and briefly repurposed as bomb shelters during the Blitz, these low-slung, arched rooms house the mosquito colonies used in the School's scientific investigations. On the door of a corner vault marked 21, a mock traffic sign warns: "Mozzies Next 5 KM." Parting the thick plastic sheets, blinking in the sticky heat, it takes a moment to grasp the surroundings—the fluorescent lights and worn gray linoleum flooring; the tightly packed shelves of mesh cages, water-filled basins, pipettes, and tubing; the heavy hum of humidifiers and mosquitoes, rising in pitch as a tiny black body floats just overhead. Part storeroom, part vivarium, an unruly arrangement of stuff, surfaces, and barely perceptible movement, Vault 21 has the feel of an experiment gone to seed.

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After spending time in insectaries around the world, one comes to expect the airless intimacy associated with the breeding, rearing, and sorting of mosquitoes. It is, instead, the reliably idiosyncratic organization of these spaces that continues to surprise, the litany of micromaterial adjustments and technical quirks that overwhelm description and cloud any effort to render an illustrative vignette. For what might appear incidental—a cage propped up at an awkward angle against a wall, the larval-feed concoction of dog biscuit and green bean powder—often betrays a fastidious appreciation of what it takes to make mosquitoes thrive in captivity. "They die when you look at them the wrong way!" is how the director of this insectary describes the hypersensitivity of one of his colonies, an expression of exasperation reminding us that, in a facility designed to support efforts to kill mosquitoes, the survival of the species under observation still represents the most crucial and most difficult achievement.

This article is motivated by our interest in the spaces in which mosquitoes are scientifically observed, and by a fascination with the constant calibrations and adjustments such observations demand. In pursuing mosquitoes and the scientists who study them, one must enter an array of odd locales—insectaries of the most diverse ilk, experimental huts and semifield stations, field cages of different sizes (some big enough to contain the scientists and their equipment), and, finally, the seemingly unbounded territory entomologists describe as "the field" or "the outdoors." By operating within these purposefully arranged spaces of inquiry, researchers seek to intensify their powers of attention to the intricate, infinitesimally complex world of mosquitoes, hoping to gain a better understanding of their behavior in order to assist in efforts to kill or repel these vectors of infectious disease.

Despite their role in advancing an adversarial, often insecticidal mission, these spaces of inquiry entail a bewildering diversity of mutual accommodations between observer and observed, captor and captive, host and vector. They are sites of cohabitation, arranged and ordered through the experiences of sharing space, of living together in proximity. For scholars engaged in social ecology, environmental anthropology, or the posthumanities, the formative role of other-than-human animals in placemaking will be a familiar theme. Analyses of predation, domestication, interspecies companionship, and cosmopolitics have all, albeit in different ways, parsed spatial categories through the proxemics of multispecies coexistence (e.g., Choy 2011; Hodder 1990; Fuentes 2010; Kelly and Lezaun 2014; Kohn 2013). In the specific context of scientific inquiry, however, human-animal relationships acquire a further reflexive spin: interactions between species are here strategically organized as an engine of knowledge production. The transformation of the animal into a suitable object of scientific inquiry is a process rich with reciprocity and emotional attachment, whether this process seeks to habituate the animal to the presence of the researcher (Candea 2010) or involves its sacrifice and transfiguration into an analytical object (Lynch 1988). Mosquitoes are not the sort of charismatic creature that tends to populate accounts of multispecies conviviality (Lorimer 2007): they stretch the category of animal beyond the comfort zone of any vision of shared vulnerability, entangled empathy, or interlocking gazes (Nading 2014; Raffles 2010). Yet the scientific investigation of their world still requires a process of reciprocal attunement, the emergence of what Vinciane Despret (2013) calls "partial affinities" between species.

This building of affinities, we will argue, is an explicitly *constructive* practice; it involves fabricating settings in which the interaction of researcher and researched can yield a moment of experimental immediacy. Whether a repurposed bunker, a mesh cage, or a model hut, these entomological facilities serve to insulate and accentuate their living objects of study, and thus can be characterized by the peculiar mode of interiority they express. This mode of interiority is not reducible to the resolution of the inside/outside distinction, but requires a kind of interior design, the arrangement of space and its furnishing with things and artifacts, to create a place-bound form of scientific attention to the patterns and peculiarities of mosquito life.

To explore how a particular mode of interiority substantiates an interspecies encounter, we will approach the settings of entomological inquiry as *room-spaces*, a term we borrow from T. J. Clark's studies of Cubism. "The room," writes Clark (2013, 150), "was Cubism's truth condition." Yet *room* did not necessarily designate a space physically contained within walls, but a new kind of spatial matrix that suppressed depth and reassembled disparate and heterogeneous elements to produce a novel form of immediacy. The essence of Cubism was its ability to wreak havoc on preexisting notions of inside and outside, foreground and background, the enclosed and the extrinsic—"a landscape can instantiate a room-space . . . and a genre scene posit an unbounded world" (T. Clark 2013, 88). The Cubist room-space provided scaffolding for light to pass and flatness to materialize, a centering of gravity that granted a self-evident coherence to odd arrangements of persons and things. The most daring instantiations of this form—Pablo Picasso's *Guernica* is Clark's destination—could fully encompass the outside with all its "monsters" (T. Clark 2013, 237), making them tangible inhabitants of a new spatial order.

To grasp how mosquitoes are interiorized in the context of scientific work, we will visit three room-spaces of entomological inquiry: the insectary, the semifield station, and the outdoors, illustrating each space with an example drawn from our combined fieldwork. Our journey begins in the inherently ambiguous space of the semifield station, an enclosure designed to enable the observation of captive mosquitoes within their own natural habitat. Next we visit the release area, the territory where entomologists liberate mosquitoes in the course of an experimental open release. We show how this particular "open" is carefully arranged and demarcated, and is better understood as a sort of "great indoors." We then return to the insectary, the laboratory where live mosquitoes are observed and manipulated under conditions described in terms of "biosecurity" or "high containment." After introducing the three facilities and the research practices that unfold in them, we flesh out the notion of room-space in relation to the intensification and orientation of attention in situations of interspecies contact. We conclude by arguing that the room's intimate inflections help nuance our understanding of how we come to know mosquitoes and the threats they pose.

SEMIFIELD STATION: The Art of Arrangement

As its name suggests, the semifield station trades in an inherent ambiguity. This setting—a variety of the many mesocosms used in the scientific study of living organisms (Odum 1984)—is located *in the field*, but it is not quite *of the field*; it is designed to absorb certain features of its environment without being overwhelmed by it. The term is best understood in a negative sense: it is neither a lab nor the field, but combines characteristics of both. Perhaps entomologists refer to it as a semifield station because the alternative designation, semilab, would sound oddly pejorative.

The first use of such a facility in medical entomology goes back to the 1930s, when Lewis Hackett and Marston Bates (1936, 507) report the use of "a large cage of wire netting" during their studies of *Anopheles* mosquitoes in Albania. The cage in question was 10.5 meters long, 5 meters wide, and 6.2 meters high, and it was supported on telegraph poles. Within this structure they built "a miniature Albanian farm" (Hackett and Bates 1938, 114) including a one-room house, a cement pool, a garden, a tree, a calf stable, and some rabbit hutches. Placing mosquitoes in this "enclosed outdoor environment" (Hackett and Bates 1936, 507), as they called it, led to a series of fascinating and often bewildering observations. This was, for instance, the place where entomologists witnessed for the first time captive male *Anopheles* exhibit the characteristic swarm that precedes copulation. Hackett and Bates (1936, 507) were struck by the fact that this mating ritual seemed to always occur in the same location, "about half a meter beneath the top of the cage, directly under one of the cross beams." This peculiar and ultimately mysterious preference ("we should consider it to be fortuitous," they wrote, "were it not repeated so frequently" [Hackett and Bates 1936, 507]) gave a first hint of the complex and still poorly understood three-dimensional geometry of mosquito reproduction.

Semifield systems grew in size and importance in the 1950s with the development of techniques of insect sterilization. At the time, the release of large quantities of irradiated mosquitoes was seen as a promising new tool for the control of mosquito-borne diseases (Knipling 1955). The ability of the sterile specimens to reduce the density of resident mosquito populations hinged, however, on their ability to survive in the area of intervention, and, especially, on their capacity to mate successfully with wild-type counterparts. Large field cages, located in surroundings that resembled as closely as possible those the sterilized mosquitoes would have to occupy, allowed the assessment of their capacities prior to a final and irreversible release.

Semifield stations have again come into vogue. Over the last decade, permanent stations have been built to support entomological research into tropical disease vectors, particularly species of *Anopheles* and *Aedes* mosquitoes. Inside these enclosed field environments, researcher can investigate fundamental aspects of mosquito ecology, test the efficacy of novel mosquito-control interventions, or gauge the fitness and field competitiveness of laboratory-reared strains. These facilities are also essential to the evaluation of genetically modified mosquitoes, serving as a crucial transitional space between the laboratories in which they are bred and the open spaces to which they will eventually be deployed (Facchinelli et al. 2013).

Our ethnographic introduction to the landscapes of the semifield is the facility built a decade ago at the Ifakara Health Institute (IHI), in the Kolombero Valley of southeastern Tanzania. Founded in 1959 by Rudolf Geigy of the Swiss Tropical Institute, IHI is a public health research organization with world-leading expertise in the control of tropical infectious diseases. This particular semifield station was built on the main IHI campus in Ifakara, and offers a microcosm of what a free-ranging mosquito might encounter during a typical life cycle in the region—including mud houses with thatched roofs, warm-blooded animals (cows and human volunteers, brought inside the facility to provide female mosquitoes with blood meals), local soils and vegetation, aquatic habitats for oviposition, and

Figure 1. Exterior of semifield station, Ifakara. Photo by Ann H. Kelly and Javier Lezaun.

plenty of resting places. Since its establishment, the facility has been used to test the efficacy of new repellents and insecticides, the feeding success of mosquitoes on different kinds of host, or to study the conditions necessary for the establishment of a self-replicating population of *Anopheles arabiensis* mosquitoes, the dominant local vector of malaria.

Like every other semifield station, the facility in Ifakara resolves the inside/outside distinction in an idiosyncratic manner. Using as its frame a modified greenhouse structure (28.8 x 21 meters), the station is raised 1.6 meters above ground level to prevent flooding and limit access to ants and other crawlers. Its roof is covered with polyethylene—a "deviation from complete naturalness" (Ferguson et al. 2008, 4) in the words of its designers, justified by the need to protect the interior from the intense seasonal rains. The walls are made of PVC-coated polyester netting imported from the United Kingdom. The density of its filaments (346 holes per square inch, twice the standard for bed nets) determines the porosity of the enclosure to airflow and light, creating a microclimate that is unique to this facility but hopefully resembles the ambient temperature, humidity, and shade distribution that a local mosquito might encounter in the wild.

These screens and filters give the station a distinctive look. Seen from the outside, the facility still recalls its greenhouse origins—many of the interior details are hidden from view, perceptible only to the researchers who operate the station and to the mosquitoes that are released in it. From the interior, however, the outdoors appears with striking vividness and immediacy, a picturesque tropical landscape framed by the scaffolding of the facility.

Figure 2. Looking out from the semifield station, Ifakara. Photo by Ann H. Kelly and Javier Lezaun.

Establishing a distinction between the inside and the outside is not simply a matter of designing an architectural structure or creating a physical enclosure; the boundary must be renegotiated on a daily basis in relation to who and what can access the facility and inhabit or furnish the experimental space. Researchers and human volunteers—but also cows, mosquitoes, scientific equipment, and a multitude of construction materials—are routinely introduced into (and extracted out of) the experimental system. Regulating these flows is no small feat. The decision to locate the station on IHI's campus is explained by the need to guard the facility and regulate access to it twenty-four hours a day, a task that can be accomplished with some effort in the vicinity of the town, but becomes more much difficult in the bush.

A depiction of the facility by the artist Mohammed Wasia Charinda captures well this constant traffic, while also reflecting the opaqueness of the facility to an external observer. In typical Tingatinga style, the painting is packed with characters and full of humorous detail. A white woman in a white coat directs animals into the enclosure, while shoeless local men work hard around it. The station appears surrounded, if not under siege, by local flora, fauna, and livestock. A strange kind of chrysalis, the structure radiates a pristine vitality, insulated from the incursions and depredations of other forms of life—most importantly, the swarm of native mosquitoes hovering over it.

Figure 3. Painting by Mohammed Wasia Charinda. Photo courtesy of Heather Ferguson.

These multiple dimensions of containment—of light and rain, materials and artifacts, human and nonhuman visitors—make the very idea of a semifield system possible. Yet what gives this particular place its distinctive identity, and what ultimately allows it to support and sustain an experimental mosquito population, is not so much the qualities of its container—its semiporous perimeter of mosquito netting and the polyethylene roof—but its interior decor, the assortment of devices, built structures, plants, animals, and ready-made objects scattered across the facility in an attempt to help mosquitoes feel "at home" in it. The facility contains a variety of local vegetation (growing in soil transported from nearby locations), buildings (replicas of a traditional mud-walled house, a cow shed, and a chicken coop), human artifacts (locally made clay pots to be used by mosquitoes as refugia, buried plastic pans to serve as breeding grounds), and animals (in this case, a calf living in the purpose-built shed). The selection and arrangement of these components has resulted from a piecemeal, iterative process, driven by an indistinguishable mixture of scientific and aesthetic criteria. Artifacts are placed and displaced until the interior conveys a certain "field" quality that, researchers hope, would encourage mosquitoes to behave in a stereotypically natural manner.[1]

Producing this effect is never simply a matter of replicating the local habitat, however, because researchers will often be uncertain as to which features of the natural environment influence mosquito behavior, and therefore cannot define a priori what aspect of the interior decor will affect them to act in a wild-like fashion. This uncertainty is compounded by the ever-present awareness that whatever occurs within the facility remains irreversibly artificial—that the task is to create de novo an environment supportive of the mosquito's life cycle.[2]

Ultimately, the mosquitoes themselves will validate the success of these interior design efforts by settling and thriving within the semifield setting. That success can also be measured by the degree of comfort this experimental interior creates in the researchers themselves. After a long process of trial and error—"a lot of problem solving on the ground," as one of the entomologists puts it—the space will remind them, in critical respects, of a real tropical place, bristling with lifelike detail and able to support the complex patterns of mosquito flight, rest, feeding, mating, and oviposition. What emerges from this laborious fabrication of a new interior is thus the sense of having produced a credible totality, a version of the outdoor environment that is plausible and, above all, close at hand.[3]

RELEASE AREA: The Great Indoors

If the semifield station aims to provide a hospitable context for the close observation of mosquitoes in captivity, the release area represents the space of maximum freedom for the organisms under investigation, a seemingly unbounded territory in which they can display their true nature without the constraint of walls, nets, or research apparatuses. Yet freeing mosquitoes into the outdoors is not an easy thing to do—at least not if one hopes to use that act of liberation as a means of generating entomological knowledge. For the operation to stand a minimal chance of success, two kinds of manipulations are needed: of the mosquito, to enhance its traceability, and of the surroundings into which the mosquito is to be released, to facilitate observation and, possibly, recapture.

Figure 4. Experimental release of transgenic mosquitoes. Photo courtesy of Christiaan de Koning.

The idea of turning the release of mosquitoes into an experimental operation was first introduced during the campaign against malaria and yellow fever that accompanied the construction of the Panama Canal (1904–1914). Unfamiliar with the habits of mosquitoes—up to that point, entomological research in the United States had been concerned primarily with agricultural pests—the entomologists recruited by the Isthmian Canal Commission devised a range of ingenuous methods to learn more about the behavior of the local *Anopheles* and *Aedes* populations.

A critical variable in planning adequate sanitation zones around the canal works was the length and directionality of mosquito flight. Multiple methods were tried to answer this question—including the eye-straining one of positioning observers at regular intervals from known breeding places to watch (or squint at) mosquitoes in flight—but reliable evidence proved elusive. As Joseph Le Prince, the commission's chief sanitary inspector, noted: "Although long flights of mosquitoes on the Isthmus were known to some of us, we were unfortunately unable to trace any individual mosquito and find out by actual observation how far it went, and in what direction" (Le Prince and Orenstein 1916, 109).

It was James Zetek, a young entomologist from Chicago, who pioneered what would become the standard technique for recording the flying patterns of free-ranging mosquitoes. Zetek's most pressing concern was to ascertain whether the mosquitoes known to breed in large quantities in the salt marshes northwest of the town of Gatun were able to reach the barracks where canal workers were housed. His investigations involved collecting mosquitoes in the malarious lowlands and spraying them with an aqueous solution that contained an aniline dye. The mosquitoes were subsequently freed at dusk, with the color of the dye identifying the day of release. Traps were placed in and around the town of Gatun, and the Isthmian Canal Commission organized "a daily search through all buildings, made by expert negroes equipped with a wide-mouth vial containing a cotton plug saturated with chloroform" (Zetek 1915, 256). When dyed mosquitoes were discovered in the town, Zetek was able to offer compelling evidence of the insects' ability to travel the distance. "The number of recovered mosquitoes is not phenomenally large," he wrote, "but it is conclusive proof that the mosquitos seen flying from the marsh toward Gatun, actually entered that town" (Zetek 1915, 257).

Zetek's reports abound with details about the relative merits of different methods of mosquito marking. His abiding preoccupation was to make sure that the dye applied to the mosquitoes, and the technique used to spray it, would in no way impede their ability to fly. Yet the more striking aspect of Zetek's method is the means by which he managed to capture vast quantities of mosquitoes for his experiment. After attempting the large-scale rearing of larvae and pupae to adulthood—"a tedious and often disappointing method"—he decided to change his approach and seize adult mosquitoes "directly" (Zetek 1915, 255):

> Mosquito bar nets were stretched out at the breeding place, three sides of which were in close contact with the ground while the remaining side was raised about a foot or so from the ground. At about 5:00 p.m. a negro was placed inside of each net, with instructions to prevent as far as possible mosquitoes biting him. Within an hour Mr. Negro shared his net with a thousand or more noisy mosquitoes. (Zetek 1915, 255)

The casualness with which Zetek discusses the use of "Mr. Negro" as bait suggests that he had seen worse during his years of service in the Canal Zone. This was, one must remember, the scene of an extensive program of racial segregation and racist exploitation in the service of U.S. "tropical triumphalism" (Sutter 2007, 726). Yet the image of an incarcerated man sharing his imprisonment with hundreds of mosquitoes clearly left an impression on Zetek: "The noise made by these dens of voracious, unrestful culicids, their persistent, unceasing attacks, and the endurance of the willing and patient negroes, are things that can never be forgotten by those who had witnessed them" (Zetek 1915, 255).

Zetek's use of "willing and patient negroes" to lure mosquitoes belongs to the long history of horrors committed in the name of tropical medicine. We cite this episode from the entomological archive to underscore an obvious but essential fact: the experimental release of mosquitoes is never simply a matter of freeing or letting loose. For these acts of calculated liberation to carry any epistemic value, they must be thoroughly intertwined with parallel practices of capture and containment—and not only of mosquitoes.

Zetek's study is the forebear of what has become known as the mark-release-recapture method, a genre of entomological research common in vector-control campaigns around the world. New techniques of mosquito rearing have made the standard protocol more ethically palatable and entomologically efficient: it is now possible to harvest large quantities of eggs or larvae and develop them to adulthood in insectaries, allowing entomologists to dispense with the need to capture large quantities of adult mosquitoes. The postrelease recapture of marked specimens has been similarly facilitated by ever more ingenuous attraction traps, while the development of easy-to-use fluorescent dusts and powders has eased the task of marking and detecting released mosquitoes. In the case of transgenic mosquitoes, techniques of genetic manipulation allow the insertion of marker genes that enable the precise identification of captured specimens. In fact, the development of genetically modified mosquitoes has reinvigorated the field of mark-release-recapture studies. Now sometimes called limited open-release experiments, pilot open releases, or staged open field releases, the method helps ascertain the longevity and dispersal of transgenic mosquitoes in the environment, as well as their ability to copulate with wild-type counterparts and pass the relevant transgenic trait to their offspring (WHO 2014).

As was evident in Zetek's original study, the outdoors into which mosquitoes are released must be carefully modified and arranged to make entomological observation feasible. These alterations begin with a multitude of mundane interventions that aim to make the release area readable to the researchers. In the case that illustrates this section—a release of transgenic *Aedes aegypti* mosquitoes in west Panama—the legibility of the territory is enhanced by marking release points on the roads and paths of the area, as well as on the maps used by the release teams, allowing researchers to free mosquitoes at exactly the same point at regular intervals.

Figure 5. Number marking a mosquito release point. Photo courtesy of Christiaan de Koning.

The careful placement of traps—ovitraps for mosquito eggs, adult traps for flying mosquitoes—constitutes another visible transformation of the surroundings. Entomological traps come in an immense variety of sizes, formats, and appearances—killing and nonkilling, attractant and nonattractant, baited and nonbaited, stationary and movable—and display a wide range of visual and olfactory cues known or suspected to influence mosquito behavior. Counterflow geometry traps, for instance, assume that mosquitoes orient themselves toward their hosts by navigating the top of the plumes of carbon dioxide that humans and animals release with their exhaled breath, but that, at the same time, they will avoid flying in a direction of increased carbon dioxide concentration. Thus counterflow traps release carbon dioxide downward, but incorporate a second fan that produces airflow in the opposite direction, thus entraining the mosquito in a current that sweeps it toward the trap's entrance. The device is thus adapted to the complex flight maneuvers of the targeted mosquitoes, using their own avoidance behaviors to facilitate capture.

The choice of location for these traps represents a sort of entomological art of placing, combining a rough scientific understanding of species-specific habits and an intuitive appreciation of where local mosquitoes might prefer to rest and in which direction they are more likely to fly. Sentinel traps like the ones used in this experimental release are generally installed near shrubs and bushes, in places sheltered from rain or direct sunlight. Yet researchers must also make sure that the trap remains visible to patrolling mosquitoes, so that its visual cues—in this case, the black/white color contrast that the trap offers when seen from above—can influence the trajectory of their flight.

Because *Aedes aegypti* mosquitoes, the object of this particular release, are highly anthropophilic, and their feeding and reproductive choices are intimately associated with patterns of human habitation, the best location for the traps is generally in close proximity to homes. Porches and other peridomestic spaces prove ideal, especially if they are used to hang clothes, a known mosquito attractor. In this way, the distribution of trapping devices not only creates a series of potential interfaces with free-ranging mosquitoes but also entangles the human residents of the release area in the research process. Residents must grant regular access to the collection points, and are expected to look after the traps in between the researchers' visits.

In fact, entomological research often requires the presence of breathing, moving, environment-modifying humans to sustain a naturalistic form of inquiry. Human presence in the release area is so critical to the replication of the mosquito's natural habitat that when, due to biosafety concerns, transgenic mosquitoes are released in uninhabited or very sparsely populated areas, a quantum of humanness is often introduced artificially. Traps, for instance, can be designed to produce convection currents similar to those created by a human in motion, emit chemicals that mimic human skin emanations, or release carbon dioxide in bursts that replicate the rhythm of human breathing. If there are no actual humans around, the mosquitoes can still be baited with human odors collected on worn clothes. These practices of simulation sometimes involve the construction of makeshift houses within the release area in an attempt to replicate the built environment of a human settlement (Kelly 2012). In some cases, the simulacrum goes to the point of creating *fake* versions of human-made breeding grounds, carefully constructed replicas of the sort of aquatic habitats (puddles, tire tracks, abandoned containers) that humans normally create inadvertently in the course of their daily lives.

Figure 6. Installing a sentinel trap. Photo courtesy of Christiaan de Koning.

The release area comes together through all these interventions. This is, in other words, a fully experimentalized outside, a field of observation circumscribed and delineated by the perimeter of traps and observation points. It is also a furnished space, even if the furnishings in questions—sentinel traps, road markings, artificial tire tracks—are more sparingly arranged or less densely packed than those of the insectary or the semifield station. Finally, like the semifield station or the insectary, this is a space of simulations: acts of imitation and mimicry directed at making mosquitoes feel at home in this peculiar setting of scientific inquiry.

INSECTARY: "Everything is a crisis"

Finally, we arrive back at the insectary. The first impression on visiting such a facility is one of overwhelming closeness; the humidity and temperature suggest an effort to enclose a tropical environment within the walls of a laboratory. The density of occupation—shelf upon shelf stacked with trays of water-bound larvae, piles of boxes full of buzzing mosquitoes—reminds us that in addition to a space of inquiry, this is also a factory dedicated to the rearing of mosquitoes on an industrial scale. In the particular insectary we will use to illustrate this section, located on the East Coast of the United States, colonies of *Anopheles* mosquitoes are constantly grown to produce a surplus of insects ready to be shipped to other laboratories for research on malaria transmission.

This insectary is an old one, and it looks its age. It was established in the 1950s, and has been in operation ever since. When it was built, it was expected to play a central role in the development of the first malaria vaccine. At the time, the most promising route to this goal involved inoculating humans with radiation-attenuated sporozoites, the form of the malaria parasite that is present in the mosquito's salivary glands and is injected into humans through the mosquito bite. Rearing mosquitoes en masse was, and continues to be, the only way of producing large quantities of sporozoites, since no method of culturing them in vitro existed or has been developed since.

Figure 7. Mosquito cage and rearing trays. Photo by Ann H. Kelly and Javier Lezaun.

The fundamental achievement of the insectary is to sustain an uninterrupted cycle of mosquito reproduction under laboratory conditions—a process commonly known as the colonization of a certain mosquito strain. A multitude of methods can be used to encourage mosquitoes to mate in an insectary, including labor-intensive ones such as manual insemination, but a population of mosquitoes will only be considered properly colonized when the insects manage to complete their reproductive cycle on their own.

A common environmental manipulation used to encourage this process is the calibration of lighting conditions to create a day/night cycle in the insectary. Little is known about how different patterns of luminosity affect the circadian rhythms of *Anopheles*, but it has long been established that they, like many other mosquito species, prefer to mate in the early evening. In the 1970s Jacques Charlwood and Mike Jones achieved the laboratory colonization of an *Anopheles gambiae* strain by exposing the mosquitoes to an artificial dusk, which they created by gradually lowering the light intensity in the insectary. "In the artificial 'dusk,'" they wrote, "virgin males became active at approximately 5 lx, performing a pre-swarming flight, characterized by wide looping flights, near the ceiling of the cage. At this time they were positively phototactic, flying towards the lightest side of the cage" (Charlwood and Jones 1980, 317). Suddenly able to coordinate their flying patterns despite the small size of the cage (1.7 m^3), the males swarmed long enough to allow a female mosquito to fly through it and emerge, *in copula*, a few seconds later.

Once a cycling population of mosquitoes has been established in the insectary, selection pressures will conspire with environmental constraints to make the mosquitoes increasingly stenogamous, or able to mate in small, restricted spaces. The price to pay for this exceptional reproductive capacity is a radical reduction of genetic diversity. As these captives become able to thrive within the extreme environment of the insectary, they lose much of their original adaptability. This inversion of fitness in laboratory colonies—unusually well adapted to the singular conditions of the insectary, uncommonly unfit to survive anywhere else—is the source of much entomological humor. Staff at this insectary tell a joke about a hypothetical meeting of insectary-bred mosquitoes, originally captured in Africa but long acclimatized to laboratory life, and transgenic specimens, engineered in the laboratory and now bound for experimental release in Africa: "These lab mosquitoes, real African mosquitoes, just laugh at [the transgenic mosquitoes], because they don't know about anything." Compared with what the transgenic mosquitoes will be up against when they arrive at their destination, life in the insectary is blissful. The irony here is that in exchange for the abundant food, controlled temperature, and lack of predators, laboratory colonies have lost their ability to live in the very environment from which they originated: they may laugh, but ultimately they would fare worse in the wild than their transgenic counterparts. This and similar jokes underscore the heuristic limitations of applying any simple natural/artificial distinction to the phenomena of the insectary. Nowadays, one can hear the paradoxical phrase *wild-type laboratory strain* to describe mosquitoes that have been colonized for decades. They are *wild-type*, of course, only to the extent that the recent creation of transgenic varieties has introduced a new axis of distinction: that between the laboratory-bred and the laboratory-born.

Figure 8. Adult insectary mosquitoes. Photo by Ann H. Kelly and Javier Lezaun.

If the insectary manages the routine feat of sustaining mosquito life indoors, it also produces a second, equally critical accomplishment: to infect female mosquitoes with rodent malaria parasites. In this particular facility, this feat is achieved by placing an anesthetized, malaria-infected mouse on top of a fine-mesh box full of hungry anophelines. After being ingested in the mouse's blood—and provided the temperature, humidity, and diet of the mosquitoes are kept to the correct standard—the *Plasmodium* protozoa will evolve inside the insect's body and find their way to the salivary glands, where they will briefly persist in the sporozoite form, ready to be harvested by researchers or transmitted to a new mammalian host. Females receive further blood meals to encourage egg production. In this insectary, two rabbits are used for this purpose; insectary staff have made attempts to replace live rabbits with more manageable artificial membrane feeders (and rabbit blood with cow or human blood), but these efforts have so far proven unsuccessful—mosquitoes seem displeased with any radical change in their diet.

The inscrutable predilections of mosquitoes and their resistance to change shape the routine operation of the insectary. Each insectary technique has been preceded by extensive efforts to calibrate how the intervention affects the vitality of the colonies until researchers find (or stumble upon) a method that appears to satisfy their colonies. Many of these procedures are never formalized or stated in written protocols; they are often referred to as *tricks* and are embodied by technical staff with long years of exposure to the quirkiness of mosquitoes. The key technician in the insectary under discussion, for instance, has no formal scientific training but has been working there for more than twenty years and is considered indispensable to the smooth running of the operation. Similarly, the technician in charge of the mice is the latest in a long line of Colombian women recruited to the job, each one of them recommended by a friend previously employed in the insectary.

Perhaps this marks the most striking feature of the insectary, the tension implicit in a form of practice that may appear repetitive, even boring, yet relies on very limited standardization or technical closure. The lack of black-boxing is evident in the insectary's equipment, much of which is tailor-made or has been recycled and repurposed in situ by the staff. Empty tubs of ice cream, for instance, are here the preferred container for adult mosquitoes. When the ice cream company that produced these tubs decided to discontinue the format, the insectary had to scramble to find an alternative container of the same size, shape, and texture—a situation that prompted the director to exclaim: "Everything is a crisis!"

In other words, the physical, atmospheric, and energetic conditions that support the continuing survival of mosquitoes in the insectary—the life-sustaining processes that Mike Anusas and Tim Ingold (2013, 58) describe as *infrastitial*—are never fully routinized in standardized protocols or equipment built to specification. The counterpoint to this lack of closure is a strong sensorial and more specifically tactile quality to insectary operations. The handling and manipulation routines of insectary staff display a constant attunement to the preferences and eccentricities of mosquitoes: an attunement that echoes in the careful exposure of mosquitoes to the materials, surfaces, fabrics, temperatures, and luminosities most favorable to the completion of their life cycle.

One could argue, then, that over the years the insectary has become a unique ecosystem, one unusually conducive to keeping captive mosquitoes alive, infected, and breeding. Describing such an ecosystem as more (or less) artificial than those encountered in the release area or the semifield station is beside the point. This is simply a setting where, as the result of decades of interspecies cohabitation under the same roof, the web of biological and epistemic connections has grown particularly dense and finely poised, creating a rare and precarious symbiosis of mosquito life and scientific work.[4]

Despite this long process of familiarization with, and adaptation to, the changing dispositions of mosquitoes, key features of this fragile symbiosis remain opaque to the researchers, a fact that comes into relief in times of transition. A few years ago, a new facility was built in the same building, one floor above this insectary. The plan was to transfer the colonies to new, state-of-the-art rooms, built from scratch to meet higher hygienic standards. The staff applied all their hard-earned expertise in an effort to replicate in this new location all the elements of the old facility that they thought were conducive to the comfort of their colonies. The planned move was never completed, however. For unknown reasons the mosquitoes did not seem as “happy” in the new environment as in their old premises. The reproductive capacity of the colonies declined steeply, and the mosquitoes were returned to their dilapidated but familiar residence downstairs.

CAPTIVATING INSECTS

Entomologists occupy a peculiar place in the history of the modern sciences. Throughout the nineteenth century, not only was the study of insects foundational to evolving understandings of the natural world, human society, or technological futures (e.g., J. Clark 2009; Parikka 2010); it also came to exemplify a particular kind of devotion to detail that embodied the fundamental virtue of the new scientific age. Describing a species demanded scrutiny of anatomical particulars and life-cycle dynamics, a mode of observation that, as Lorraine Daston (2004, 114) has argued, yielded "copious and minute" descriptions rather than abstract generalizations. Discerning behavioral continuities (asserting a seemingly simple pattern, such as "cicadas breed in summer") required repeated observations under varying conditions over long periods of time. Insects bred new standards of empiricism, and these standards were sustained by new regimes of attention.

Attention is never epiphenomenal to the objects that form its focus or to the spaces where it unfolds. As William James implies in the epigraph that opens this article, what we notice and attend to is also *who we are* and *where we want to be*—a composite of memory, will, sensation, and desire that defines each one of the worlds we inhabit. James understands attention as that which brings coherence to the transient and chaotic plurality of experience; it creates pools and eddies in the stream of thought, "resting-places" and "perchings" (James 1890, 243) for our consciousness. Reality inheres in what excites our interest and incites our passion—"we are all seeing flies, moths, and beetles by the thousand, but to whom, save an entomologist, do they say anything distinct?" (James 1890, 286).

The semifield station, the release area, and the insectary are all carefully built to allow mosquitoes to say something distinct. These are "knowledge traps" (Rheinberger 2015, 169), epistemic contraptions designed to capture phenomena whose specific contours remain to be determined. Yet here, as with any experiment that hinges on the manipulation and observation of captive animals, one first has to parse, then recombine, the literal and phenomenal facets of the trap. For the facilities we have discussed so far are not just "lethal parodies of the animal's *Umwelt*," to borrow a formulation from Alfred Gell's (1996, 27) study of the aesthetics of trap-making. They are also, as Gell emphasizes, the material embodiment of a nexus of complex intentionalities, a physical interface for human and nonhuman actors and their respective representational capacities.

In the three spaces we have described, mosquitoes are seen—apprehended, handled, interpreted—as creatures both delicate and resilient; finicky organisms that are also highly opportunistic and able to perceive and react to a seemingly endless number of cues in their environment. Malleable and equipped with prodigious powers of adaptation, the mosquito can find a suitable niche in the most adverse circumstances. The three locales make a bid to capitalize on this protean quality, creating surrounds rich with potential stimuli in the hope that insects will secure a new *Umwelt* amid the apparatus of scientific inquiry. At the same time, each locale hopes to arrest that phylogenic fluidity long enough to substantiate a series of scientific observations—to discover new regularities in mosquito behavior, even if each of those regularities is inextricably linked to the space where the behavior in question unfolds. Suspended in these traps—held, albeit briefly, in place—a species acquires specificity, habits emerge from habitats, relationships surface and take shape against the boundless expanse of ecological dynamics and evolutionary change. Entomological facilities thus bind, "reciprocally though not symmetrically" (Despret 2013, 51), deliberate scientific designs and highly adaptive animal agencies. This binding materializes phenomena that can neither be anticipated nor modeled in advance, for these experimental systems are always articulated—one might say, cultured—through the iterative accommodations of scientists and their living objects of study.

Attention, in sum, describes here a double movement: granting attention to and capturing the attention of (cf. Hennion 2007). The ability of entomologists to observe mosquitoes scientifically and to immerse themselves in their lifeworlds hinges on the construction of spaces able to foster new modes of proximity and propinquity between researchers and their elusive objects of study. At the same time, mosquitoes' sensory capacities are activated by settings that are purposefully arranged to make them feel "happy" or "at home"—to use terms often employed by entomologists—in the hope that they will then settle into describable patterns of behavior. Transforming the mosquito into such a "captivating captive" (Hayward 2012, 162) makes for a painstaking craft of composition. It depends on the creation of forms of interiority that allow entomologists experimental access to their object of study while excluding all the dynamic contingencies that threaten to overpower that encounter. The result is a kind of fragile belonging together in the transitional spaces and momentary times of scientific inquiry.

MAKING ROOM

How to understand this precarious interiority? In his discussion of the Cubist room-space, Clark (2013, 214) recounts a famous saying by Picasso. Asked why he never painted landscapes, the artist replied: "I never saw any." His challenge, and that of Cubism more generally, was not to depict what could be made to seem naturally out there, but to create a new kind of immediacy or presence for objects and things that might be notionally external to the physical location of the viewer but could suddenly be put on the same plane of reality as that which appeared closest at hand.[5]

When it comes to creating moments of experimental immediacy between researchers and mosquitoes, we have argued, space might not always be contained, but it is always *room-bound*. *Room* is to be understood here as a space for being *in*, “a surrounding whose shape and extent we can enter into” (T. Clark 2013, 281). Even when entomologists release mosquitoes into the open, the space in question must be rendered palpable and forthcoming, tangible to the experimenter. Alterations in the genetic makeup of the mosquito and the furnishing of the release area with devices of observation and capture achieve the specific form of nearness that grants this interspecies encounter its epistemic value.

Nearness, then, is not a measure of distance, nor an effect of scale. For Clark, room-spaces cultivate comfort and intimacy; they provide a bearing, a center of gravity, a place for the eye to rest. In a room, the world is close, but not necessarily within arm’s reach. Interiority belongs to the coherence and specificity of the surroundings—an achievement of light, composition, and, critically, contrast, for “an inside becomes vivid only in relation to an outside” (T. Clark 2013, 104). This opposition of inside and outside is not primarily architectural, but perceptual—it is phenomenal, one could argue, rather than literal (cf. Rowe and Slutzky 1963). The exterior is what remains remote, just beyond the field of vision. Against that backdrop, the interior feels intense and immediate, a space where “nothing important is far away” (T. Clark 2013, 27).

In an epistemic register, the room-space engenders salience. Bounded within a habitable geometry, objects and figures strike the viewer and command her or his attention. The production of salience is critical for entomologists, because their investigations unfold against a background of limitless ignorance. Not only are basic dimensions of mosquito behavior poorly understood or simply unknown; any advance in their knowledge of these creatures is constantly offset by their relentless biological evolution—the speed of processes of speciation, of ecological and behavioral divergence, generate an endless stream of new surprises for the researcher. Without a framework allowing certain objects to materialize and others to fade, the overdetermined nature of mosquito behavior would quickly overwhelm observation. The interior design of each space of inquiry—the design of each experimental space *as an interior*—thus serves to constrain and narrow the range of interpretation. Room-spaces provide the necessary holds for the entomologist’s grasp—a focus, margin, and fringe to orient commitments and order concerns (James 1890).

Seen as idiosyncratic room-spaces, then, semifield station, release area, and insectary represent more than physical sites; each facility provides entomologists with a unique *medium* of experience. For entomology, in this interpretation, is not simply multisited but also multimodal; the task of the entomologist is not just to connect or align disparate locales of investigation but to weave together different evidentiary registers. As Stefan Helmreich (2009, 233) writes of oceanography, entomology is "cobbled together from different genres of experience, apprehension, and data collection." Each room-space provides a spatial matrix in which the world can be real after its own fashion—not in relation to an ideal degree of naturalness or a universal style of realism, but according to the specific shape reality takes within each space of inquiry.

By foregrounding the achievement of each investigative interior, the concept of room-space helps us pose anew the question of how entities are arranged to be encountered, which elements of their worlds are internalized and which are held at bay (cf. Carter 2013). This question extends well beyond entomology. As a means of apprehending the interplay between the inside and the outside of inquiry—the oscillation of observation and encompassment, presentation and representation, here and elsewhere—the room-space has theoretical mileage for anthropology itself. The field—our discipline's most enduring and precarious methodological device—belies an aesthetic of interiority that, if no longer always site-bound, continues to cultivate a sense of setting whereby ethnographer and informant encounter each other in time and space (Candea 2013; Strathern 2004). Recent efforts to design fieldwork unencumbered by, as George Marcus (2010, 275) puts it, "the mythic *mise en scène*," have experimented with juxtapositions of sites, perspectives, and media to stretch the affordances of ethnography beyond the thick descriptions of the solitary fieldworker—working his or her way "into" a culture from the "outside"—toward the recursive articulations of subjects that are internal to the concerns and relationships the anthropologist seeks to describe (Kelty 2008; Clifford 1981). The room-space adds to this conceptual arsenal by offering new coordinates for the kind of investigative intimacy that constitutes anthropology's central intellectual operation. It prompts us to interrogate the composition of our ethnographic ground, our ability to stage encounters that are, in Kim Fortun's (2012, 459) words, "productively creative, creating a space for something new to emerge, to think outside and beyond what we know presently."

CONCLUSION: A World of Interiors

In this article we have explored some of the spaces entomologists construct to produce scientific knowledge about mosquitoes. The semifield station, the release area, and the insectary exemplify the diversity of facilities in which researchers attempt to apprehend the predispositions of mosquitoes and capture regularities in their behavior that might assist in the control of mosquito-borne diseases. Inspired by entomologists at work, we have sought to articulate the qualities that allow these spaces to create moments of experimental immediacy between the human and the nonhuman, the researcher and the researched.

In these room-spaces, as we have called them, entomologists try to align a precise scientific purpose with the bionomic flexibility of animal agencies. The routine activities of these facilities illuminate the multiple accommodations necessary to produce such alignment. Filing insectary trays with Evian water to mollify a prickly colony, arranging and rearranging the potted plants and clay pots in a semifield station hoping to facilitate mosquito breeding, selecting the most appealing corner of the porch to hang a trap—these minute operations underscore the labor but also the intense optimism that sustain the effort to fix mosquitoes, albeit momentarily, into objects of scientific attention.

In our discussion of these room-spaces we have resisted the urge to rank them along a scale of naturalism or containment, instead pausing long enough in each of them to appreciate its unique form of realism. Avoiding a hierarchical or sequential classification of research settings does not make for an easy task, as it requires circumventing both the discourses of biosafety that pervade contemporary understandings of scientific work with pathogen-carrying animals and traditional epistemological justifications for the validity of scientific, and by extension entomological, facts. Understood through the lens of biosafety, spaces of inquiry are defined by a single measure, namely, the degree of physical containment they provide, the porosity of the respective enclosure to unpredictable inflows and outflows (Caduff 2014). This notion of containment is highly amenable to scalar quantification, most explicitly in the classificatory system that ranks research settings according to a numerical biosafety level. Heterogeneous spaces of inquiry can then be placed on a linear trajectory, with the insectary providing the highest level of containment and the open field providing none. The same sort of ordering emanates from epistemological reconstructions of scientific fact-making, which characterize each research setting by how thoroughly it subjects the object of inquiry to the intentions of researchers. The result is a compelling narrative arc, extending from the artifice of the laboratory to the naturalism of the field and tracing a stepwise inversion of stability and relevance in between.

Both biosecurity considerations and epistemological justifications are at play in the three room-spaces we have described. Since they house mosquitoes capable of carrying human pathogens, these facilities must comply with an array of biocontainment rules that shape the architectural and procedural organization of scientific work. Similarly, if entomologists hope to turn their experimental observations into scientific facts that can circulate beyond the location of their production, they must be able to place individual settings of inquiry along a linear trajectory of increasing naturalism or faithfulness to the natural world.

And yet the successful operation of these facilities, we have argued, rests on a form of constructive spatial practice that is poorly articulated by the concept of containment, and involves a degree of mutual adjustment between scientists and mosquitoes that languages of control tend to disavow. The notion of containment articulated in biosafety discourses describes an essentially negative intervention, an effort to neutralize space or inactivate some of its productive qualities; it refers us to the ability to segregate an inside and an outside, but not to the particular ways in which the two can be fused or overlaid to uncover novel relations, to learn something new. Entomological facilities are indeed constrained and constraining, but they are also capacious and accommodating (cf. Corsín Jiménez 2003). From the humid airs of the insectary to the layout of traps along the side of the road, they are adapted to the sensory capacities of mosquitoes, and seek to generate knowledge through a delicate grasp of their evolving existence. Similarly, characterizing each space of inquiry on the basis of the degree of control it affords over experimental objects leads to exceedingly narrow accounts of the animal agencies involved in the research process, reducing them to a mere offshoot of the scientists' (in)ability to constrict their behavior. This is a radical simplification of the patterns of mutual attention that the room-space nurtures, and leads to impoverished descriptions of what the researchers themselves contribute to the staging of successful, epistemically productive encounters.

While the insectary might be designed to facilitate human intervention into the lives of mosquitoes, that does not make it a controlled space. It is rather a complex and fragile habitat, an ecosystem grown out of decades of reciprocal adjustments in a shared physical setting, an example of what Donna Haraway (2016, 32) calls the *sympoiesis* of "multispecies muddles." At the other end of the conventional spectrum, the release area might be more sparsely populated with human artifacts than the insectary, and its limits are perhaps demarcated in a less obtrusive or more distributed manner, but that does not make it any more unconstrained or less artificial. In fact, as we have seen, when the ratio of human presence falls below a certain threshold, it has to be recreated or simulated.

Finally, it is easy to think of the semifield station as being somehow *in between*—its very name conveys the sense of transition, a halfway house between proper scientific establishment and natural environment. Yet its value as a space of inquiry does not derive from its position on an abstract continuum spanning the laboratory and the field, or even from its location in a "border zone" connecting landscapes and labscapes (Kohler 2002, 20). Rather, this value arises from the configuration of its interior—from its configuration *as* an interior—and its capacity to create a new spatial matrix linking researchers, mosquitoes and their respective lifeworlds. In other words, as a room-space the semifield station is as specific as any other. It is neither a miniaturized version of the outdoors nor a scaled-up insectary; it is just one of the many natures researchers build to meet mosquitoes in pursuit of scientific knowledge. Each of the facilities we have described provides the scaffolding for a distinct interspecies encounter. This encounter might be more or less ephemeral, depending on the timeline of the research endeavor in question, but even in locations, like the insectary, where the process of scientific work extends uninterruptedly over decades, the intensity of attention and the precariousness of standardization suggest a conviviality in need of constant renewal.

Redescribing the settings of entomological inquiry as room-spaces has implications for how we understand the nature and purpose of the public health interventions they are meant to support. Not only does it force us to reconsider the complex dialectics of contact and separation, approximation and distance, that characterize scientific work with pathogenic organisms. It also helps expand our imagination of the ways in which humans can relate to mosquitoes. This imagination is thoroughly constrained by the exigencies of vector control and leads to a set of standard choices among a traditional set of insecticidal strategies: indoor residual spraying, insecticide-impregnated nets, areal fogging, larval control, the introduction of mosquito predators, and the like.[6]

The work of entomologists is almost always oriented toward achieving a more efficient way of killing or repelling mosquitoes, but the experience of observing them at close quarters over extensive periods of time has often left them with a sense of healthy skepticism, if not despair, about the reach of human action in the face of the bionomic adaptability and the breakneck genetic evolution of insect vectors. Mosquitoes, as we have seen, are almost as hard to keep alive and breeding within experimental facilities as they are to kill outside them. This paradox triggers a complicated dialectic of caring and killing: acquiring the knowledge necessary for a more efficient extermination of mosquitoes requires forms of attention grounded in an exquisite, almost amorous adjustment to their preferences; the promise of eradication is kept alive through ever-new forms of experimental cohabitation.[7] Yet the affective oscillations evident in the entomological room-space rarely percolate into the domain of public health or the practices of vector control, nor do they inflect the way we imagine human-mosquito relations more generally. If we were to carry the values of the room-space into the world at large—if we were to look for room-spaces everywhere, so to speak—we might find ourselves attending to new forms of knowing and doing in science, and impressed by a rather different set of achievements.

ABSTRACT

This article examines three locations where entomologists engage in the experimental observation of mosquitoes: the insectary, the semifield station, and the outdoors. We approach each of these settings as creating a distinct mode of interiority, a particular room-space. This concept resets the investigative encounter in terms of an aesthetic of attention, and offers a counterpoint to the ideals of control and containment that dominate biosecurity understandings of infectious disease research. An ethnographic foray into the compositional logics of entomological experiments serves to illuminate the dialectics of caring and killing that characterize scientific inquiry into animals that pose a public health risk. [mosquitoes; vector control; entomology; multispecies ethnography; global health research]

NOTES

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1. The trial-and-error quality of these arrangements extends beyond the example of the semifield station, or other entomological room-spaces for that matter, to what Hannah Landecker calls the surrounds of biological inquiry: the media, chemical or otherwise, that allow organisms to grow in experimental captivity. These media, Landecker (2016, 150) argues, often express "an accidentally accurate capture of the biology of life in man-made conditions."
2. Marston Bates (1949, 379), who pioneered the use of semifield stations in the 1930s, urged entomologists to abandon any pretensions of naturalness inside their field cages, however large these might be: "One still cannot be sure that the reactions of the mosquito are 'natural' because there is always the barrier of wire liable to be encountered on extended flights; and when the flight of a mosquito has been interrupted by this wire barrier its further activity may be definitely unnatural."
3. Researchers at IHI have recently created two larger facilities: the VectorSphere, which includes a free-living area (see http://ihi.or.tz/the-vectorsphere/), and a Mosquito City encompassing a variety of semifield environments (see http://ihi.or.tz/the-mosquito-city/).
4. The web of interspecific relations extends beyond humans, mosquitoes, parasites, mice, and rabbits to include long-term microscopic inhabitants of the insectary. This insectary, for instance, includes an entrenched population of mites. "We have decided we will live with them," the director notes, "try to keep them at a low level. They don't kill the mosquitoes, or the parasites, if they are under control." Not only would it be extremely laborious to eliminate these mites completely, but the level of hygiene required might have a negative impact on the liveliness of the mosquito colonies.
5. Tellingly, the window is often the ultimate device for achieving this effect, the object whose resolution makes or breaks the impression of absolute immediacy. A successful window allows the outside to enter the room and become part of the scene up front. A failed window, in contrast, is one that posits the outside as a source of light, context, or validation for the objects presented within the literal enclosure of the physical room (T. Clark 2013, 89–91).
6. This repertoire has recently expanded with a radical new addition: what if we were able to eradicate a whole mosquito species, maybe even to create "a world without mosquitoes" (Fang 2010)? This vision is empowered by the development of so-called gene drives, synthetic pieces of DNA that can spread through wild populations and entrench in them a desired trait—for example, pathogen incompatibility or sterility. This form of insecticidal utopianism capitalizes on the mosquitoes' own opportunism and promiscuity to trigger the self-annihilation of the species (Regalado 2016).
7. This combination of registers is not unique to scientific research. It recalls the "regimes of violent care" (van Dooren 2014, 92) that characterize the conservation of endangered species, or even the "double perspective" (Willerslev 2004, 630) of prey common in hunting societies.

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