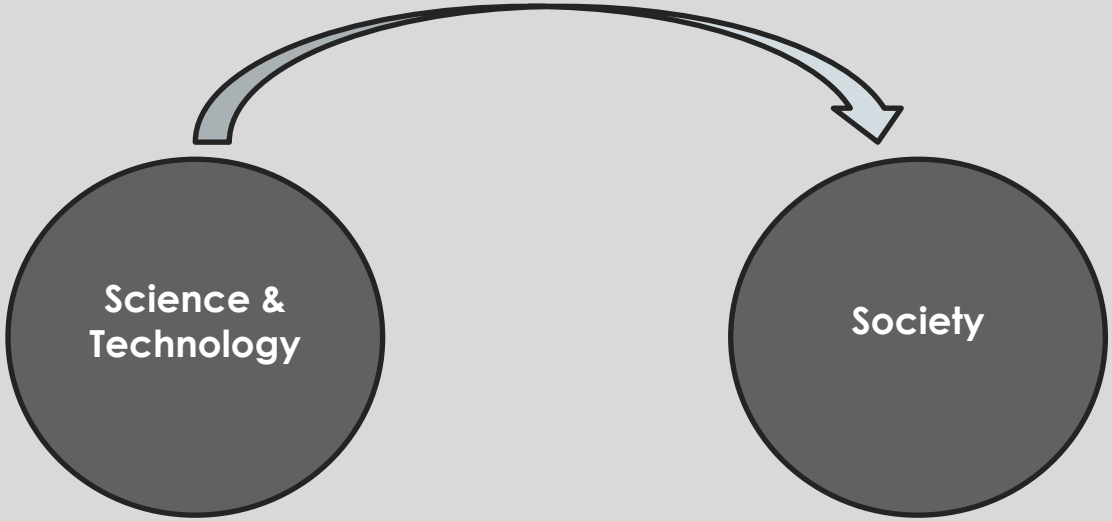
CARING FOR THE ENEMY, KILLING THE ALLY:

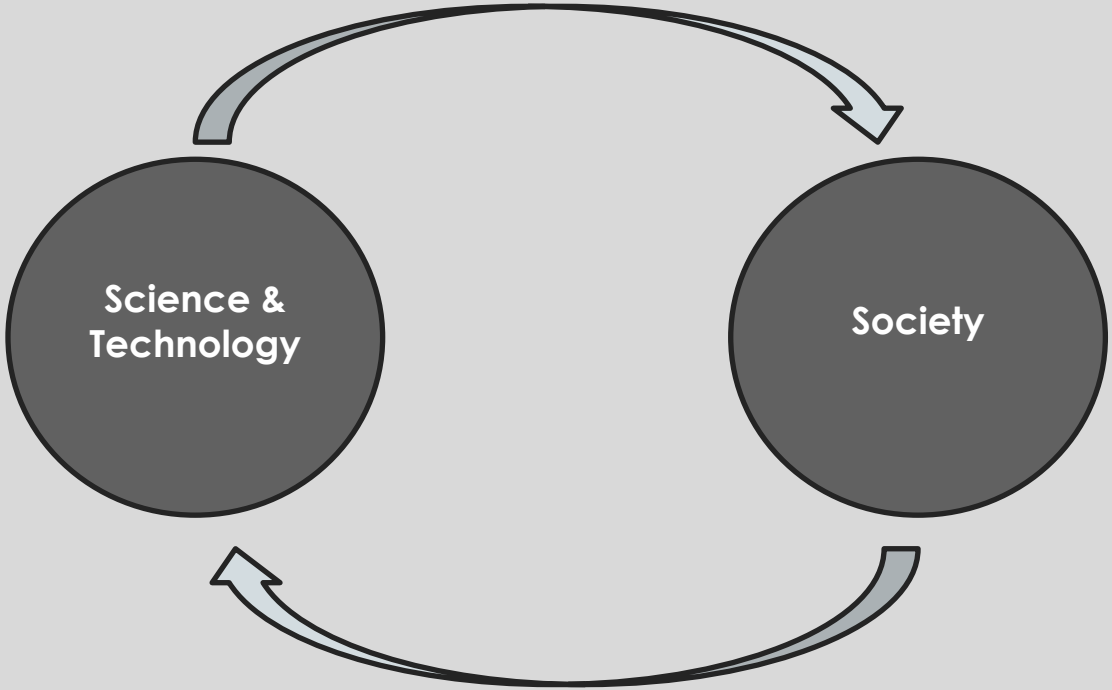
The More-than-Human Politics of Transgenic Mosquitoes

Luísa Reis Castro

University of Southern California (USC), United States

School on Mathematical Modeling and Governance, October 30, 2023


Science &
Technology
Society


Science &
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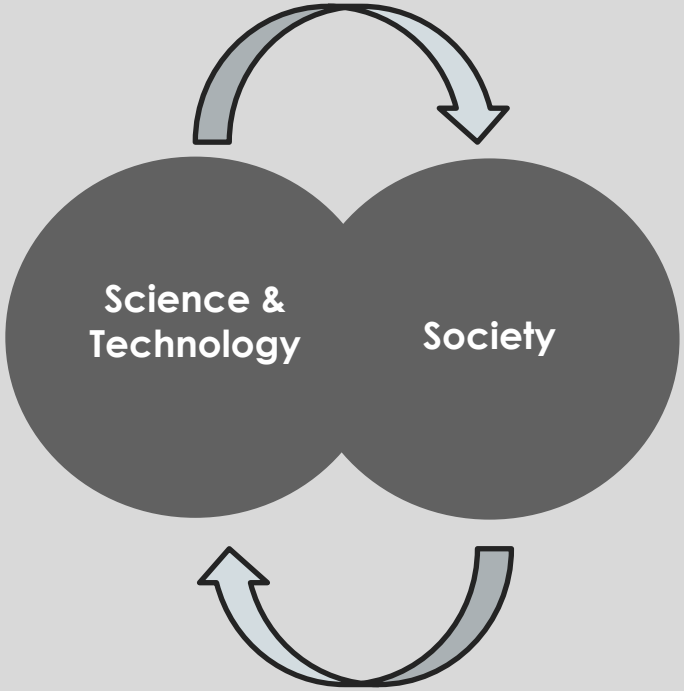
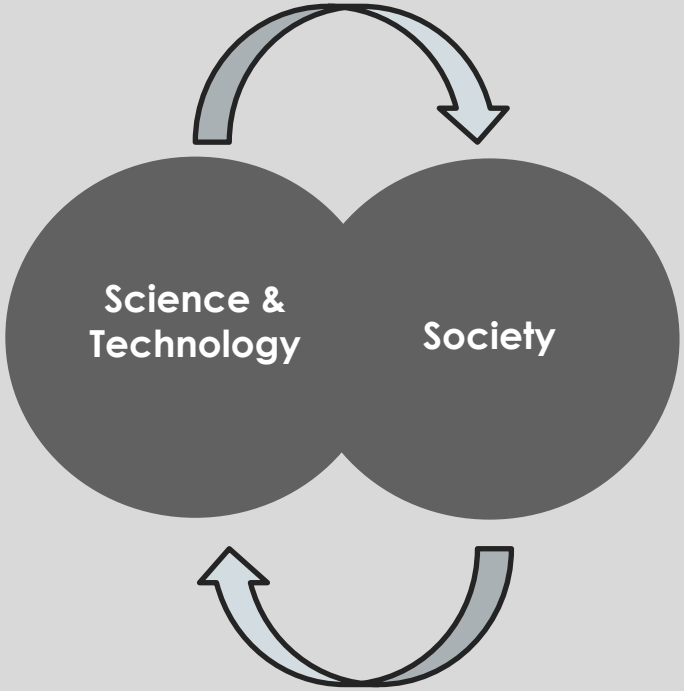
Science and Technology Studies (STS)



Science and Technology Studies (STS) | Anthropology



Ethnographic Research

- participant observation / "deep hanging out" (Rosaldo cited in Clifford 1996)

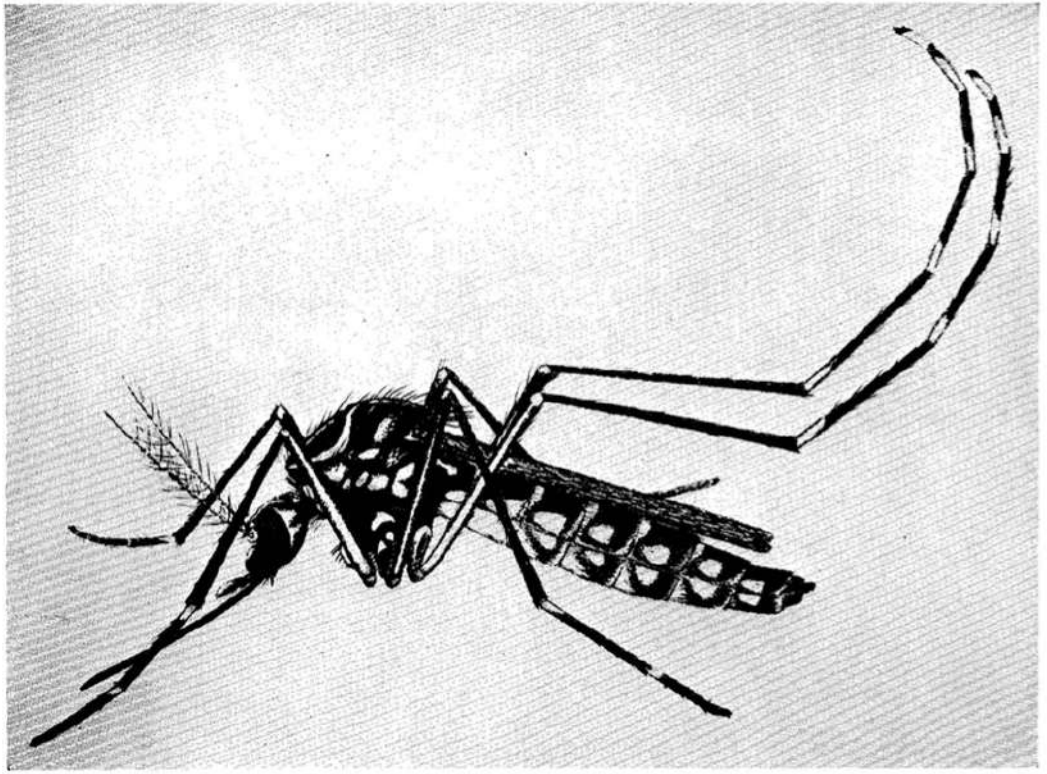
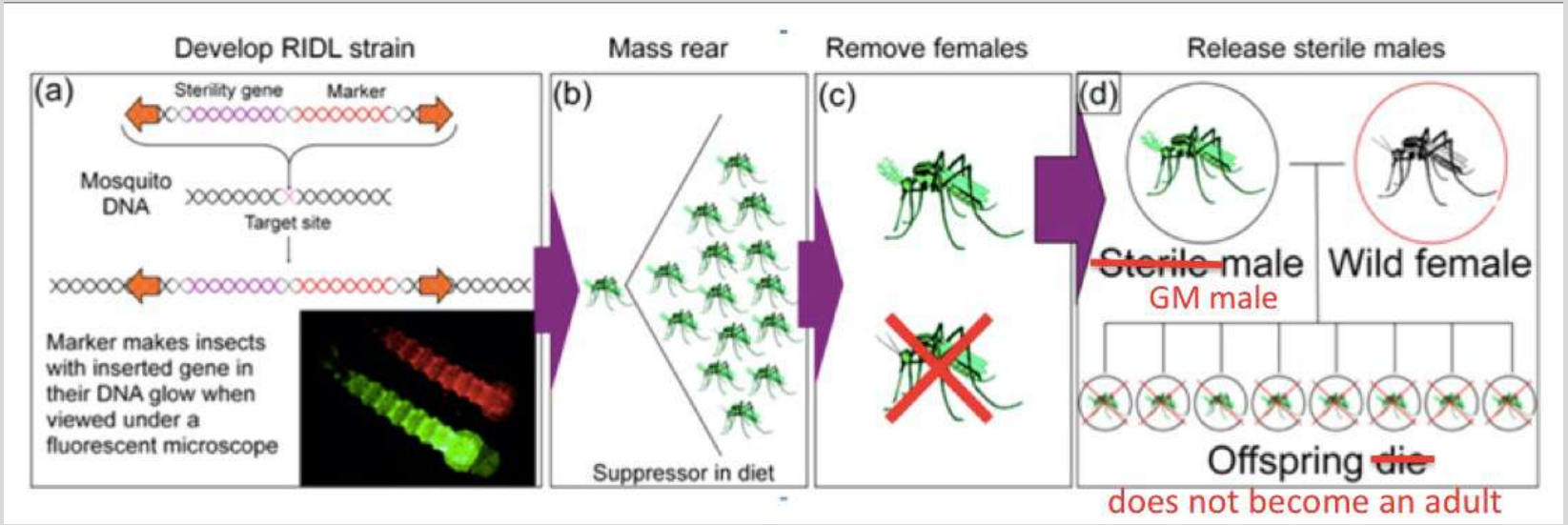


FIG. 5. Lateral view of female *Aedes aegypti*.



(Wilke et al. 2009)

April to May 2013

Becoming Without

Making Transgenic Mosquitoes and Disease Control in Brazil

LUÍSA REIS-CASTRO
Society of Fellows in the Humanities, University of Southern California, USA

Abstract The *Aedes aegypti* mosquito, known as the vector for Zika, dengue, chikungunya, and yellow fever viruses, has historically been targeted by public health campaigns as an enemy to be eliminated. However, new strategies, such as the transgenic approach, biologically modify the *A. aegypti* so that they can be deployed to control their own population—here, mosquito breeding and mating is operationalized as an insecticide. In this case, the insect must be simultaneously a friend and an enemy, cared for and killed, and it must establish encounters and nonencounters. Drawing on ethnographic fieldwork at a "biofactory" in the northeast of Brazil dedicated to mass-producing these transgenic mosquitoes, this article investigates the new forms of labor and value produced through these contrasting human-mosquito relations. The author also examines how the project is implemented within broader geopolitics of experimentation and more-than-human gendered conceptions. Analyzing the multispecies relationships engendered under the premise that it is possible to produce nonencounters, she identifies the historical conditions and promissory claims of transforming the *A. aegypti* 's reproductive capacity into labor for killing. Such recasting yields what the author calls the "nonencounter value" within the scientific remaking of mosquitoes, their *becoming* and *being*.

Keywords reproduction, labor, value, genetically modified organisms, health, multispecies

Resumo O mosquito *Aedes aegypti*, conhecido como o vetor dos vírus Zika, dengue, chikungunya e febre amarela tem sido o alvo de campanhas de saúde pública, sendo visto historicamente como um inimigo a ser eliminado. No entanto, novas estratégias, como a abordagem transgênica, modificam biologicamente os mosquitos a fim de empregá-los no controle de sua própria população—aqui, a criação e o acasalamento de mosquitos são operacionalizados como inseticida. Nesse caso, o inseto precisa ser, ao mesmo tempo, amigo e inimigo, precisa ser cuidado e ser morto e precisa estabelecer encontros e não encontros. Com base em pesquisa etnográfica, feita em uma "biofábrica" dedicada à produção em massa desses mosquitos transgênicos no Nordeste brasileiro, Reis-Castro investiga as novas formas de trabalho e de valor produzidas por meio dessas relações contrastantes entre humanos e mosquitos. A autora examina, também, como o projeto é implementado, de maneira mais ampla, a partir de uma geopolítica de experimentação e de concepções mais-que-humanas gendradas. A partir de uma análise das

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The Flying Public Health Tool: Genetically Modified Mosquitoes and Malaria Control

ULI BEISEL* & CHRISTOPHE BOËTE**

**Lancaster Environment Centre, Lancaster University, Lancaster, UK, **UMR 190 "Emergence des Pathologies Virales", Aix-Marseille Université, France*

ABSTRACT *For many in the scientific world, technologies of genetic modification offer a promising method to control vector-borne infectious diseases such as malaria. Nevertheless, the recent releases of the first genetically modified (GM) mosquitoes into the wild have triggered heated discussions. How is the human–mosquito relationship being reconfigured through the development of GM mosquitoes? The scientific modifications that make mosquitoes incapable of transmitting malaria and capable of generating profit have epistemic consequences for public health. GM mosquitoes have shifted malaria control in ways that might best be understood in terms of 'transposition' (Braidotti): the mosquito transforms from a disease-bringing agent to a benevolent public health tool. This transformation from vector to tool is technically elegant, but this elegance is also risky. As the history of malaria epidemics has shown, mosquitoes travel long distances in hardly predictable patterns. Creating a GM mosquito then also means to surrender public health practices to the lines of flight of the mosquito itself.*

KEY WORDS: Genetically modified mosquitoes, malaria, transposition, uncertainty, ecology, public health

Introduction

For centuries, the relationship between humans and mosquitoes has been dominated by antagonism—mosquitoes are to be avoided at the very least, killed at best if one values one's own health. Genetically modified (GM) mosquitoes promise to change this dynamic fundamentally by becoming harmless

Correspondence Address: Uli Beisel, Lancaster Environment Centre, Lancaster University, Lancaster LA1 4YQ, UK. Email: u.beisel@lancaster.ac.uk

TRANSFORMER POUR CONTRÔLER

Humains et moustiques à La Réunion, à l'ère de la biosécurité

SANDRINE DUPÉ

RÉSUMÉ

La lutte contre les moustiques vecteurs de maladies a longtemps été basée sur l'usage des insecticides. Mais les résistances qu'ils provoquent chez les moustiques et leurs effets sur l'environnement remettent en question leur utilisation systématique. La prise en considération de ces limites marque un tournant dans les politiques de santé publique. Elle inscrit la lutte contre les moustiques dans un régime biosécuritaire. L'étude comparée de deux techniques de lutte déployées à La Réunion pour limiter l'usage des insecticides permet de penser les effets de l'abandon des insecticides. Deux choses seront observées : la déstabilisation des représentations et pratiques induite par la mise au ban des insecticides, et les ressorts politiques, axiologiques et technoscientifiques sur lesquels s'appuient les acteurs de la santé publique (opérateurs et experts) pour impulser cette transformation biosécuritaire.

Mots clés : biosécurité, biodiversité, surveillance, transformation du vivant, moustiques.

INTRODUCTION

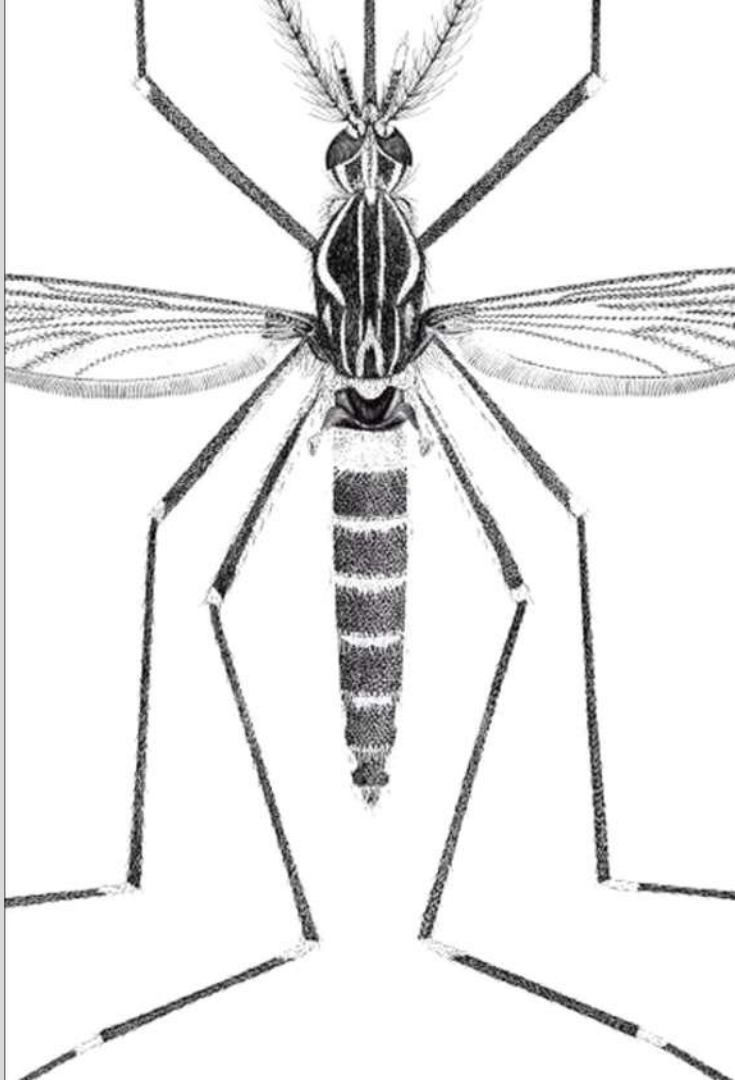
La place de l'animal est fixée par la société (Staszak, 2002). Et les enjeux sanitaires placent indéniablement les moustiques vecteurs de maladies en dehors de la société, que ce soit par des mécanismes de mise à distance ou d'éradication. Si les insecticides ont longtemps rempli ces fonctions, leur inefficacité à long terme et leur toxicité ont remis en cause leur usage systématique. Ils ont

AEDES DO BEM!

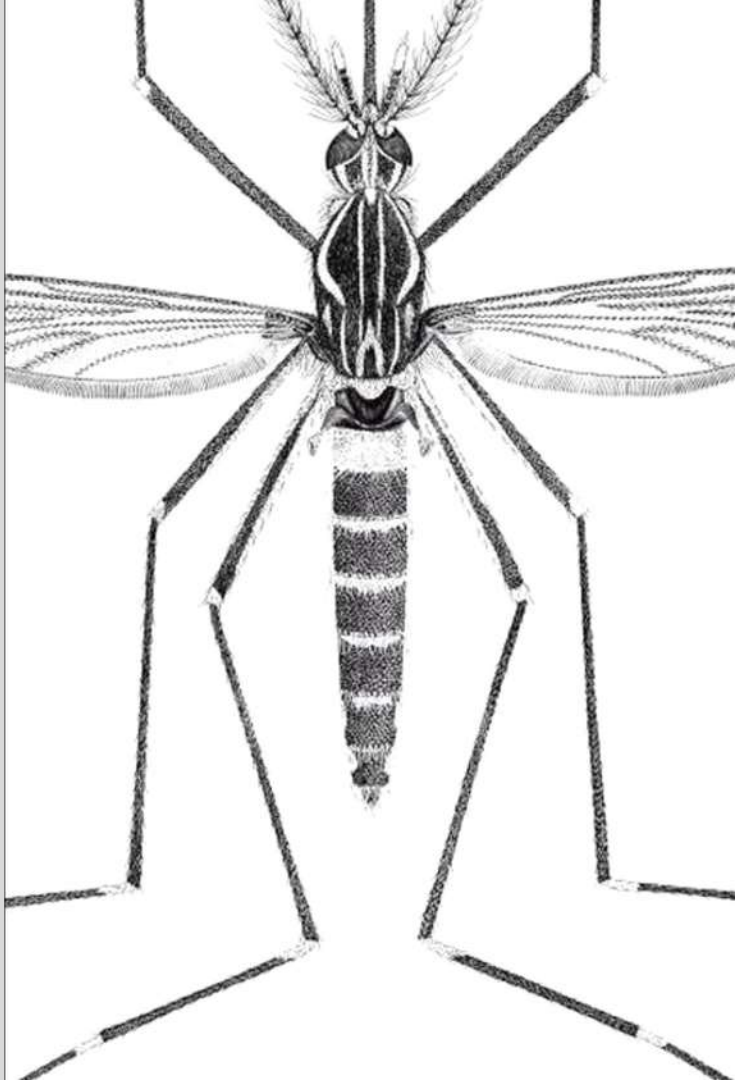

Friendly
Aedes aegypti
Project
Fighting the dengue fever, chikungunya and zika mosquito to improve people's lives
Results
Decrease in mosquito populations after the implementation of Friendly Aedes aegypti Projects around the world:
East End Grand Cayman (Cayman Islands) 96%
99% Mandacaru Juazeiro (Brazil)
Nuevo Chorillo Panama City (Panama) 93%
94% Itaberaba Juazeiro (Brazil)
92% Pedra Branca Jacobina (Brazil)
Friendly Aedes aegypti is a genetically modified male that cannot bite or transmit disease
Male mosquitoes do not bite and cannot transmit dengue, chikungunya or zika viruses
The friendly Aedes aegypti males are released and mate with local females, passing on their genes
The population of larvae that carry friendly Aedes aegypti genes can be monitored using a colour marker
Any offspring from females that have mated a friendly male Aedes aegypti mosquito die before reaching adulthood
With successive releases, the population of the dengue, chikungunya and zika mosquito is reduced
OXITEC

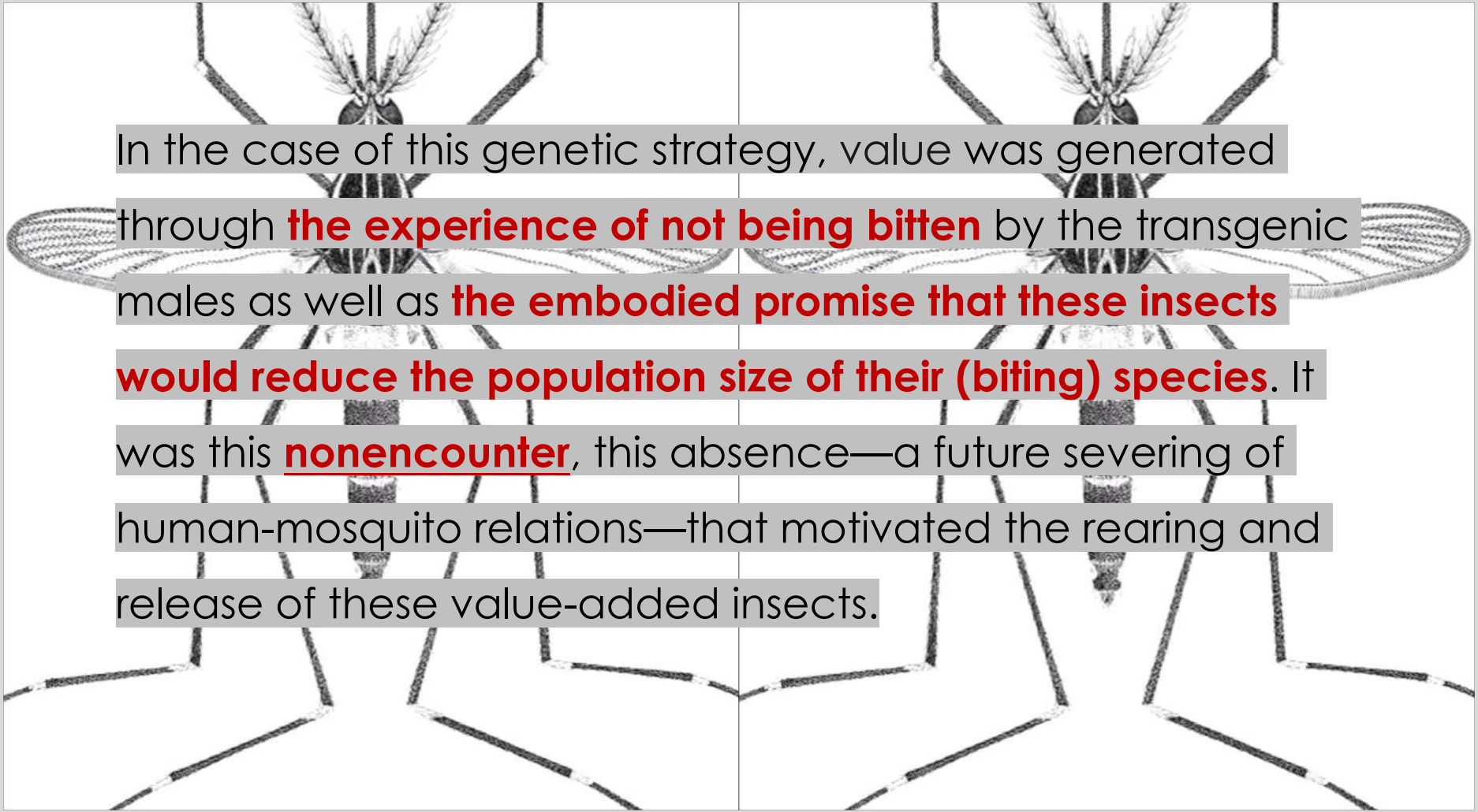
Caring for the Enemy, Killing the Ally

The mosquito can exist as an "ally" or a "friend" only to the extent that it also exists (**simultaneously**) as an enemy.



When transgenic mosquitoes are deployed their own reproduction is transformed into labor for killing. Mosquito breeding and mating are operationalized as *insecticide*, turned into a sort of **deadly reproductive labor**.





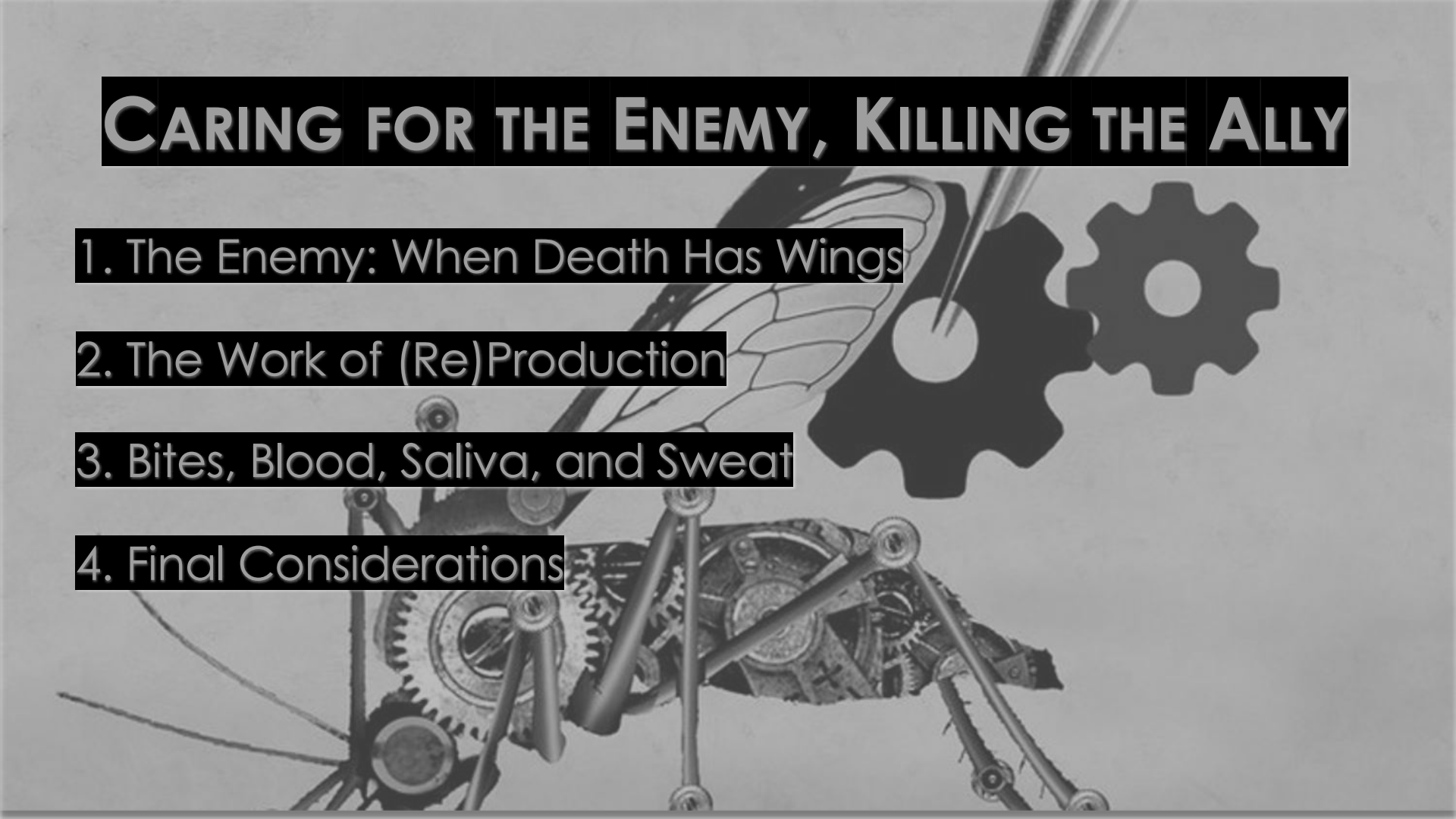
In the case of this genetic strategy, value was generated through **the experience of not being bitten** by the transgenic males as well as **the embodied promise that these insects would reduce the population size of their (biting) species**. It was this **nonencounter**, this absence—a future severing of human-mosquito relations—that motivated the rearing and release of these value-added insects.

As a result, to implement this genetic strategy proponents of this technology had to reengineer not only the mosquito body but also **three different aspects of the human-mosquito encounter**.

1) Transform an insect that has long been an enemy into an ally;
2) They needed to make, rather than kill, mosquitoes;
3) They had to reenvision human-mosquito encounters as ones in which mosquitoes (especially the released ones) do not bite humans.

Caring for the Enemy, Killing the Ally

1. The Enemy: When Death Has Wings
2. The Work of (Re)Production
3. Bites, Blood, Saliva, and Sweat
4. Final Considerations



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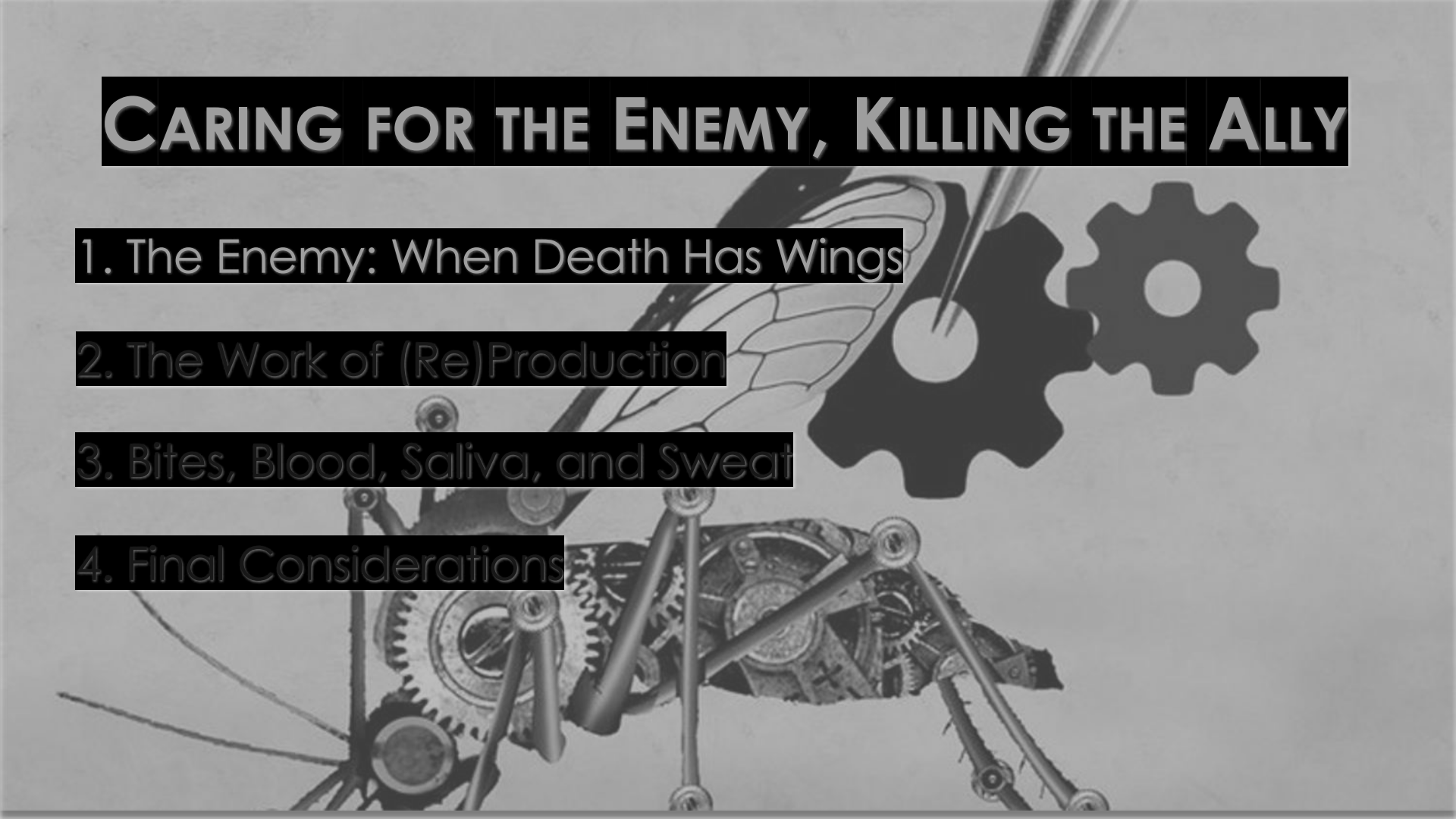
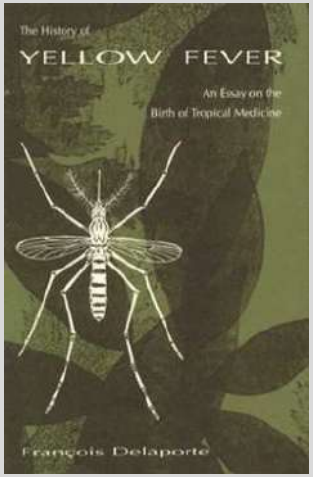
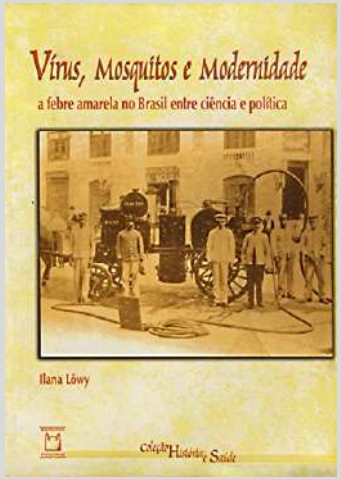
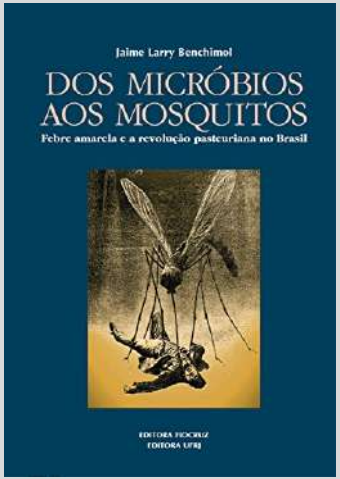
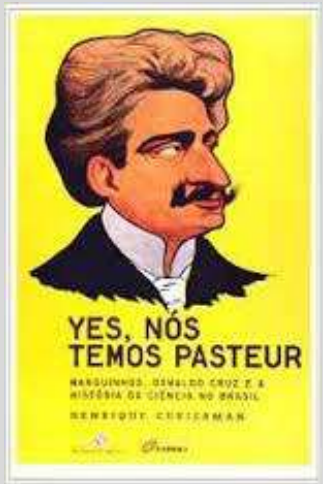
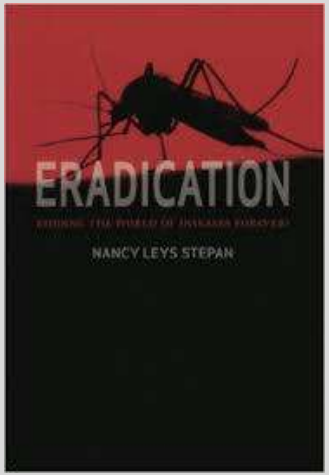


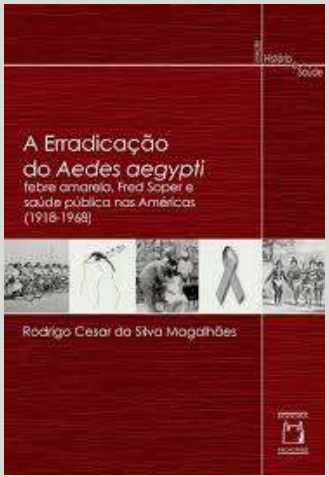

The History of
YELLOW FEVER
An Essay on the
Birth of Tropical Medicine
François Delaporte

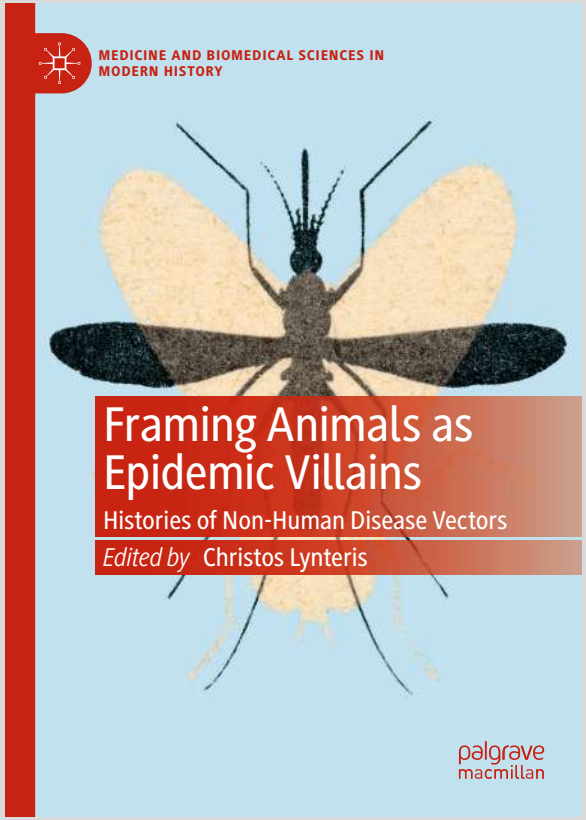

Vírus, Mosquitos e Modernidade
a febre amarela no Brasil entre ciência e política
Ilana Löwy
coleção História e Saúde


Jaime Larry Benchimol
DOS MICRÓBIOS
AOS MOSQUITOS
Febre amarela e a revolução pasteuriana no Brasil
EDITORA FIOCRUZ
EDITORA UFRJ


YES, NÓS
TEMOS PASTEUR
HENRIQUE CUKIERMAN


ERADICATION
NANCY LEYS STEPAN


A Erradicação
do Aedes aegypti
febre amarela, Fred Soper e
saúde pública nas Américas
(1918-1968)
Rodrigo Cesar da Silva Magalhães



CHAPTER 6

A Vector in the (Re)Making: A History of *Aedes aegypti* as Mosquitoes that Transmit Diseases in Brazil

Gabriel Lopes and Luísa Reis-Castro

Introduction

On May 25, 1986, a headline from *O Globo*, a newspaper in Rio de Janeiro, reported on a public health threat with the headline 'Cloud of "aedes" alarms the city'.[1,2] This threat came in the form of the *Aedes aegypti*, a mosquito that public health officials believed had been eradicated from Brazil in the 1950s, when it had been held responsible for yellow fever epidemics. More than thirty-five years later, this same insect had re-appeared, but now as the vector for a new virus, dengue fever.[3] When interviewed in *O Globo* about the outbreak, Dr. Márcio Dias, a physician responsible for epidemiological surveillance, observed that, while the *A. aegypti* was getting wide attention, there had been reports of its presence in the

G. Lopes (✉)
Casa de Oswaldo Cruz, Rio de Janeiro, Brazil

L. Reis-Castro
Massachusetts Institute of Technology, Cambridge, MA, USA

C. Lynteris (ed.), *Framing Animals as Epidemic Villains*,
Medicine and Biomedical Sciences in Modern History,
https://doi.org/10.1007/978-3-030-26795-7_6

CULTURAL ANTHROPOLOGY

THE WILD INDOORS:
Room-Spaces of Scientific Inquiry

ANN H. KELLY
King's College London
http://orcid.org/0000-0003-4658-2133
JAVIER LEZAUN
University of Oxford
http://orcid.org/0000-0002-5483-3628

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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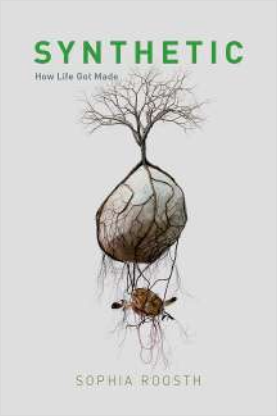
"insecticidal utopianism"

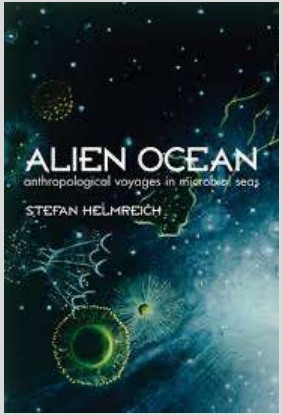
From Pest to Product

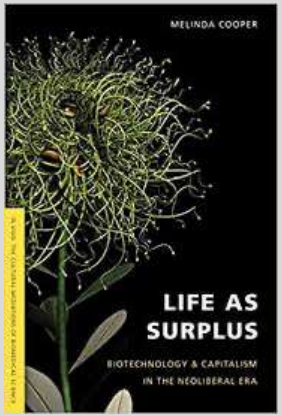
This transformation—from an organism that carries a problem (a pathogen) to one that carries the solution (its own species' self-annihilation)—turns mosquitoes into something **valuable**. Yet, the mosquito as an "ally" in the quest for healthier humans can only exist to the extent that the mosquito as an "enemy" is still looming, threateningly, in the background. It is through this paradoxical mosquito-human interaction that the strategy can generate value. To make mosquitoes have ***value*** here can be understood **not only through the money saved from health and death costs but also the value of the mosquito as a commodity**.

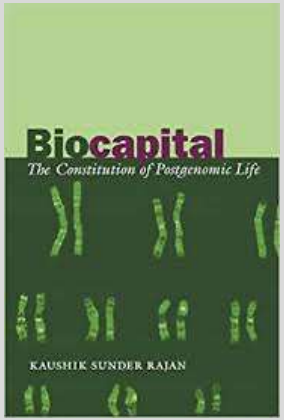

OXITEC

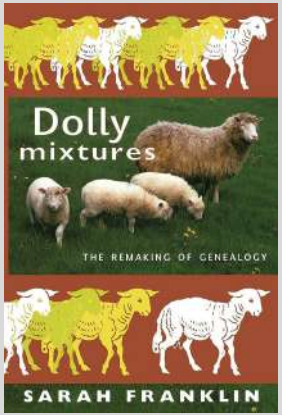
Indeed, results published after my fieldwork showed that there was a suppression of the *Aedes aegypti* population during sustained releases but, once these stopped, there was a gradual recovery to prerelease numbers—bringing **no long-lasting benefit to residents** of the areas where experiments were conducted.

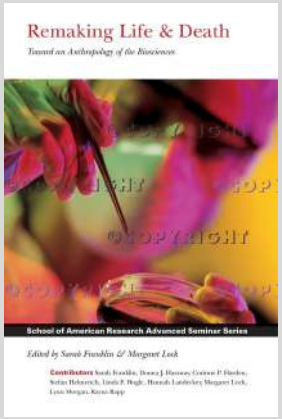

SYNTHETIC
How Life Got Made
SOPHIA ROOSTH


ALIEN OCEAN
anthropological voyages in microbial seas
STEFAN HELMREICH


MELINDA COOPER
LIFE AS SURPLUS
BIOTECHNOLOGY & CAPITALISM IN THE NEOLIBERAL ERA

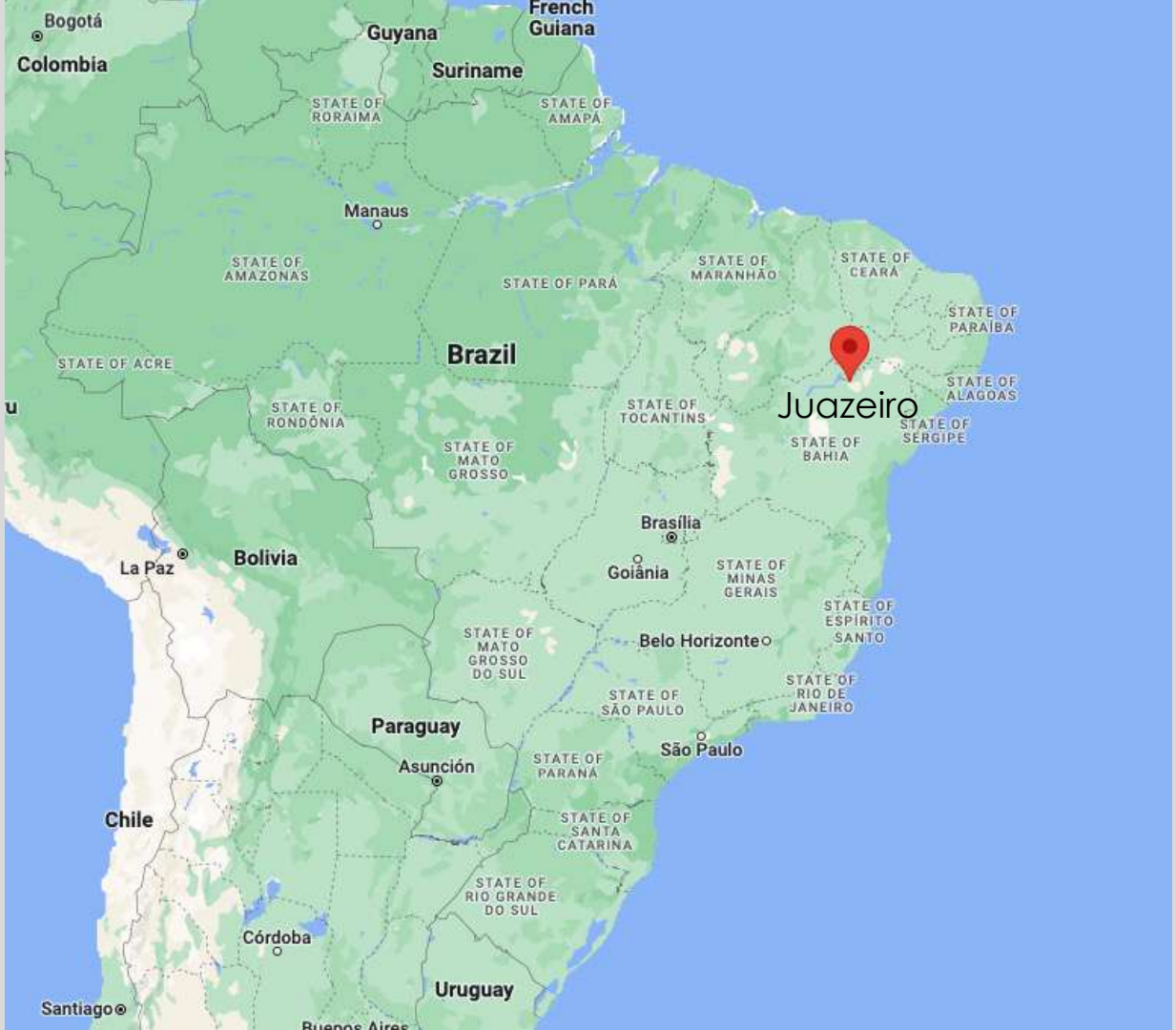

Biocapital
The Constitution of Postgenomic Life
KAUSHIK SUNDER RAJAN


Dolly
mixtures
THE REMAKING OF GENEALOGY
SARAH FRANKLIN


Remaking Life & Death
School of American Research Advanced Seminar Series


OSCAMED
BRASIL

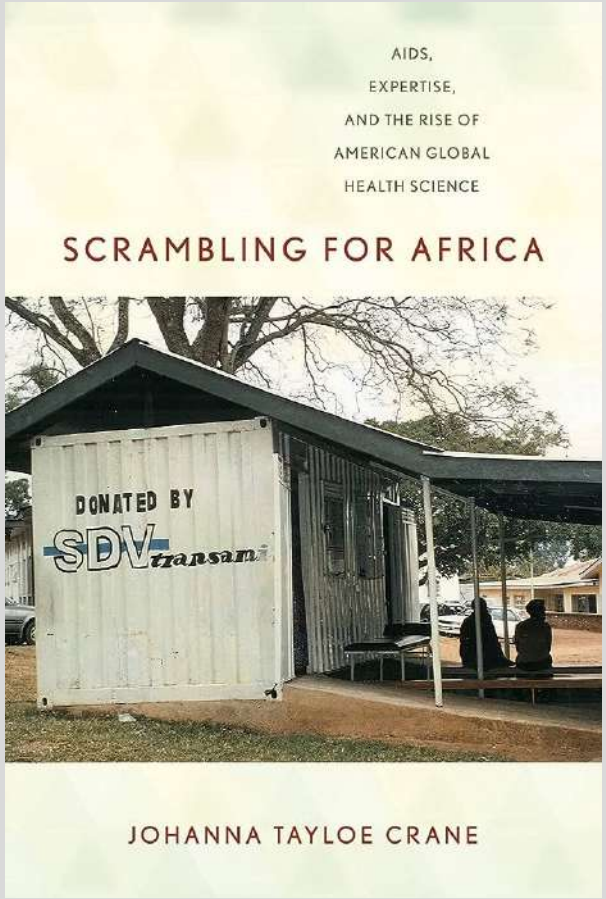

USP
Universidade de São Paulo


Bogotá
Colombia
Guyana
French Guiana
Suriname
STATE OF RORAIMA
STATE OF AMAPÁ
Manaus
STATE OF AMAZONAS
STATE OF PARÁ
STATE OF MARANHÃO
STATE OF CEARÁ
STATE OF PARAÍBA
STATE OF ACRE
Brazil
STATE OF RONDÔNIA
STATE OF TOCANTINS
Juazeiro
STATE OF ALAGOAS
STATE OF SERGIPE
STATE OF BAHIA
STATE OF MATO GROSSO
Brasília
La Paz
Bolivia
Goiânia
STATE OF MINAS GERAIS
STATE OF ESPÍRITO SANTO
STATE OF MATO GROSSO DO SUL
Belo Horizonte
STATE OF RIO DE JANEIRO
STATE OF SÃO PAULO
Paraguay
São Paulo
Asunción
STATE OF PARANÁ
Chile
STATE OF SANTA CATARINA
STATE OF RIO GRANDE DO SUL
Córdoba
Uruguay
Santiago

The workers were aware of the politics of conducting experiments in the northeast's *sertão,* the semiarid hinterlands—a **historically marginalized part of the country**.

The anthropologist of science and health Rosana Castro has described how Brazil's **social and racial (and in this case also regional) inequalities** are reframed by scientists as conditions that enable and propel scientific research in the country—what Castro defines as "**opportune precariousness**." Thus, the workers' jokes and remarks about the *sulistas* could be understood as social commentaries on the **regional geopolitics at play in these experimental releases**.

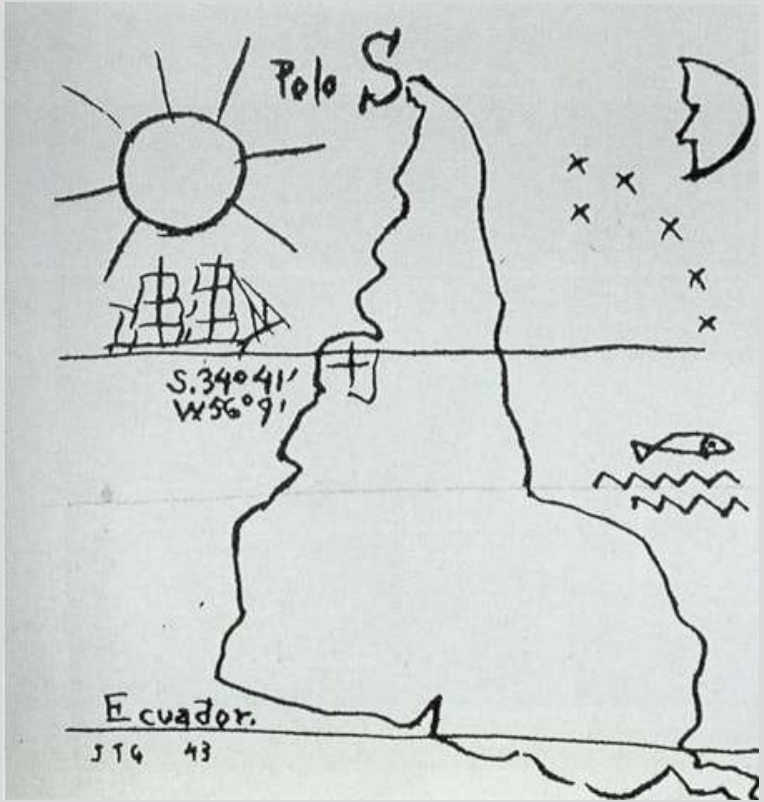
Medical anthropologist Johanna Crane has described similar circumstances in collaborations between Uganda and US-based universities, where the "poverty and inequality" that institutions in the United States (or in Europe) are aspiring to "remedy is also what makes their global health programs both *possible* and *popular*." Crane defines these as "**valuable inequalities**."



valuable ***national***
inequalities

“Our [global] North is the South”

valuable ***national*** inequalities



Caring for the Enemy, Killing the Ally

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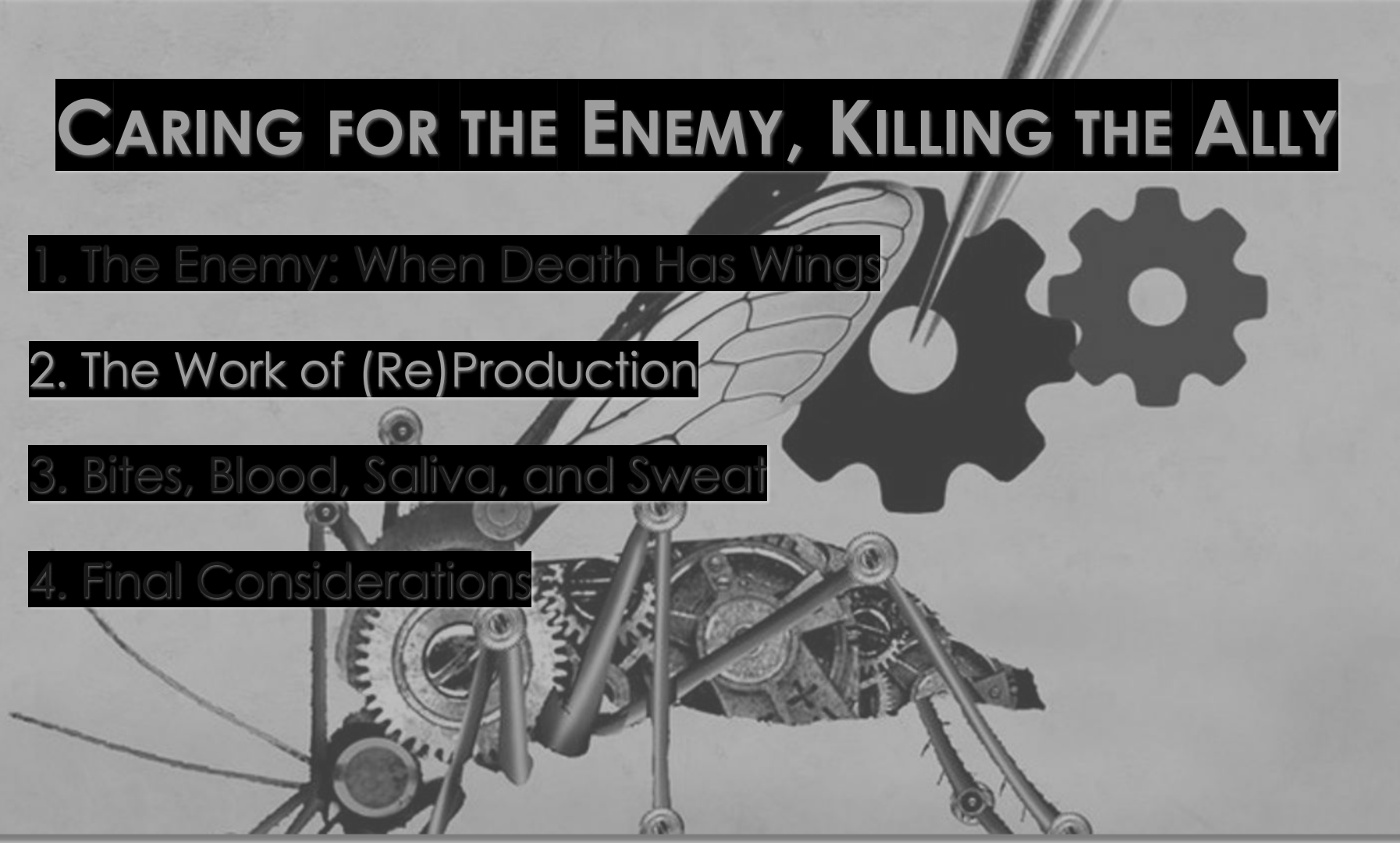

Gendered Politics of Transgenic Mosquitoes

"We release these mosquitoes, and they do all the work for us. This technology works so well, because the best thing *machos* (males) can do is to find *fêmeas* (females). **All machos think about is sex**."

Gendered Politics of Transgenic Mosquitoes

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During fieldwork, I heard many variations of "jokes" about horny machos that, driven by their insatiable and unending desire for sex, won over picky fêmeas.

Gendered Politics of Transgenic Mosquitoes

The person telling the joke would usually not specify that it was about mosquitoes, therefore implying that these remarks referred not just to mosquitoes but also to **more-than-mosquitoes gendered sexualities** (to insects and humans alike).

Class Politics of Transgenic Mosquitoes

"All this imported food and we need to go through all this effort to feed them. **These mosquitoes have a better life than I have**!"

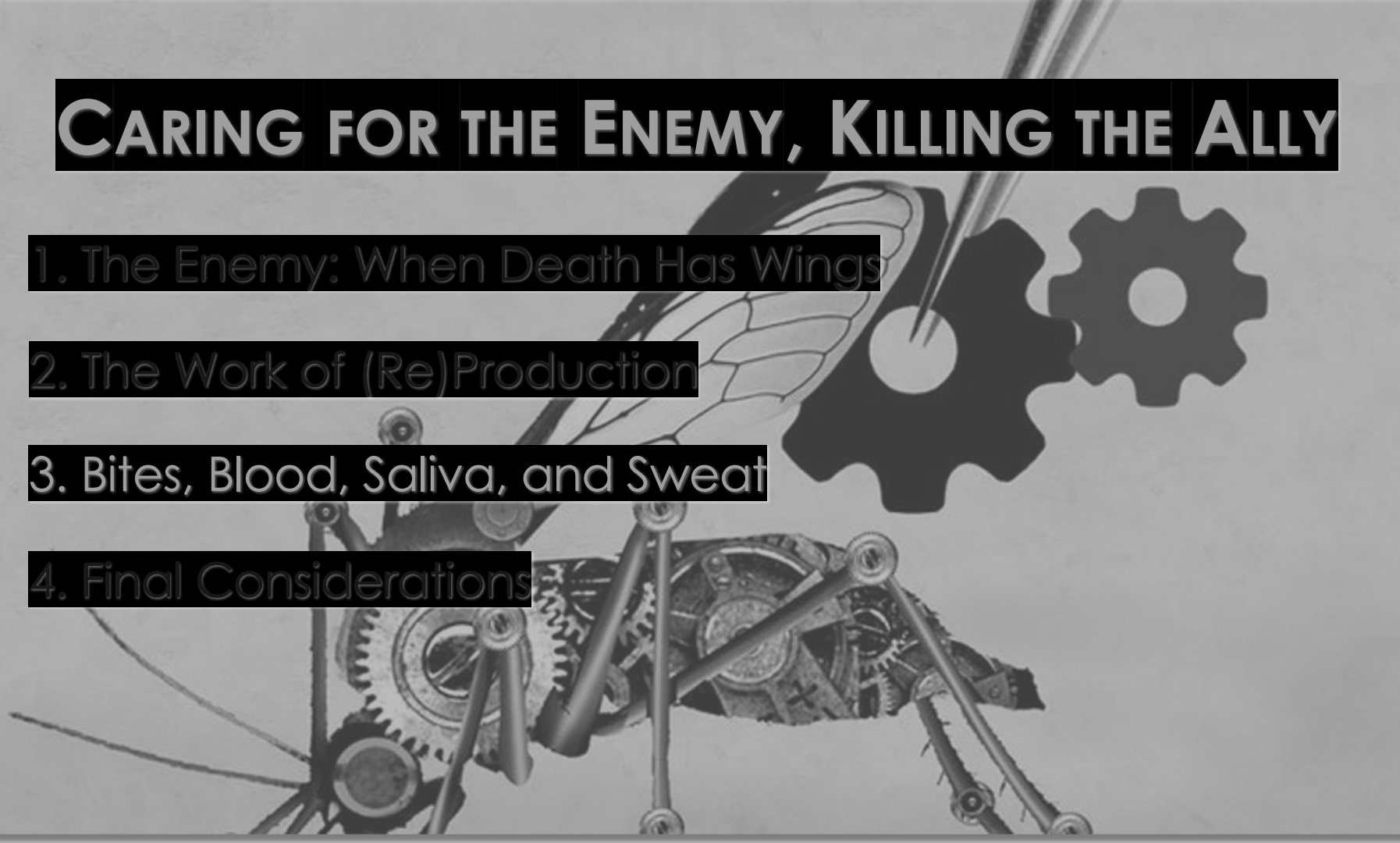
Class Politics of Transgenic Mosquitoes

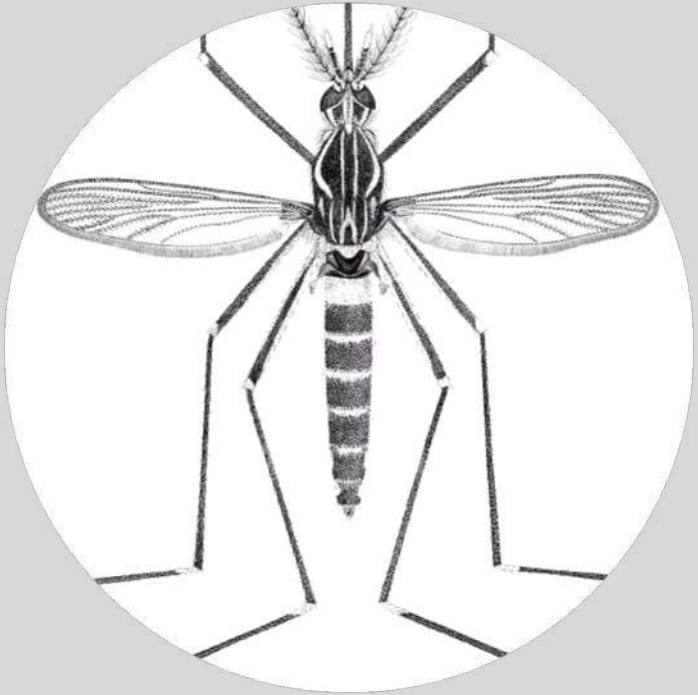
"All this imported food and we need to go through all this effort to feed them. These mosquitoes have a better life than I have!"

Perhaps the remarks about these mosquitoes—remade to be at the same time commodity and laborer—were also a social critique on how **more value seemed to be given to the "labor" of mosquitoes than to the human labor** needed to implement this strategy.

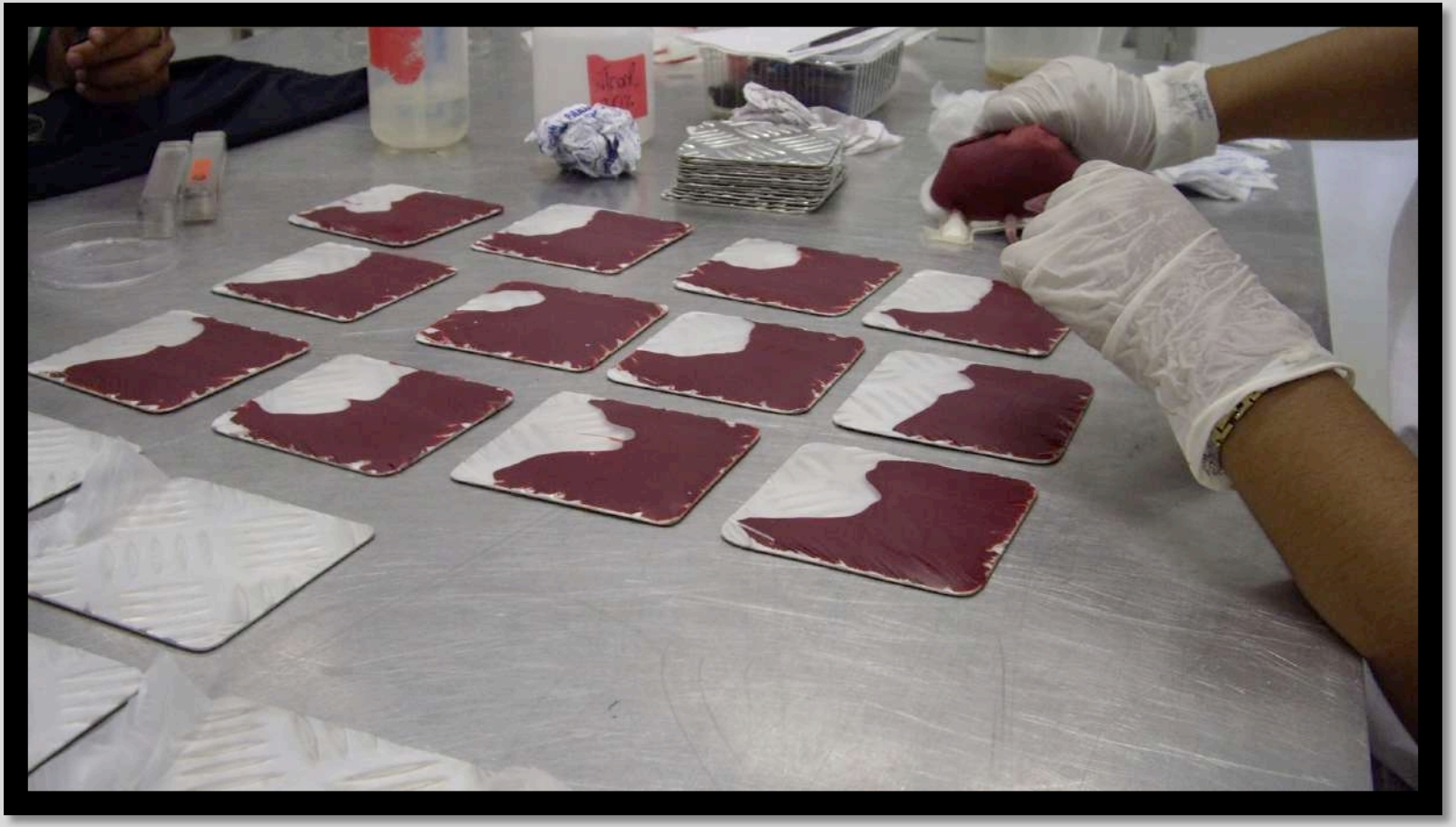
Caring for the Enemy, Killing the Ally

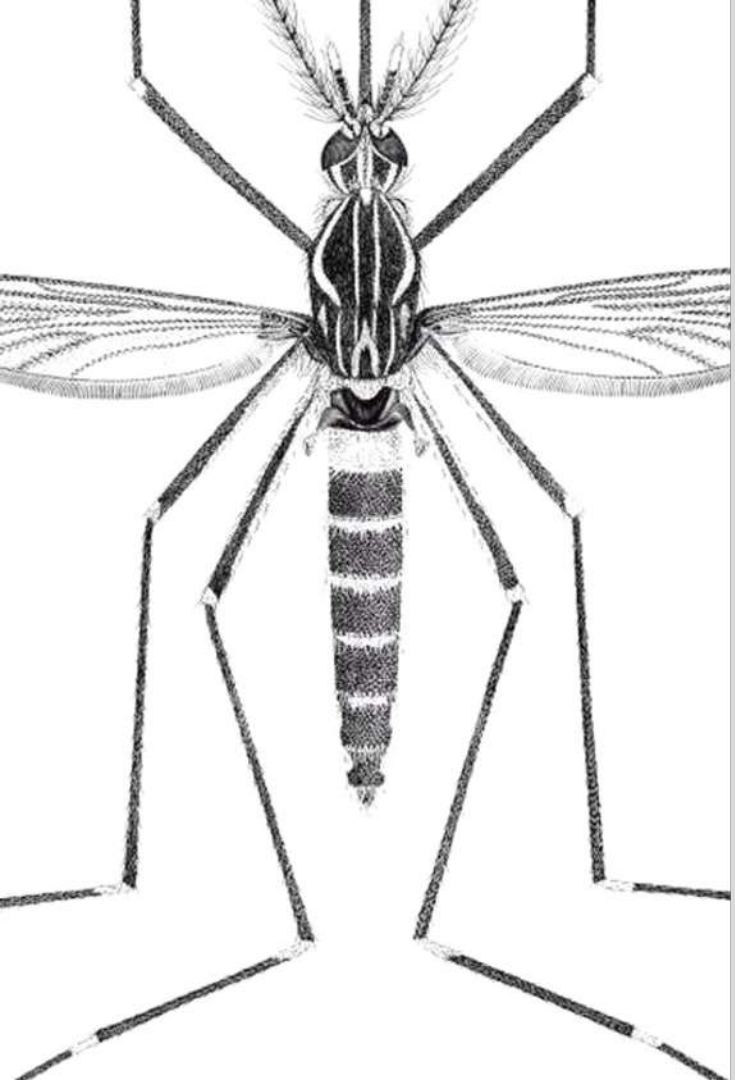
1. The Enemy: When Death Has Wings
2. The Work of (Re)Production
3. Bites, Blood, Saliva, and Sweat
4. Final Considerations





In this multispecies interaction, the exchange of fluids means the **survival** of some beings (mosquitoes) but a **potential threat** to others (humans). The bite, then, is a haptic reminder of how the **production of diseases** is always **relational** in our **porous and permeable bodies**.



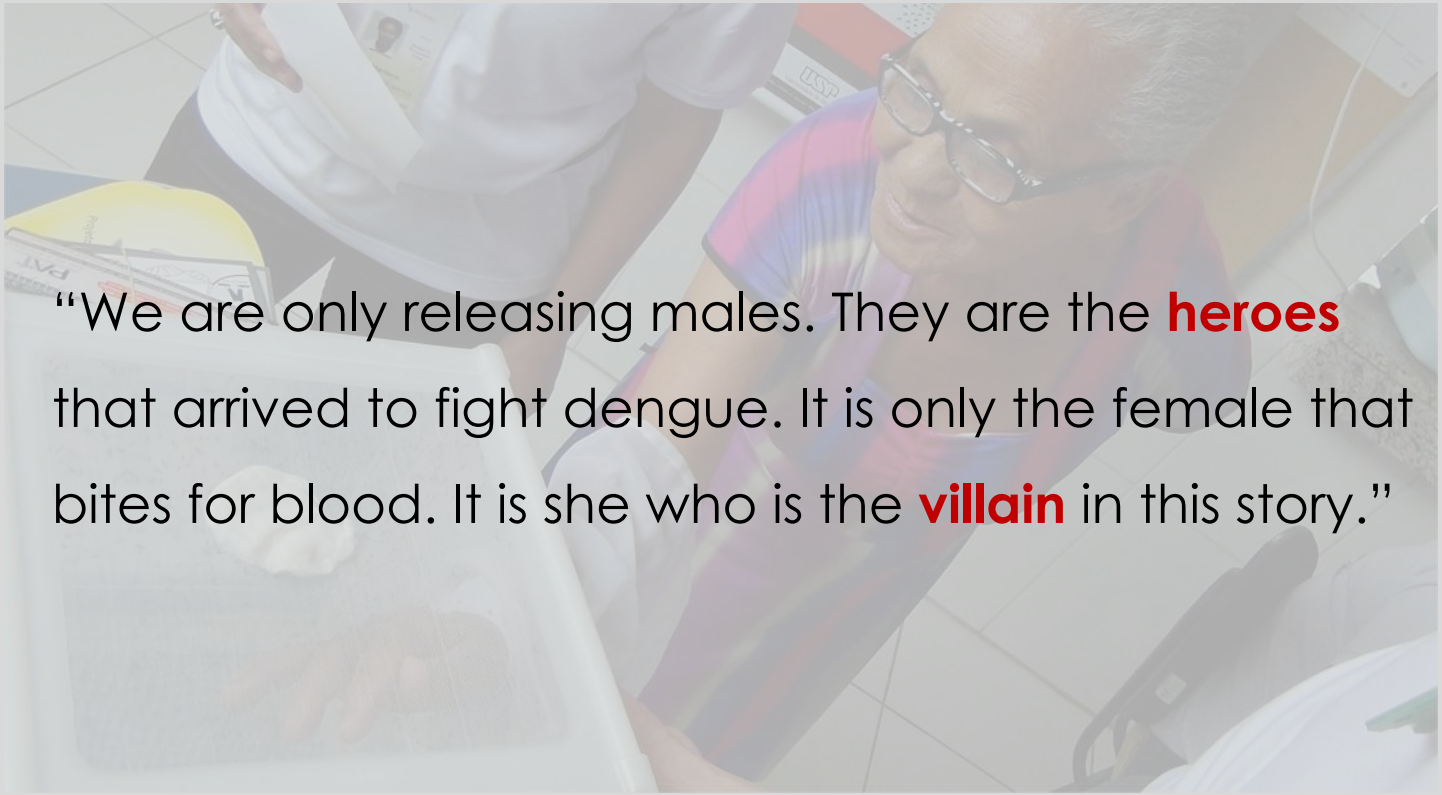


These practices attempted to create the first redefinition of the biting/being bitten encounter: by **mimetically transforming** blood of a goat—**an animal which is food for humans**—into a **form of humans as food**, the transgenic *A. aegypti* could be fed (and therefore reproduce) without having them pierce their proboscis into human skin.

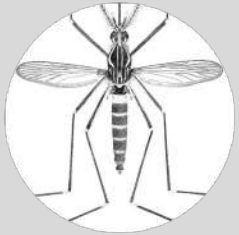
Source: Página do Facebook da Moscamed

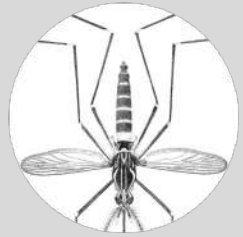

PAT
Projeto Aedes Transgênico
VENHA CONHECER
OS MACHOS TRANSGÊNICOS, CRIADOS PARA CONTROLAR O MOSQUITO CAUSADOR DA DENGUE.
DESENVOLVIMENTO DO MOSQUITO TRANSGÊNICO
Transgene
CICLO DE VIDA
Adulto
Aedes Transgênico
MORRE!!!
Realização:
Parceiria:

Source: Moscamed Archives

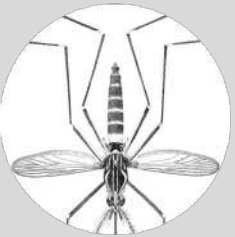


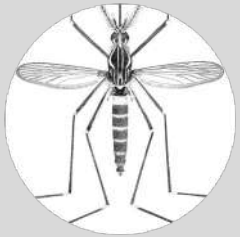
"We are only releasing males. They are the **heroes** that arrived to fight dengue. It is only the female that bites for blood. It is she who is the **villain** in this story."





It seemed that to make sense of the remaking of human-mosquito encounters into significantly new terms, proponents of this technology had to hold on to **more-than-human gendered stereotypes** of horny males and picky females, of heroic males and villainous females. And, to frame the male transgenic mosquito as an ally (a hero!), proponents of this strategy also had to foreground the act of biting and the biological need for blood—something only females seek—as the defining characteristic in the negative human-mosquito relationship.





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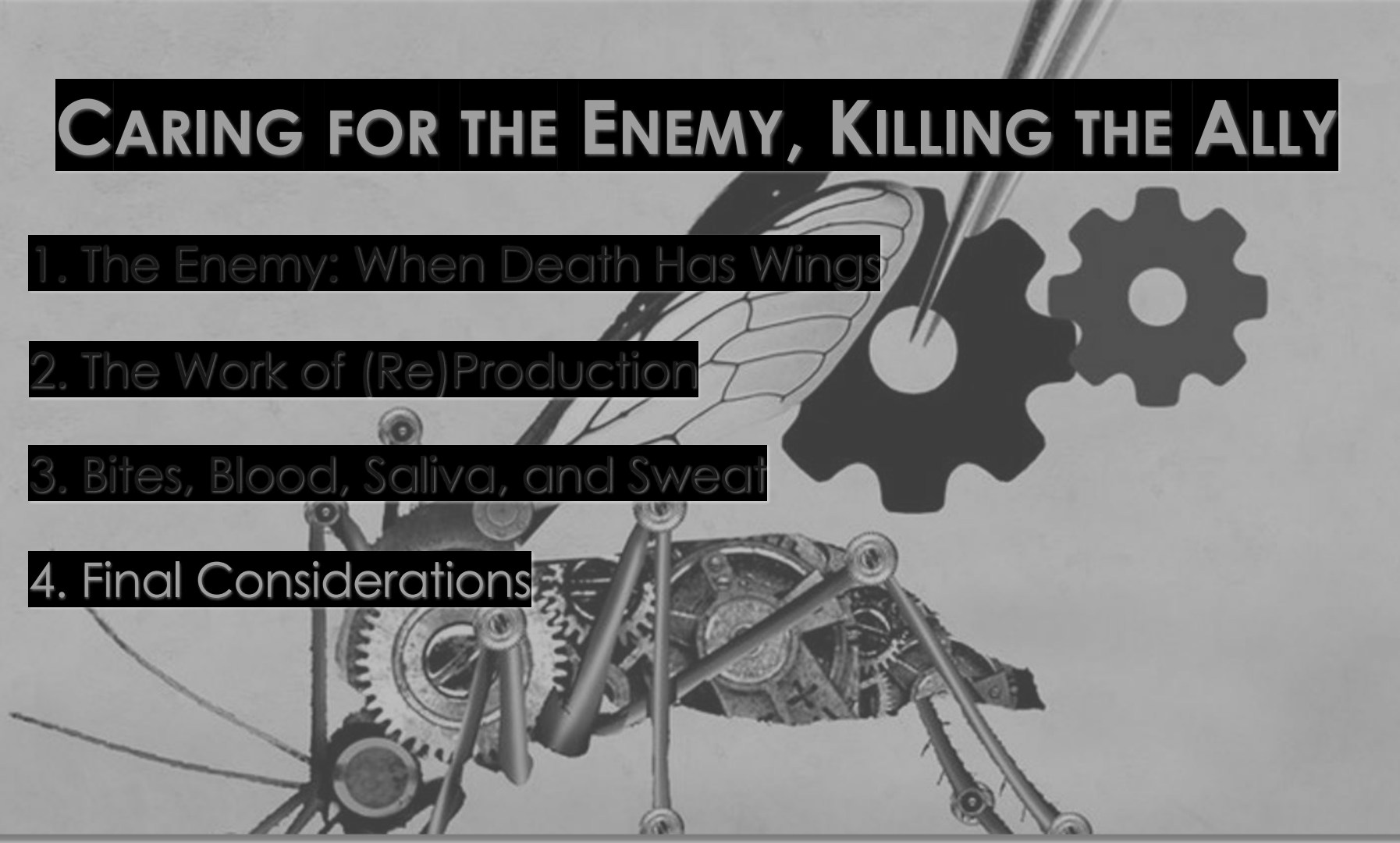


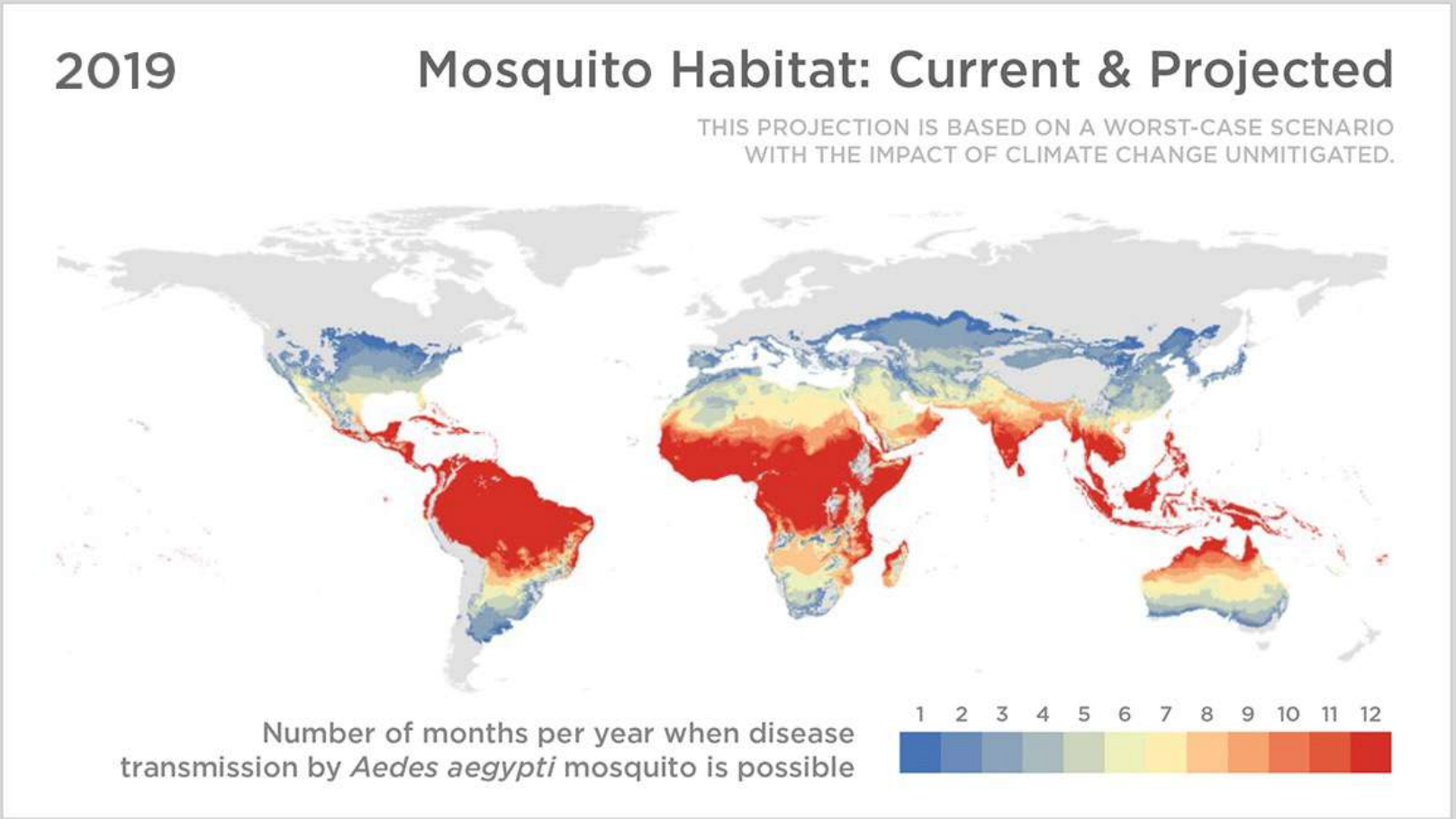
The New York Times Magazine

FEATURE

The Insect Apocalypse Is Here

What does it mean for the rest of life on Earth?

By Brooke Jarvis
Nov. 27, 2018



Source: Sadie J. Ryan, Colin J. Carlson, Erin A. Mordecai, and Leah R. Johnson
Credit: Koko Nakajima/NPR

reshape current

epidemiological geographies

The New York Times

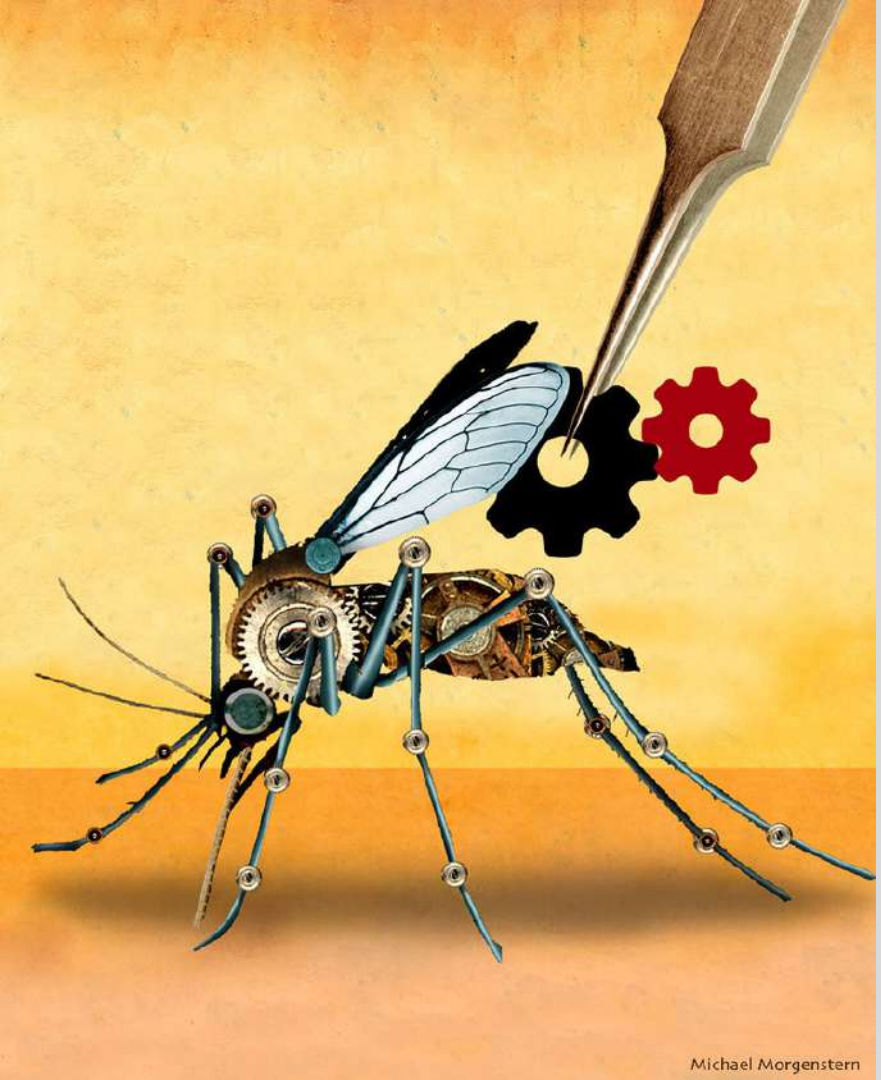
The Mosquitoes Are Coming for Us

They are our apex predator, the deadliest hunters of human beings on the planet.

By Timothy C. Winegard

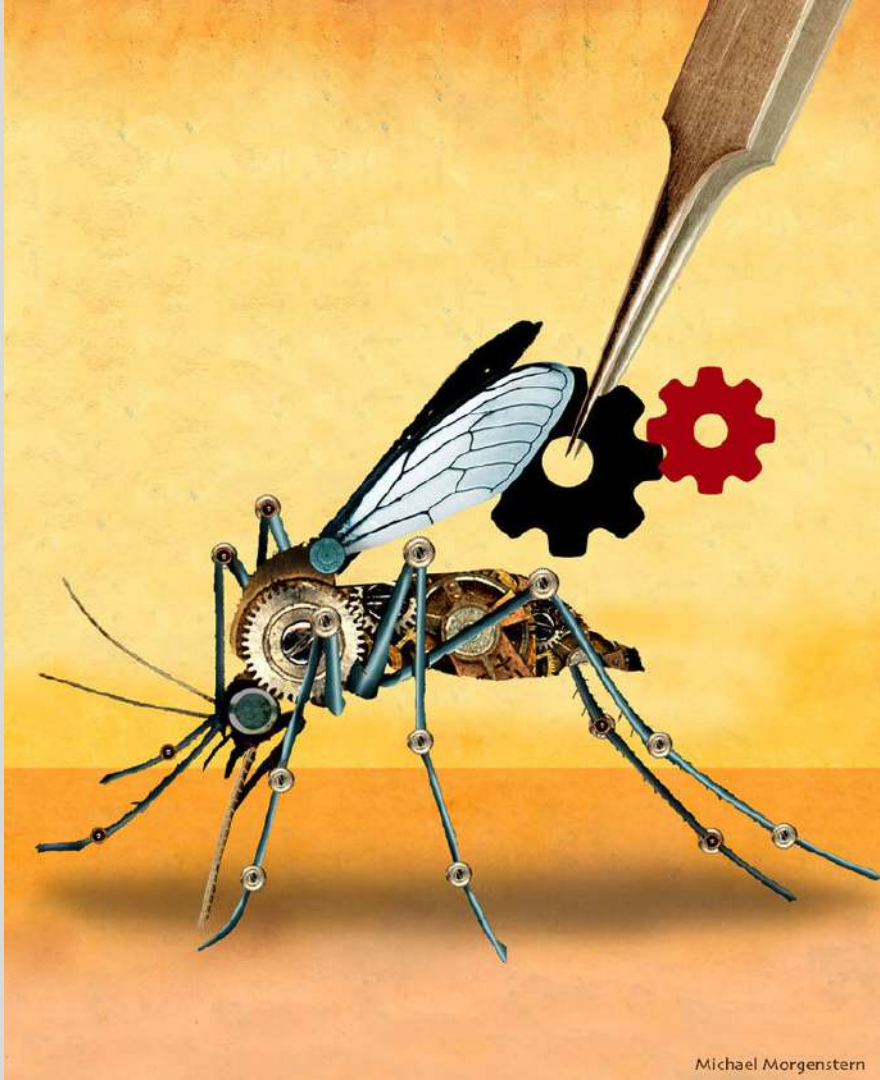
July 27, 2019

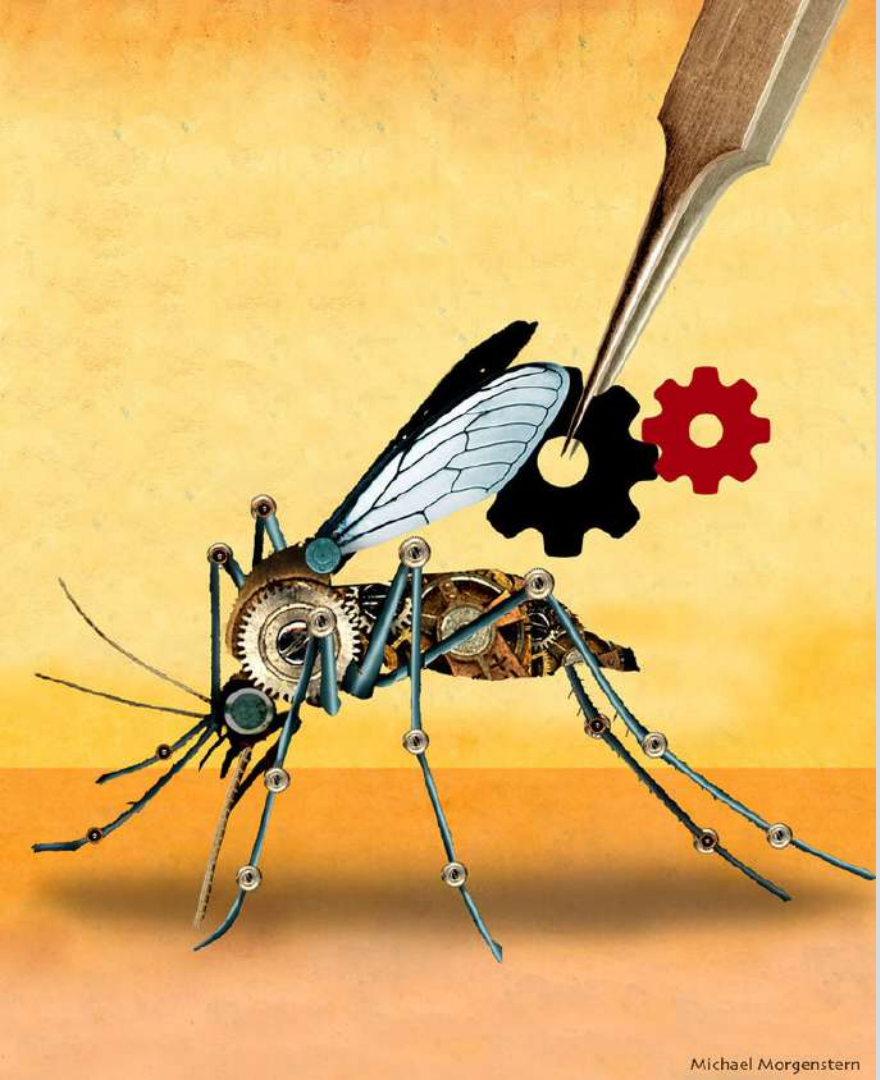
”When it comes to mosquitoes, the world will become Brazil”



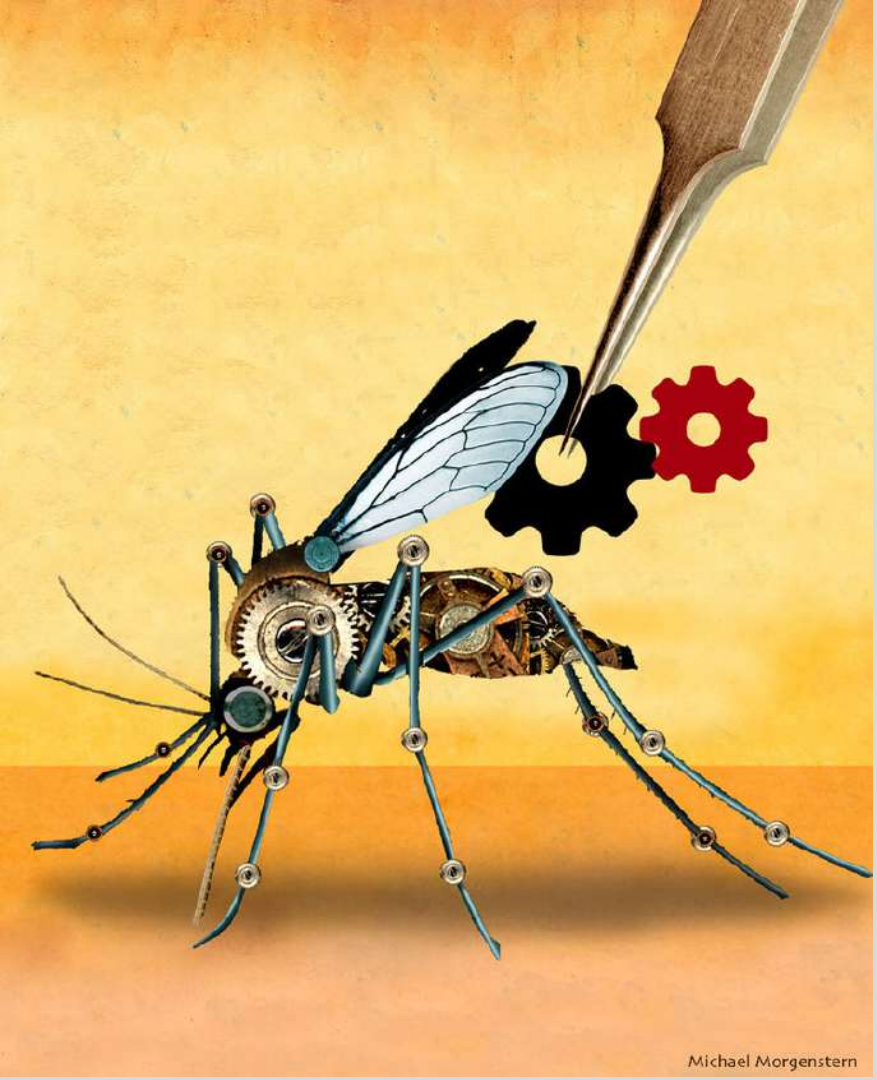
My project ***The World Will Become Brazil: Ecologies, Epidemics, and the Reinvention of Mosquito Science*** focuses on the *Aedes aegypti* to examine how climate change is not only creating new epidemiological geographies but also prompting epistemic shifts.

I examine how Brazilian researchers depicted mosquito ecologies as a locus point to produce a Brazilian science that would challenge the **geopolitics of knowledge production**. Yet, I also show how, even as they questioned hierarchies within knowledge-making, my interlocutors **reproduced long-standing racialized inequalities within Brazil**.




Michael Morgenstern


Recife
Rio de Janeiro
Foz do Iguaçu



Thank you!
Obrigada!

reiscast@usc.edu