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Bat People: Multispecies Ethnomusicology in Austin, TX and Chiapas, MX

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Prelude and Some Acknowledgements

Five years ago, when I first began thinking about this project, the idea of writing an ethnomusicology paper about bats seemed controversial. However, the papers at this year's SEM meeting evidence rising interest in topics variously termed post-humanist, multispecies ethnographic, biomusicological, ecomusicological, zoömusicological, "animanities"-focused, and a host of other neologisms. As an example, the panel that I participated in at the conference included what I would describe as neo-Feldian paper, looking at natural symbolism in non-Western cultures; a paper with a commodity chain approach, looking at the contributions of non-humans to the material production of goods associated with music (musical instruments, etc); and a social approach, looking at how interactions between humans and non-humans in musical settings contribute to the construction of particular social categories. The breadth of this research demonstrates a rising sense of urgency among scholars about the importance of including non-humans in our conceptualization of culture.

Despite the variety of approaches, however, I left the conference feeling that most papers had not argued for anything beyond the need to include non-humans in our concept of culture. Even after having spent a considerable amount of time thinking through my own work, I was left with the question of, why? What is the purpose of a multispecies/post-human/animanities approach to ethnomusicology?

In my dissertation, I have attempted to answer that question by delving into issues such as how we define nature, humanity, science, and culture. I have asked what our relationships with non-humans can tell us about the categories we create for ourselves, about the ways we divide ourselves from other humans, and the ways we conceptualize

ourselves as human. Perhaps more importantly, I have attempted to understand how the very *question* of "who counts as human?" is crucial to the formation of 21st century society.

These questions and concepts help us to understand Western hegemony on a more nuanced level. As I argue in the introduction, however, a re-examination of the West and its associated normative identity constructs does not imply simply turning traditional social categorizations onto ourselves, or merely shifting our frames of analysis, but changing the way in which we produce analytical frames for study. Instead of simply addressing categories like whiteness or US nationality using tools designed by the study of non-normative social groups, I suggest looking instead to the nuances of our lived experiences. This is a turn towards reflexivity, but to the extreme; rather than simply understanding our positionality within discourses about the other, we also need to turn the anthropological gaze on ourselves as subjects.

Analytical frames constructed in this way will illuminate potential problems with our academic approach, because as insiders, we can see how we are misrepresented by the methodologies we use to address others. As a result, they will suggest new inroads for further research – what aspects of our experiences are not represented by traditional frames of analysis, and how can we represent them? Finally, by deconstructing normative identities, we can better understand how they function in relation to many kinds of others in addition to breaking down the reified monolith of our normative selves against which all other identities are juxtaposed.

The extent to which I have achieved this in my dissertation is somewhat variable. I was able to conduct fieldwork for different amounts of time in different places, and certain portions of the project have been subjected to more extensive academic review than others. There are many subsidiary case studies that did not manage to make their

way into project, all of which deserve fuller consideration. There are also certain theoretical areas that could be better addressed not just in the literature review, but as currents throughout the paper.

However, what I hope I have provided is a possible example of what it would look like to conduct a study designed around the phenomenological aspects of normative identity. In my case, rather than write about my own ethnic background or gender identity, I have looked to my academic past, something that noticeably and deliberately impacted my perception of the world. By studying other scientists, tourists, residents of the city of Austin who are not from the city of Austin, I have attempted to move away from traditional social categories, offering instead a diffractive, complicated, multispecies depiction of what it is like to live in the entanglements of the 21st century world.

As fond as I am of the Congress Avenue Bridge bat colony, this dissertation isn't ultimately about them. It is about what happens when we examine academia under the same lens we have used to examine non-academics. It is about viewing a modern city like Austin as deeply embroiled in natural relationships and an indigenous community in southern Mexico as misrepresented by theories of the natural. It's about using the data in our surroundings to flip our preconceptions on their heads, coming out of the bat cave of our old theoretical paradigms.

I want to conclude by saying how grateful I am to have participated in a program that allowed me to write a piece like this that isn't exactly interdisciplinary, but certainly falls somewhere between the cracks of the various disciplines that I have studied throughout my academic career. I believe that academic writing should not be about replicating narratives fostered in the academy for the sake of achieving a higher position within institutional structures, but about honestly engaging with the world around us. I

feel very fortunate to be a part of a program that supports and shares that goal, and as such, some thanks are in order.

First and foremost, thanks to my advisor, Robin Moore, for supporting me in a project that diverges significantly from his own research interests. To my other committee members: Sonia Seeman, for her honest feedback throughout my degree program; Luis Cárcamo-Huechante, for offering both incisive critiques and rich resources to expand my thinking beyond the confines of the original project design; to Charles Carson, for stepping in last-minute; to Michael Smotherman and Michael Ryan, for interviews, lab visits, and insights into scientific thinking; and to Veit Erlmann, for his thoughtful criticism early in the process of developing my project. I would also like to thank Merlin Tuttle, Dianne Odegard and Lee McKenzie, Danielle O'Neil, and many volunteers at the Congress Avenue Bridge for welcoming me into their conservation project; the Bat City Surfers, Echo and the Bats, Bevis Griffin, French Smith, Steve Parker, Brent Baldwin, Antonio Gómez Gómez, Damián Martínez, the members of Vayijel, and Lumaltok for granting me their time and suffering through my persistent questions; Marie Westover for some thought-provoking conversations from the other side of the disciplinary divide; Aaron Allen, Jeff Titon, Heather Sparling, and the peer-reviewers at MUSICultures; and of course many, many others who I will thank in person.

Abstract

Bat People: Multispecies Ethnomusicology in Austin, TX and Chiapas, MX

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In an age characterized by narratives of environmental crisis, understanding the interrelations among humans and other species is crucial. Human-non-human relationships form the basis for how we define concepts such as "humanity" and "modernity," extending beyond simple survivalist dependencies into our aesthetic practices. Multispecies ethnography is a recent trend in anthropology and science and technology studies that has begun to address the issues of non-humans' involvement in what are typically considered human cultural practices, but so far this trend has not reached into related disciplines like ethnomusicology. My dissertation project brings multispecies ethnography into ethnomusicology, particularly exploring bat-human interactions in Austin, TX, and Chiapas, MX, and the ways in which they are articulated sonically and aesthetically. Using a mixture of traditional ethnography, "ethnography of science" (following Stefan Helmreich), and internet research, I explore ways in which humans and bats are entangled through technology, art, and science, creating each other through their interrelations. More specifically, I explore how bat migratory processes

contribute to the music-based tourist industry in Austin, TX; how scientists, artists, and visually-impaired humans use echolocation to understand bat subjectivities, revising pre-existing notions of sound and the senses in the process; how anthropologists have perpetuated colonialism by incorrectly assigning bats as important symbols to Tsotsil communities in Chiapas, MX; and how Texas-area biologists use terminology associated with singing to reconsider the relationships between bats and humans.

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Chapter One: Introduction (Turning Ethnomusicology Upside-Down)

"Listen to them – the children of the night. What music they make!"

- Bram Stoker, *Dracula* (1897)

INTRODUCTION

Amidst Anthropocene narratives of climate change, rapid species extinction, and widespread ecological crisis, understanding the relationships between human beings and other species is paramount. We depend on non-human Others for more than the maintenance of simple trophic hierarchies: we are deeply entangled with the multivariate beings that populate the earth in ways that reach even as far as our aesthetic practices. Unlike the environmentalism of the 1970s that sought to recreate ecological paradise by isolating "nature" from human involvement,[1] the present moment calls for a kind of environmentalism that evaluates and values interspecies interactions, searching for meaning in the ways that humans and non-humans productively coexist in a rapidly shrinking world.

One trend in academic thought that has begun to approach this issue is multispecies ethnography. Authors such as Donna Haraway, Anna Tsing, and Stefan Helmreich, to name a few, have sought to reinscribe non-human species into our understanding of human practices by understanding culture, aesthetic practices, and the body as interrelations of many types of beings rather than viewing nature as an inert object acted upon by human culture. Haraway, Tsing, and Helmreich's writings have been transformative in breaking down the neat divisions between

[1] In making this argument, I draw from William Cronon's discussion of "the Trouble with Wilderness." In particular, he problematizes practices of enclosure and the exclusion of indigenous peoples from land for the benefit of an elite anti-modernist fantasy. I also draw from Bruno Latour's *We Have Never Been Modern* in its breakdown of the notion that modernity is defined by humanism. William Cronon. "The Trouble with Wilderness: Or, Getting Back to the Wrong Nature." *Environmental History*, 1:1 (1996); Bruno Latour, *We have Never been Modern*, (Cambridge, MA: Harvard University Press, 1993), 13.

"nature" and "culture" that have historically dominated academic understanding of what material is considered suitable for cultural study. The nature-culture divide has also created artificial distinctions between academic disciplines ("science" and "humanities") which can now be reassessed.

Though multispecies ethnography has made its way into diverse fields such as anthropology and science and technology studies, it so far remains absent from related fields like ethnomusicology. My project brings multispecies ethnography into that discipline, drawing on my own interdisciplinary background in both biology and music. With this in mind, the project is designed with an eye towards fostering collaboration between scientists and ethnomusicologists, who have historically had a complex and at times problematic relationship to one another.

In particular, my dissertation focuses on the relationship between human beings and bats in Austin, TX and Chiapas, MX. In what ways are aesthetic practices a result of human-bat inter- and intra-actions? How does redefining our relationships with other species alter our conception of humanity? Using a combination of ethnographic and web-based methods, I address the ways in which thinking with bats deconstructs our preconceptions about sound, the senses, and the very nature of being human.

As Donna Haraway argued, "it matters what stories we tell to tell other stories with" (Haraway 2016: 12). Not only is the bat's propensity for hanging upside-down an ideal metaphor for the reversal of perspective implied by multispecies ethnography, bats are also deeply associated with sound in ways that defy standard narratives proposed by representational interpretations of cultural forms. Throughout this dissertation, I address the many ways that human-bat relationships up-end such varied topics as the ear, the limits of the human body, colonialism, modernity, and the narratives that define humans' separation from the natural world.

My study is transnational and diffractive, following the methodologies proposed by Donna Haraway and Karen Barad. Like the classic "two-slit" experiment in physics,[2] my study emerges from multiple points of origin, overlapping to unveil complex patterns, rather than proceeding in a linear fashion. Throughout the course of the dissertation, we will encounter Mexican Free-Tailed Bats, Tsotsil indigenous musicians, anthropologists, laboratory and field scientists, horror-surf rockers, librarians, vampires, 18th century Italians, techno-hybrid "bat-men," and a host of other figures who all mutually constitute one another through their diffractive intra-actions. The many figures that make up this assemblage illuminate the experience of multispecies entanglement that results from living in the 21st century world.

What may appear to be a fluctuating ambivalence between emphasis on ethnography and theory actually highlights one of the key theoretical underpinnings of this study: that all knowledge is inseparable from its processes of production. To understand science, we must understand scientific experimentation; to understand anthropology, we must look at how ethnography constructs its objects. A more transparent view of knowledge production creates room for contesting the hegemony of institutions and structures of power and therefore is crucial to formulating a potentially decolonized form of ethnography. While on one hand my dissertation offers a theory about the function of animal-human relationships in the creation of culture, it also offers a new methodology for ethnomusicology, one that I detail at the end of this introduction.

[2] A classic experiment in physics demonstrating that waves bend around obstacles, and that when waves overlap (known as "interference") they display patterns that trouble simplistic differentiations between waves and particles (Barad 2007: 74-81).

LITERATURE REVIEW

The Multispecies Turn

The central theoretical underpinning of my study is the practice of multispecies ethnography. This term is adopted from science and technology studies scholars Eben Kirksey and Stefan Helmreich, whose works have engaged with multispecies interactions not only on an academic level, but also through the production of visual art (Kirksey 2014; Kirksey and Helmreich 2010). Multispecies ethnographers focus not only on the interactions between multiple species, but also on how the life processes of particular organisms might serve to complicate normative definitions of social categories and relations. Kirksey and Helmreich seek to understand animals, plants, microbes, and fungi not as *zoe*, or "bare life", following the terminology of Giorgio Agamben, but as *bios*, or political life (Kirksey and Helmreich 2010: 545). An example is Helmreich's work *Alien Oceans* that addresses the division between "native" and "invasive" species, categories reflecting human cultural fears (Helmreich 2009). Other major works in the field include Donna Haraway's "Teddy Bear Patriarchy," (1984-5) which examines the raced and gendered implications of museum taxidermy; Anna Tsing on immigration narratives associated with "Africanized" bees (1995); Hugh Raffles on insects in love (2011); and John Hartigan on "interviewing" plants (2014). This approach has ethical implications in the face of environmental crisis, not only in terms of understanding what precisely is meant by the term "environmental crisis," but also in understanding how humans and other species might (and do) productively coexist amidst rapid environmental change.

A few ethnomusicologists have adopted a multispecies ethnographic approach in their work, though for the most part they do not take advantage of the full potential of the methodology. Rachel Mundy's *Animal Musicalities* (2018), for example, examines collecting practices in the bird song archives of Cornell University in order to demonstrate the continuity

between scientific practices of categorization – which she problematizes as foundational to the concept of difference – and human musical categorizations.. While Mundy's work taps into some important correlations between science and early ethnomusicology, her work poses a number of problems, including inattention to scientists' own ideas about song type's function in avoiding interspecies breeding and an overly simple understanding of the holotype specimen. More importantly, birds remain largely absent from her narrative, suggesting that had she used more conventional sources, her results would have been the same. What remains is for ethnomusicology consider what information can be gleaned from a multispecies approach that cannot be derived from other sources.

Steven Feld's *Sound and Sentiment* is another notable example of multispecies ethnomusicology, though one that is situated in the theoretical pitfalls of its time. While efforts such as Feld's ethno-ornithology are greatly needed to contest the dominance of scientific classificatory systems, his focus on indigenous relationships to the natural world belies prejudices about modernity and so-called "traditional" societies. As Kent Redford argued in "The Ecologically Noble Savage" (1991), the over-emphasis on natural narratives in describing indigenous cultures is indebted to not only salvation narratives, but to Judeo-Christian conceptions of the Garden of Eden. Addressing the relationship between indigeneity and the natural with a critical eye will be a current that runs throughout this dissertation.

Rather than follow in Feld's footsteps, I turn to Bruno Latour's *We Have Never Been Modern* (1991) which significantly troubles the relationships between nature and culture in the modern world. Latour argues that nature and culture are not disparate spheres as modernist narratives might imply and that so-called modern subjects are just as situated in the natural world as the groups they have Othered as "savage." I find his concept of "nature-culture" (Latour 1991:7) crucial in formulating case studies that exist somewhere between biology and aesthetics. Additionally, Latour's work is useful in deconstructing the notion of modernity from two

directions: by situating allegedly "modern" subjects within natural frameworks, and by breaking down narratives that situate indigenous communities as "pre-modern" through their relationship to the natural world.

Bringing multispecies ethnography into ethnomusicology implies more than simply including non-humans in our conceptualization of culture. It involves a radical rethinking of not only humanity's centralized position in nature-culture narratives but also of the very nature of humanity itself. Rather than burden ourselves with narratives that position humans as the sole creators and destroyers of the environment, we must come to understand the ways in which we are repeatedly remade by it. As Latour argued, "there is no cure for the condition of belonging to the world. But, by taking care, we can cure ourselves of believing that we do not belong to it, that the essential question lies elsewhere, that what happens to the world does not concern us" (Latour 2017: 13). I find the work of feminist scholar Donna Haraway, discussed in the next section, crucial to achieving a more situated understanding of humanity's place in the multispecies world.

Donna Haraway, "Becoming With," and Her Antecedents

Feminist and Science and Technology scholar Donna Haraway's *Staying With the Trouble* (2016) examines the implications of modernity and the natural world, focusing on the patriarchal implications of Anthropocene narratives. The term "Anthropocene", coined by Nobel Prize-winning chemist Paul Crutzen in 2000, refers to the present geological age, in which the impact of human beings on the earth outweighs any naturally occurring geological forces (Crutzen 2005:14). The concept has been foundational to apocalypse aversion-based environmentalism. Haraway's work rejects the Anthropocene paradigm in favor of "staying with the trouble," arguing for a re-evaluation of humans' place within a multispecies world rather than attempts to revert to a pre-Anthropocene ecological imaginary. She understands human beings

not as unitary figures who can create or solve environmental crises, but as deeply entangled with other species who mutually create and deconstruct the world. She directly addresses narratives that connect the natural world with the feminine, focusing on the extension of biopolitical controls of reproductive power through metaphors about the earth as a Gaia-inflected mother figure. To resolve these issues, she argues, we need to move beyond patriarchal narratives that construct Man at the center of all things, but instead understand more complex interrelations between many kinds of beings.

Haraway foreshadowed *Staying With the Trouble* (2016) with the "Cyborg manifesto" (1985) which sought to design a mode of considering femininity "uncoupled from organic reproduction" (292). Haraway used the fiction of a human-machine hybrid to move away from structures that value women exclusively for their ability to produce children, rejecting metaphors that associate women with nature in the process. Reconsidering natural narratives as my study does therefore implies an inherent feminism that takes "*pleasure* in confusion of boundaries and *responsibility* in their construction" (Haraway 1985: 292).

Haraway's work is indebted to Simone de Beauvoir, whose reconsideration of the Hegelian Other in *The Second Sex* (1949) demonstrated that gender roles were not naturally tied to gendered bodies. In her chapter on "Biological Data," De Beauvoir uses examples from biological science to demonstrate the lack of ontological or empirical basis for differentiation between the sexes and their subsequent hierarchy (De Beauvoir 1949: 46). Instead, she focuses on the ways in which males and females are entwined both in biology and in culture, interrogating the processes by which women have become defined exclusively in opposition to men. This theory of Otherization, in which "the subject posit itself only in opposition; it asserts itself as the essential and sets up the other as inessential, as the object" (De Beauvoir 1949: 27), is crucial to my project. Similarly, De Beauvoir's focus on "lived experience" as a means of understanding women's subjugation to men in social hierarchy is a key component of my

methodology, which similarly seeks to deconstruct species boundaries, social constructs, and disciplinary divisions through the use of ethnography (De Beauvoir 1949: 326).

Despite her claims about scientific contributions to gender discrimination, De Beauvoir cleverly uses examples from the sciences to contest social hierarchies. Haraway's *When Species Meet* (2008), which addresses relationships between humans and their pets, similarly uses science to break down epistemological constructs that have contributed to hierarchy between species, individuals, and social groups. Focusing on the transfer of cellular information through touch ("symbiogenesis"), Haraway demonstrates that human bodies are not independent units, but are rather comprised of composite relationships with many microbial beings, constantly remade through contact with others. This theory, termed "becoming with," is a crucial thread that connects my disparate case studies. Following Haraway, I argue that we are constantly in processes of becoming with the many kinds of beings we encounter through both touch and representation. Asking *what* we become as a result of these interspecies entanglements is beside the point, however: Haraway conceptualizes bodies as embroiled in constant processes of evolution, arguing against the idea of a fixed identity.

Haraway's "becoming with" is derived from Deleuze and Guattari's notion of "becoming-animal" in *A Thousand Plateaus* (1987). Dissatisfied with totemism and myth as tools to describe human-animal relationships, Deleuze and Guattari revivify the process of imitation to describe the production of selves through relationships. Rather than existing as discrete entities prior to our relationships with other beings and things, we are made by and constantly remake others through our relationality. Becoming-animal is not about achieving literal transformation through imitation, it is about entering into mutually constitutive terms of relation with another being. This generative relationality is an "assemblage," another key concept in my work. Karen Barad has theorized something similar with her term "intra-action," another phrase I use occasionally throughout the dissertation (Barad 2007:178).

Theories surrounding the related concepts of mimesis, mimicry, and imitation have a long history predating their use in postmodern endeavors like Deleuze and Guattari's or cyborgian ones like Haraway's. Plato's idea that reality is a poor copy of an imagined ideal – a concept we will revisit in the last chapter when discussing museum studies and the notion of the holotype – and Aristotle's more creative mimesis in which the world exists through nomination have both been a topic of some debate among postmodern theorists. In chapters two and three, I briefly discuss Michael Taussig's (1993) thoughts on mimesis' function in creating subject-object relationships, focusing particularly on its generative nature (24). However, while these theories have certainly influenced my thinking, mimesis as a concept does not fully represent the kinds of interspecies relationships discussed throughout my dissertation. I have thus coined my own term, "bios-mimesis" to describe the relational, yet asymmetrical, processes of becoming that result from human attempts to imitate non-humans. This theory is drawn heavily from Haraway's "becoming with," in that it posits a mutual evolution when beings come into terms of relation with one another through touch or representation (which I argue is a kind of touch, see chapter two). *Bios-mimesis* is also generative in the manner of Taussig's mimesis, but it does not rely exclusively on the participation of humans, as Taussig contends. Most significantly, it suggests that while all of the participants in an assemblage evolve as a result of their terms of relation, some components of the assemblage benefit more than others – despite the fact that they may see their relationship as an equal one.

Attention to asymmetry in theories of mimesis (without a complete return to Platonic "copying") accounts for the mistreatment of scientific test subjects in chapter three as well as the colonial histories implied in chapter four. Roque (2015), for example, has argued that 16th and 17th century Northern Europeans sought to distinguish themselves as "better" than Southern Europeans by disparaging the adoption of indigenous customs as immoral and improper to colonization (207). Similarly, as Audra Simpson (2014) has argued, ethnological research (and

by extension, anthropology and ethnomusicology) has its roots in mimesis, in which "playing Indian" led to the development of damaging fictions that denied agency to the people that it purported to imagine (77). As a result, reimagining imitation through theories of "becoming with" or *bios-mimesis* are not just relevant to non-human animals, but also to those humans who have been denied personhood through scientific and anthropological study.

A part of this work to decolonize human-non-human relationships entails greater attention to the contributions of indigenous scholars. As I mention briefly in chapter one, though Haraway situates her theory of "becoming with" in microbiology, it also reflects Tsotsil indigenous cosmologies regarding animal-human relationships. While I don't suggest that Haraway directly drew from a knowledge of these indigenous ideas when formulating her theories, key concepts from the environmental movement such as "Gaia" or "mother Earth" are directly derived from indigenous worldviews. Therefore while I frame the mutually generative processes of human-non-human becoming throughout my dissertation primarily in terms of Haraway's theory, I want to acknowledge her debt to many indigenous thinkers from whom her ideas are unconsciously borrowed.

Additionally, the work of white feminists like Haraway has recently been called into question for its failure to consider the particular experiences of indigenous, black, and Latina women. In *The Second Sex,* for example, De Beauvoir draws parallels between women's experiences and those of other subaltern groups, suggesting that through their Otherness, their experiences are somehow the same. However, Crenshaw (1989) demonstrated with her intersectionality theory that single-axis perspectives on race and gender contribute to the erasure of groups like black women, who are marginalized by more than one social category (140). Like Crenshaw, my study is concerned with how multiple social constructs work in tandem with one another, highlighting the ways in which focus on a single identity frame (like race or gender) misrepresents lived experience. For this reason, while I could have separated Haraway's

publications under different disciplinary headings like "feminist theory" and "science and technology studies", I have chosen instead to use her as an example of how various identity frames – feminist, scientist, environmentalist – work together in a single individual and their work. Haraway's theories are more than just instructive for my project; her work demonstrates the kind of interdisciplinary, boundary-crossing thought that my project seeks to employ.

Ethnography of Science/Science and Technology Studies (STS)

Aside from Haraway, my project entails the work of many other authors engaged in ethnographic exploration of scientific practices, a trend known as "science and technology studies" that first rose to prominence in the 1990s. For writers such as Bruno Latour, Stefan Helmreich, and others– many of whom, notably, are also proponents of multispecies ethnography – this entails understanding the behaviors, expressive practices, and ideological underpinnings of 21st century laboratory and field sciences as culturally situated. Science, like the humanities, is a process of constructing knowledge, and its proponents have mutually shared beliefs about ethics, truth, and their place in the world. The goal of an ethnography of science is to utilize the tools developed in other areas of field-based cultural study and apply them to science, which is often considered from the outside to be objective and unbiased – "without" culture, so to speak.

The rise of science and technology studies is undoubtedly indebted to philosophers like Michel Foucault, whose work *The Order of Things* (1989 [1966]) addressed the epistemological underpinnings of modern science. However, unlike Foucault, science and technology scholars (and the present study) move beyond examining the unconscious structures that allegedly reside beneath knowledge production in any given period to examining the practice of science as a lived experience. Re-inscribing scientists into scientific discourse illuminates the relationship between information and the structures that produce it, something that is crucial to contesting its

hegemony. Additionally, because the scientific method focuses heavily on the relationship between methodology and results, a focus on scientific practice rather than merely results is an attempt on my part to use the emic concepts of scientific practice as the substance of my own methodology to examine them. Understanding science as culturally situated does not mean devaluing it. In a 2001 special issue of *Cultural Anthropology*, editor Daniel Segal discussed trends in early forays into anthropology "on/in/of Science":

> For some, the goal has been to locate cultural anthropology *in* science, to prove that anthropology "really is" scientific. Others have pursued an anthropology *of* science, to prove that science "really is" cultural. In both cases, there has been an element – at best distracting, at worst consuming – of strategic play *for* science's cultural capital. One approach aims, in effect, to "raise" anthropology to the level of science; the other, to bring science "down" from its pedestal (Segal 2001:451).

My goal is not to adopt either end of this dialectic. To do so inevitably undermines the knowledge produced by one methodology or the other, suggesting that one way of thinking is less "true" than the other. Understanding science as culturally situated does not mean invalidating scientific findings – a point that I find extremely important in light of the deployment of "alternative facts" to undermine dangerous environmental and political realities – it simply means strengthening knowledge by understanding where it comes from. In my experience, this is a practice widely held by practitioners in the scientific community; one's findings are not valid simply because they have been subjected to the scientific method, but because the very foundations to which the methodology has been applied (and is it the correct methodology for the question being asked?) have been subjected to rigorous criticism. Thus, to an extent, scientists already understand themselves as cultural, in that they are constantly searching for the impact of their own biases and human error in their experimental practices.

To resolve this issue, I turn to feminist theoretical physicist Karen Barad's theory of "agential realism" to understand academic practices as both constructed and real. Barad's theory is indebted to Judith Butler's notion of performativity, which states that gendered bodies are created through repeated actions, validated by cultural norms. Butler uses this theory to break down the notion of reality and representation, signifier and signified. Barad extends Butler's theories by re-inserting the material effects of discursive practice, stating that theorizing, experimenting, and all other forms of discourse are material agents that bring about and create the objects about which they extemporize (Barad 2007: 55). As Barad argues, "experimenting and theorizing are dynamic practices that play a constitutive role in the production of objects and subjects and matter and meaning", and she further asserts that truth does not rely on the "correct correspondence" of words and things (Barad 2007: 56). In other words, just like gendered bodies, scientific practices construct their objects of study, but they are no less real because of it.

The trend that Segal notes – of competition for science's cultural capital by either "debunking" it as cultural opinion or valorizing culture at the level of scientific fact – is a dangerous one, in that it over-simplifies the complex and interpenetrating relationship between cultural and scientific thought. This is apparent in the very foundations of ethnomusicology, a field that was initially grounded in the sciences. As has been often discussed, ethnomusicology as a discipline exists in large part because researchers sought ways of making musical study more scientific. Works such as Guido Adler's *The Scope, Method, and Aim of Musicology*,[3] Ellis's "On the Scales of Various Nations," Gilman's "The Science of Exotic Music," and many works of comparative musicology (ethnomusicology's predecessor) were concerned not only with legitimizing the study of so-called non-Western musics as an academic field but also with establishing an evolutionary hierarchy in which Western Classical music was seen as the

[3] See Mundy (2014) and Mundy (2018) for a more in-depth discussion of Adler's relationships to science.

pinnacle. In the 1960s, this approach was famously revisited in Alan Lomax's work "Song Structure and Social Structure."[4] It suggested a scientific classificatory system to catalogue world musics with the goal of understanding their direct relationship to the societies from which they emerged. Such forays into a more scientific form of anthropology/ethnomusicology/folklore have since been roundly critiqued for their failure to consider the perspectives and agency of the people whose music they studied, and because they mistakenly applied evolutionary theories to cultural practices in a manner akin to the kinds of biological determinism associated with scientific racism.

Though ethnomusicology has moved away from a reliance on classificatory systems and evolutionistic thought, the influence of the physical science is still evident, and attempts to revive comparative musicology continue – as may be seen in zoömusicology and biomusicology, discussed below. It is therefore imperative that we understand the ways in which science has contributed to our own processes of knowing, rather than merely dismissing its theoretical paradigms as outmoded and no longer relevant to our discipline. Science is not just cultural; it also informs cultural studies. Thus undertaking an ethnomusicological study of scientific practices and thoughts seems long overdue.

Notwithstanding the pressing need to engage with science as a process of knowledge construction, I argue that such engagements must be appropriately situated in social and historical context. While an increasing number of musicologists and ethnomusicologists have attempted to engage with scientific findings in their works (Becker 2004; McLucas 2013), these attempts remain largely dissociated from an understanding of scientific practices. As such, the researchers' ability to appropriately assess the significance or veracity of scientific studies is severely limited. I do not advocate for *all* ethnomusicologists to begin engaging with the

[4] More recently, the "Natural History of Song" project at Harvard University has revived Lomax's theories in attempt to examine the evolution of musical ability (see https://www.themusiclab.org/nhs).

sciences; but, as with any other area of study, ethnomusicologists must be willing to invest the time and energy to understand science on its own terms, including language, practice, and underlying belief systems.

Zoömusicology

In addition to an increasing number of engagements between ethnomusicology and the sciences, recent trends in post-humanism have led ethnomusicologists to directly address non-human species. The resulting works are not strictly multispecies ethnographic, however, because they leave intact the narratives and methodologies associated with traditional ethnomusicology. Rather than developing new tools appropriate to the non-human subjects they study, proponents of fields like zoömusicology simply turn existing methodological approaches onto the sounds produced by non-human animals.

Perhaps most significant among these thinkers is Dario Martinelli, proponent of the "zoömusicology" subfield and method, initially proposed by French composer François-Bernard Mache. Zoömusicology is essentially an extension of the field of zoosemiotics, proposed in the 1960s by Thomas Sebeok to refer to the rise in animal communication studies. He saw it as an emergent field encompassing the intersection of the study of signs with "ethology", or the study of animal behavior (Sebeok 1968: 142). However, while Sebeok sought to coalesce existing research into a single field, Martinelli promotes a new method of study entirely.

Zoömusicology is the study of non-human animal communication using frameworks developed from human musical practices and attempting to ascertain trans-species universals through the process of comparison (Martinelli 2009:6). The primary theoretical element I take away from zoömusicology is the assertion that function and aesthetics are not mutually exclusive. For Martinelli, this argument justifies the use of aesthetic criteria to analyze biological sounds. In my study, I consider instead the possibility of a more complicated relationship in

which aesthetics and function are deeply entwined, a perspective that has been common in more straightforward social analyses of music for some time.

In practice, zoömusicology looks at vocalizations made by animals and attempts to establish a universal theory for what constitutes music. While I am also interested in the vocalizations made by animals, my goal is not to reify humans'place in a natural hierarchy as evolutionistic and zoömusicological narratives ultimately do. Rather than making definitive statements about whether animal vocalizations "are" or "aren't" music, I couch my argument in the different ways that humans have imposed musicality on non-human animals. I contrast this with ways in which human inability to control non-human animals has led to restructuring of human cultural practices.. Humans are therefore central to musical culture and decentralized at the same time.

The key problem facing both zoömusicology and zoosemiotics is that there is no way of verifying whether or not the researcher's assumptions about meaning are correct because (at least in this technological moment) we cannot actually ask animals what they are trying to say, if in fact they are trying to "say" anything. Martinelli does not see this as a problem, stating: "Ethnomusicologists could not avoid dealing with musical civilizations with whom it was hardly possible to communicate, and thus had to formulate methods that could make research possible without linguistic interaction. Evidently, and even more so, zoomusicologists face the same problem (Martinelli 2009:9)." As a solution, Martinelli simply advocates the use of older, more structurally based methods from ethnomusicology – methods adopted before subjective experience was taken into consideration and when researchers did not take it upon themselves to learn the language of the people who they studied. Researchers using these techniques assumed that by analyzing musical sounds and practices from an outside perspective and applying "objective" (Western) musical terms to them, they could understand what music meant better than the people that partook in it. Subsequent research that takes into account the emic

perspectives of traditions from many of these cultures has repeatedly disproven the conclusions drawn by early ethnomusicologists.

Biologist Michael J. Ryan's *A Taste for the Beautiful* (2018) has made steps towards taking the emic perspectives of non-human animals into account by defining aesthetics in terms of the *recipient* of animal vocalizations, rather than using reified Western definitions. Examining Darwin's theory of sexual selection – which questions why traits detrimental to survival are not genetically selected out of animal populations – Ryan argues that female aesthetic preferences drive evolution. By examining female animal brains in greater depth, Ryan suggests that we can gain insight into what those aesthetic preferences are from the perspective of the female.

Social scientists might take some issue with Ryan's claim that an individual's perspective can be ascertained from neurological anatomy or that preferences can be observed through scientific experimentation. Similarly, feminist scholars like De Beauvoir might contest Ryan's one-to-one relationship between reproductive and social behavior. However, Ryan's work is without a doubt a step in the right direction: rather than imposing human aesthetic criteria onto animals as zoömusicology purports to do, we must make an effort to try to understand them on their own terms.

My approach differs from Ryan's because I suggest that we will never ultimately achieve an understanding of another species' perspective – see my discussion of Eduardo Viveiros de Castro, below, and Thomas Nagel in chapter three.

Nonetheless, all is not lost in the attempt to engage with non-human animal sounds: I argue that even the exercise of *attempting* to understand another species (or individual's) experience can be productive – we simply need to acknowledge our own involvement in the process. Unlike Martinelli, I do not assume that zoömusicological attempts to engage with non-human animals will be able to "uncover" pre-existing animal subjectivities; rather, following Barad's agential realism, I suggest that by hypothesizing about what another animal *might*

experience, we can ultimately produce new kinds of subjectivities, predicated on our relationships to other species, our "becomings with."

Engaging with non-human sounds nonetheless contains some ethical ambiguities, another issue I address in chapter three. Martinelli touches on this when he states that "non-human animals are perceived as *the others* par excellence, i.e., they are to *Humans* what, in the past – and sometimes in the present – *Women* were to *Men*, *Blacks* were to *Whites*, *Indians* were to *Settlers*, and so on" (Martinelli 2009:51). However, rather than unpack the relationships of subalternity formulated by relationships to non-human species, Martinelli simply advocates a continuation of colonially derived anthropological methodologies. In this dissertation, I instead follow the work of Ana María Ochoa in *Aurality* (2014) in seeking to deconstruct the narratives that have posited human others as "like animals," looking to species division as a way of understanding the construction of subalternity. As I discussed in the section on Donna Haraway, I also work to deconstruct Otherness or subalternity as a single construct that can apply to any group of humans or non-humans in the same way; instead, I look at the way that intra-actions among various groups construct shifting identities and representations, embroiled in more complex kinds of power relations.

Biomusicology

Zoömusicology is in some ways indebted to the broader field of Biomusicology, a term coined by Nils L. Wallin in 1991. Wallin conceptualizes biomusicology as a new field with a focus on understanding human evolutionary origins through an examination of the evolutionary emergence of music. It comprises three subfields: evolutionary musicology, concerned with selection pressures underlying the evolution of music, as well as animal song as a potential predecessor of human music; neuromusicology, or the neural and cognitive processes involved in music processing; and comparative musicology, which searches for musical universals across

cultural and behavioral systems (Wallin et al 1999: 5). For the purposes of this study, I employ some elements of biomusicology's subfields evolutionary musicology and neuromusicology. Rather than assuming that animal sound is a predecessor to human communicative processes as many of my biomusicologists do, however, I ask what emerges if we consider animals as our contemporaries rather than our underdeveloped predecessors. Naturalist Henry Beston said it best in his 1928 memoir *The Outermost House*:

> We need another and a wiser and perhaps a more mystical concept of animals […] We patronize them for their incompleteness, for their tragic fate of having taken form so far below ourselves. And therein we err, and greatly err. For the animal shall not be measured by man. In a world older and more complete than ours they moved finished and complete, gifted with extensions of the senses we have lost or never attained, living by voices we shall never hear. They are not brethren, they are not underlings; they are other nations, caught with ourselves in the net of life and time, fellow prisoners of the splendor and travail of the earth (Beston 2013: 25).

Though Beston's language is, of course, greatly romanticized, the notion of viewing animal communities as distinct, rather than as "pre-people", opens up many more possibilities for the consideration of culture in multispecies terms. Additionally, it illuminates the complex interspecies dynamics implied by human creation of animal musical subjectivity, pointing out areas of contradiction, self-definition, and unequal control.

Furthermore, the validity of evolutionary claims about language evolution (and by extension, musical evolution) viewed through the lens of animal communication has come into question in the scientific community in recent years. Hauser et al (2014) suggest that

> studies of nonhuman animals provide virtually no relevant parallels to human linguistic communication, and none to the underlying biological capacity…our understanding of the genetics of language is is so impoverished that there is little hope of connecting genes to linguistic processes any time soon; [and] all modeling attempts have made unfounded assumptions, and have provided no

> empirical tests, thus leaving any insights into language's origins unverifiable (Hauser et al 2014:1)

Thus biomusicology and zoömusicology's engagements with science are poorly attuned to the conversations happening in that field presently.

In addition to being disconnected from the rapid advances of the sciences, biomusicological and zoömusicological work is methodologically problematic. In particular, it focuses on structural analyses of sounds produced by non-human animals and by humans, evidencing theories of "music as sound object" more akin to historical musicology than to ethnomusicology. This structuralist approach, in my opinion, is at the root of many thorny issues that arise in discussions of whether or not animal sounds can be considered music – the largest of these being the issue of intentionality, which is extremely difficult to determine in the case of non-human animals (Wallin et al 1999: 27). Though studies such as Seyfarth (1980) have attempted to assign intentionality to animal communication and behavior, they ultimately only demonstrate communicative *outcome*, not intention. As Karen Barad argued in her analysis of Michael Frayn's play *Copenhagen,* "we can't have full knowledge of people's [or animals'] motives and know something about their actions that enact those motives" (Barad 2007: 8). In other words, there is a trade-off between knowing someone (or some animal's) intentions and their actions; we can never know what someone *meant* to do, only what they did.

Addressing the function of music in biomusicology is similarly problematic, as it requires a great deal of guesswork on the part of the observer to determine what animal sounds are "supposed" to do. In many animal communication studies, researchers rely heavily on observation to determine the function of animal vocalizations. However, ethnomusicology has shown over many decades of study that observation-based research is frequently proved wrong when researchers try to verify their observations with their interlocutors. This presents a

problem when the interlocutors are non-human animals, who cannot (at least until the invention of Doctor Doolittle-style communications technology) tell us what their intentions actually were. For this reason, though my study may be considered to be "zoömusicological" or "biomusicological" in some sense, my theoretical focus is more grounded in multispecies ethnography and ethnography of science as articulated by scholars in non-musical fields. Rather than offer a biologically deterministic argument about the function of animal sounds, I focus on exposing the ideologies behind scientific attempts to engage with animal communication.

Sound Studies

In addition to its grounding in science, science and technology studies, and multispecies ethnography, my dissertation draws from somewhat less controversial fields like sound studies. In chapter three, I offer what is essentially a post-humanist version of a sound studies paper. As such, some background on that discipline is in order.

In particular, I engage with narratives about modernity's relationship sight and sound, as conceptualized by Jonathan Sterne. Sterne has articulated what he terms the "audiovisual litany," or, a list of features attributed to sight and sound that have historically contributed to narratives surrounding the rise of modernist rationality in the 20th century. The list includes the directionality and objectivity of sight, as opposed to the diffuse and subjective nature of sound, among a variety of other features (Sterne 2003:15). Sterne ultimately breaks down this litany with the goal of showing that the advent of modernity and rationalism during the rise of the 20th century was not exclusively linked with a rise in visual practices, but that hearing was also crucial in the ideological development that occurred at that time. The work done by biologists on echolocation in chapter three ultimately supports Sterne's argument about sound's ability to function in ways that surpass these claims of visual superiority.

Sterne seeks to deconstruct "naturalist" arguments by configuring sound as an interpretive process undertaken by human bodies. Citing German physiologist Johannes Müller, he describes how what we typically call "sound" exists only as vibrations when exterior to the human ear; it is the translation of vibrations by the ear into meaningful information that creates sound (Sterne 2003:11). Because this translation process is dependent on the technology of the human body, it is necessarily affected by the same social and historical constraints that impact individual human beings. As a result, sound and hearing are both socially constructed, historically contextual processes. For Sterne, sound can never be dissociated from the social, historical bodies that interpret it and does not exist in objective, naturalized form exterior to them. Much like Karen Barad's performative "agential realism," Sterne's theory of hearing is both socially constructed and material.

However, Sterne's revolutionary conceptualization of hearing falls short of addressing non-human species due to the misconception that anything beyond the human falls into the category of biological determinism that Sterne labels "the natural." Authors such as Donna Haraway, Anna Tsing, and others – not to mention a long list of animal studies – have begun to show us that the behaviors and bodies of non-human species are also socially and historically articulated, both in relationships among conspecifics (or individuals of the same species) and in interspecies interactions. In other words, to speak of species beyond the human is not necessarily to speak of fixed biological constants; rather, it is to understand the expansion of sociality into many kinds of beings. This is not anthropomorphism; it is an acknowledgement of the many kinds of interrelationships that occur between species on a daily basis. Furthermore, if Sterne's understanding of human hearing as socially constructed and historically situated has made great strides in unpacking preconceptions about the ways in which the senses function, addressing the social and historical nature of many different *kinds* of hearing bodies can do much

more. Furthermore, working to expand sound studies beyond the human seeks to deconstruct fantasies in which "normal" human bodies are male, able-bodied, and white.

In chapter three, I examine the ways in which inter- and intra-actions between human beings and bats in the laboratory have resulted in a kind of Sternian reconsideration of the properties of sound and the limits of the senses. First, drawing from scientific literature, I briefly discuss echolocation as an interpretive process occurring in the Chiropteran brain. As with Sterne's examples of human hearing, echolocation relies on the technology of the body, meaning that it is subject to cultural and historical forces. Second, I examine the ways in which social relationships between bats shape the practice of echolocation, particularly focusing on how vocalizations are learned. Finally, following Karen Barad, I demonstrate that echolocation is a category generated by scientific inquiry, resulting from interactions between humans and bats in the laboratory. Scientist-bat assemblages in the lab have not only redefined Chiropteran hearing as a social process but have also redefined sound as inherently spatial and tactile, thereby deconstructing the audiovisual litany as defined by Sterne.

Some Background on Echolocation

Chapter three also engages with the practice of echolocation, which readers in more culturally-oriented fields may only be superficially familiar with. As I describe in chapter three, echolocation is a process by which many different species (bats, cetaceans, shrews, humans) use vocalizations to construct a mental map of the world around them. This process is a result of many different kinds of scientific study and has been mobilized in the service of human beings in multiple ways.

Because bats brains have many similarities to human brains, they are often used in neurological studies to examine sensory phenomena. However, there are differences. Certain cell

groups in bat brains believed to be associated with hearing and echolocation are particularly large, meaning that a significant portion of the bat brain's real estate is devoted specifically to interpreting the sounds produced and reflected by the process of echolocation (Dook *https://particle.scitech.org.au/earth/bats-help-explain-human-brain/*; Pollack and Casseday 1989: 41). Thus, as I discuss in chapter three, while studying bat echolocation may tell us *some* things about human sensory perception, direct parallels are unrealistic and ultimately tell us more about the hybrid conceptualization of bat-humans than about either one.

Bat echolocation fits well into Sterne's narratives about the social construction because bats actively control their ability to hear during echolocation. This includes behaviors such as moving the head and ears (structures that, along with appendages known as "nose leaves," are believed to contribute to focusing sound) to hear more clearly. Echolocation itself is also an active process predicated on bats' ability to emit sounds and to control pitch, call timing, and direction. Though bats are typically classified by species as either using "frequency modulated" echolocation calls (FM; "sweeping downward about an octave throughout the duration of the signal," from 0.5 to 5.0 milliseconds) or "constant frequency" calls (in which "the major portion of the call is composed of a constant frequency (CF) portion at about 80Hz, a pure tone in effect, and each call is terminated with a brief, 2- to 4- ms portion that sweeps downward about 20 to 25kHz), they adjust their calls based on environmental and social factors, including increased call frequency when zeroing in on prey and even Doppler shift compensation (Pollack and Casseday 1989: 7, 11). In other words, because bats actively produce vocalizations for the purpose of echolocation, they have control over pitch, direction, and other variables not typically conceptualized as being a part of more "passive" styles of hearing.

More significantly, it is possible that echolocation calls are learned. Authors such as Boughman (1998) have demonstrated that bats' social calls not used for echolocation are learned, begging the question as to whether echolocation calls might also be. . Though the literature on

this topic is scant, a few examples stand out. In horseshoe bats (*Rhinolophus ferrumequinum*), for example, a study conducted in the early 1990s demonstrated that echolocation calls changed throughout a bat's lifetime, lowering in pitch as it aged, and that bat pups' echolocation frequencies were related to the frequencies of their mothers (Jones and Ransome 1993: 125). The researchers in the study found that older mothers produced pups with lower-pitched calls. If call frequency were exclusively genetically determined, we would expect pups to produce a higher-pitched call like the one the mother produced when it was young. Since they didn't, the researchers concluded that the pups were imitating the echolocation frequencies of their mothers through listening, thus providing evidence of social interaction and learning. More direct analyses of social learning of echolocation – for example, by placing pups with different mothers to see the effect of such social dislocation on their calls – have been deemed unnecessarily cruel in many cases, so further evidence of social learning of echolocation calls is relatively scant in the literature. However, studies have also suggested that though echolocation pulses may not be emitted with a specifically communicative goal, they nonetheless contain information about a bat's species, sex, age, and perhaps even an individual-specific signature (Jones and Siemers 2011:447). Bats use this information to eavesdrop on conspecifics and members of other species and may even utilize the echoes from other individuals' calls to add to the information from their own echolocation calls as they navigate.

Beyond the social learning found among Chiropteran conspecifics, echolocation is also socially constructed in that it was articulated as a part of interspecies relationships in the laboratory. While echolocation appears deeply Chiroptero-centric when viewed through the lens of neurology or in examining relationships between bats, it is at the same time a result of relationships with human scientists who defined it in a laboratory. Bats may have produced the calls we now term "echolocation" without the involvement of human interlocutors, but laboratory and field researchers decided which frequencies could be considered echolocation and

determined what they thought the function of these frequencies was. As I discuss in chapter three, the fact that these experimental interactions determined echolocation as a behavior does not make them any less "real," nor does it necessarily affect the behavior of bats who do not interact with humans.

The Ontological Turn

Within the broad rubric of post-humanism (anthropological and other engagements with plant, animal, fungal and microbial species, material objects, and spirit beings),[5] many authors have addressed the issue of human-non-human relationships by turning to indigenous ideologies, often from Latin America. These authors, proponents of the "ontological turn," seek to move past a simple representational framework in which societies are seen to hold relative beliefs about a single world. Rather, these authors seek to mobilize the worldviews of indigenous peoples by suggesting that there are actually multiple coexisting worlds created through the practices and ideologies of multiple groups of people. Central to the arguments made by these authors is the notion of translation. In particular, they discuss how literal depictions of indigenous worlds through academic terminology may not be possible. I utilize these authors to ground my study not just for their utility in thinking through human-animal relationality, but also to consider the ways in which translations occur between humans and among species.

One of the best-known authors of the ontological turn, Eduardo Viveiros de Castro, coins the term "multinatures," borrowing a concept from the politics of multiculturalism in Brazil

[5] For the purposes of this project, I focus primarily on those authors that address the agency of living beings rather than turning to object-oriented ontologies of authors such as Bruno Latour and Jane Bennet. The reasoning behind this is that there is a long history of denying personhood or subjectivity to animal species by treating them as if they were "like objects." What's more, this denial of personhood is historically linked worldwide with processes by which certain people are made subaltern. As stated in my introduction, I do not seek to make an argument about animal personhood, but I also do not wish to deny that personhood through an association with nonliving material objects. Alan Mikhail, *The Animal in Ottoman Egypt* (Oxford University Press, New York, 2014); Ana Maria Ochoa-Gaultier, *Aurality: Listening and Knowledge in Nineteenth-Century Colombia* (Durham, N.C.: Duke University Press, 2014).

where his work is conducted. Multinatures implies that rather than existing in a world where different beings have different perspectives, animals, humans, spirits, and other beings inhabit simultaneous yet different natural realities (Viveiros de Castro 1998: 480). Our inability to understand the worlds of other animals (or people) is due to what he terms an equivocation, or a misunderstanding due to the fact that what exists is dependent on the body and hence the perspective of the individual; we can never cross into another being's world and are therefore always constrained from fully comprehending it. For Viveiros de Castro, however, this equivocation is precisely what defines the process of translation (Viveiros de Castro 2004:10). Translation, for Viveiros de Castro, is not a process of eliminating Otherness, but is the relational process that constructs it.

Marisol de la Cadena, working with the Runakuna in the Peruvian highlands, extends the notion of translation even further in her work on earth beings in the Andes. Rather than viewing multiple coexisting worlds as separate, however, she explores the partial connections between indigenous and nonindigenous worlds, particularly as articulated through disputes about land rights and access to natural resources (De la Cadena 2015:5). De la Cadena emphasizes the simultaneity and plurality of relations between multiple worlds; a mountain can be a mountain in the nonindigenous sense, and also an earth being. Translation, then, is about finding commonalities between worlds without insisting on sameness.

Like the above authors, Eduardo Kohn addresses the issue of translation through notions of multispecies personhood in his book *How Forests Think*. Working with the Quichua speaking Runa in Amazonian Ecuador, Kohn examines the ways in which all life forms, through semiosis inherent in biological reproduction, can be said to be thinking, experiencing selves (Kohn 2013:15). By drawing parallels between indigenous worldviews and biological science, Kohn's work is centered on understanding signification processes as central to life itself.

Some indigenous authors, such as Zoe Todd (2016) have critiqued the ontological turn as a colonial enterprise. Todd argues that the ontological turn mobilizes indigenous worldviews out of context of indigenous persons and politics, erasing indigenous scholarly contributions. Bearing this critique in mind, in the various places that I highlight Tsotsil indigenous beliefs in my dissertation, I do so with an eye to acknowledging indigenous contributions to discussions held in the broader scholarly community. I draw parallels between indigenous belief systems and theoretical contributions by science and technology studies scholars in an effort to acknowledge the origins of such scholarly engagements, rather than using indigenous cosmology as decontextualized "source material" to serve my own interpretive goals.

Anthropology in Chiapas

While the first part of my study focuses primarily on scientific work with bats, the latter part examines a related field: anthropology. In Austin, the efforts of the scientific community branded it the "Bat City"; similarly, in southern Mexico, anthropological work has led the *municipio* of Zinacantán to be known as "the land of the bats." My inclusion of a chapter about Zinacantán is not intended as a direct comparison to Austin, however. Rather, the two sites are entwined both geographically and ideologically, as flip-sides of the relationship between modernity and nature.

San Lorenzo Zinacantán is located in Chiapas, the southernmost state of Mexico. The *municipio* is composed of 60 localities housing close to 40,000 people, 99% of whom are Tsotsil Maya. Tsotsil language is still widely spoken among the inhabitants of Zinacantán, though many Tsotsil youth prefer to speak Spanish as a result of the pervasive anti-indigenous racism in neighboring cities. Language and cultural revitalization projects, such as those by Chamulan rock band Vayijel discussed in chapter four, are widespread in Chiapas as a result.

Most *zinacantecos* living in the *municipio* wear brightly colored floral shawls particular to the region rather than Western dress, and the sale of handmade textiles to tourists is a particularly prevalent industry. The *municipio* also receives funding from tourists visiting the church of San Lorenzo, though in fall 2017 during my fieldwork, an earthquake that measured 8.1 on the Richter scale toppled the church's main tower, making it inaccessible to visitors. The church is particularly well-known for its bright floral adornments and its highly syncretic version of Catholicism. The *municipio*'s patron saint, San Lorenzo, is a key example: though he takes the name of Catholic Saint Lawrence, he is described as a man who led the Tsotsiles to the land where Zinacantán presently resides, near what was once a lake. Some of my informants suggested that this story originated from a time of great drought that coincided with the decline of the Mayan empire, drawing a connection between present-day *zinacantecos* and their pre-colonial past.

As I discuss in chapter four, there are many reasons for the associations between Zinacantán and bats, but anthropologists generally justify the comparison linguistically. Anthropologists argue that the name "Tsotsil" derives from the Tsotsil word for bat ("sots'") and that "Zinacantán" derives from the Nahuatl word "tzinacantli," which also means "bat." However, as I discuss, these linguistic connections are tenuous, and poorly supported by cultural data.

Nonetheless, Zinacantán remains relevant for the study of bats not only because it illuminates the processes by which anthropologists have imposed natural imaginaries onto indigenous communities, but because it reflects the real migrations of Mexican Free-Tailed Bats themselves. Though the Congress Avenue Bridge colony in Austin has not been collectively tracked to determine where in Mexico it spends the winter, my interlocutors at ECOSUR el Colegio de la Frontera Sur in Chiapas informed me that they had found individually tagged bats

from Texas in a cave nearby. The duality of my study thus reflects the seasonal migrations of the bats themselves: half in Texas, and half in Mexico.

Zinacantán is not the only Tsotsil community in Chiapas and the region is characterized by a mixture of indigenous groups. San Juan Chamula, a nearby *municipio*, houses approximately 75,000 Tsotsil inhabitants, who speak a slightly different variant of Tsotsil language and typically wear a distinctly different style of dress. Though Chamula and Zinacantán are somewhat isolated from one another, both communities have a strong presence in neighboring city San Cristóbal de las Casas, where I was stationed for the bulk of my fieldwork. Named for the combination of Saint Christopher and Fray Bartolomé de las Casas, San Cristóbal has served as a center of trade and communication for the Mayan regions of Central America since long before its founding in 1528, and now hosts a vibrant mixture of European, Mexican, and U.S. tourists, locals of mestizo or European heritage, and Tsotsil, Tseltal, and Ch'ol people from the neighboring indigenous *municipios*. Walking through the central plaza and markets, visitors to San Cristóbal will encounter *zinacantecos* in bright pink and purple tasseled florals, *chamulas* in thick black or white wool "chij" ponchos and cowboy hats, and tourists speaking a range of different languages and dialects, in Birkenstocks, backpacks, and Bob Marley-themed apparel. The relationship between locality and cosmopolitanism highlights the colonial forces I discuss in chapter four, which remain present in the form of ethnotourism.

San Cristóbal is best known for the Ejército Zapatista de Liberación Nacional (EZLN), an indigenous paramilitary group who brought Chiapas to the global stage during armed conflict with the Mexican government in the 1990s. Though the group remains active, even bringing a candidate forward for the 2018 presidential election, in San Cristóbal, they have been reduced to a liberal symbol to be adopted by tourists who know little about Mexican politics or indigenous peoples, purchasable in the form of handicrafts. Members of the EZLN living in autonomous zones known as *caracoles* maintain their political and social practices despite such reductive

impositions by tourists in a clear example of what Audra Simpson has termed a politics of "refusal" (2014: 11).

Aside from sociological and historical accounts of the EZLN uprising, much existing academic work on Tsotsil communities has to do with issues of land use. As I discuss in chapter four, this is due to the history of *indigenismo* policies in Mexico that understood anthropology as a tool by which to understand, and therefore assimilate, indigenous peoples into mainstream culture. These policies reached their heyday in the 1930s and 40s under President Lázaro Cárdenas, including the establishment of government institutions geared towards controlling information and policy regarding indigenous peoples in Mexico. Though the organizations have long-since been dismantled, the idea of indigenous peoples as wards of the state in need of salvation from poverty, rurality, and vice remains at the root of ongoing attempts to erase and contain indigenous culture, language, and populations. George Collier's writings examine the ways in which the persistence of traditional cultural forms in Chiapas highlands is utilized as a way of integrating Tsotsiles into larger projects of Mexican national Indianism, for instance (Collier 1975).

The bulk of existing anthropological research in Chiapas came from the Harvard Chiapas Project under the tutelage of Evon Zartman Vogt for more than three decades (1957-1980). Vogt and student Robert Laughlin remain deeply present in highland Chiapas, as evidenced by the many buildings and institutions that carry their names. Their work, which included creating Tsotsil dictionaries and grammars in the manner of the Dominican priests that preceded them in colonial times, was centered around understanding how Tsotsil culture persisted despite the pressures of modernization. As I discuss in chapter four, the preservationist arguments made by the Harvard Chiapas Project ultimately deny Tsotsil history, the violence of colonization, and the complexities of Mayan society prior to the arrival of the Spanish in favor of an ecological imaginary.

The anthropologists of the Harvard Chiapas Project emphasized the importance of ecology to the constitution of culture, including ethnobotanical works, descriptions of farming practices, the flower industry, and complex classification systems of native plants (Breedlove 1993). However, in exploring the relationship between ecology and culture, the anthropologists drew tenuous connections with bats in an effort to maintain this connection when it may not have really been there. The approach ultimately overlooks more complicated colonial histories in favor of a construction like Kent Redford's "Ecologically Noble Savage."

Since Henrietta Yurchenco's work in the 1940s, few ethnomusicologists have engaged with Tsotsil indigenous music. Yurchenco's work with the Tsotsiles largely consisted of making recordings and adding Tsotsil music to compilations with tracks by other indigenous Mexican groups. The notes that accompany Yurchenco's recordings largely focus on culture contact between Tsotsiles and Spanish invaders, identifying those elements that existed prior to the conquest and positing the ritual significance of singing (Yurchenco 1948:58-9). Similar recordings were made by Richard Anderson in the mid-1970s (Yurchenco 1976: 616-7). Yurchenco's work in the area reflects an older form of ethnomusicology focused on collection and preservation that contrasts sharply with my own, though her contributions to the field of ethnomusicology should not be overlooked.

To date, engagements with more current forms of Tsotsil musicking remain relatively few, though De la Cruz López Moya et al's *Etnorock: Los rostros de una música global en el sur de México* (2014) is a notable exception. Unfortunately, though the work seeks to account for the rising trend in *rock en Tsotsil*, some of the groups described in the book felt that they were misrepresented by it and that their perspectives were not taken appropriately into account. Articles in popular media, such as Rolling Stone Mexico (2014), *Noisey* from vice.com (2016), and NPR's Alt.Latino (2015), in addition to my conversations with musicians themselves, have therefore been much more instructive in considering the work of Tsotsil *rockeros*. Additionally,

works like Kyle T. Mays' *Hip Hop Beats, Indigenous Rhymes: Modernity and Hip Hop in Indigenous North America* (2018) and Luis Cárcamo-Huechante's 2013 work on Mapuche radio have been helpful in considering how music, sound, and technology can be used to contest colonial structures.

Chapters and Content

In the chapter that follows, I explore the relationship between Austin the "bat city" and Austin the "musical city," searching for the origins of the conflation between these two characterizations. Following Donna Haraway's (2008) conception of "becoming with," I examine how human-bat relationships in Austin have blurred the lines between the natural and the cultural. I begin by discussing negative stereotypes about bats drawn from both colonial history and anti-immigrant narratives. I then explore Austin's evolution into the "Bat City," a process which radically revised these colonial preconceptions through a profusion of aesthetic and touristic activity, including electronic musicians performing in concert with nightly bat emergences, the annual Bat Fest, and widespread images of bats playing musical instruments. Finally, I explore a musical case study that exemplifies Austin's relationship to its local bat colony: horror-surf band the Bat City Surfers who describe themselves as evolutionary descendants of bats. Rather than fall back on posthumanist theories that barely diverge from commodity fetishism, I examine the ways in which human-bat relationships at the Congress Avenue Bridge deconstruct narratives about modernity as a separation from the natural world, demonstrating the co-constitutive processes of becoming that led to the development of a multispecies, musical, bat city.

In chapter three, I examine the phenomenon of echolocation, offering an example of how multispecies ethnography might be incorporated into sound studies research. My analysis includes human-bat laboratory interactions and what I term the "bios-mimetic" echolocation

practices utilized by blind and visually impaired humans. I focus on the notion of "sonic sight" in which echolocation is envisioned as a method by which bats can "see" using their ears. Popular conceptions of echolocation such as this one blur boundaries between the visual and auditory senses, suggesting new ways of conceptualizing sound's relationship to spatiality. I conclude with an analysis of "Bat/Man," an experimental musical piece by Austin-area composer Steve Parker, whose work uses sound itself to comment on issues of trans-species communication and the spatiality of sound. Following Karen Barad, I argue that biomimetic practices such as those employed by Parker are not futile or anthropomorphic, but rather offer important ways of reconsidering process of knowing. At the same time, I note that scientific practices are mired in complex and tenuous ethical questions, as discussed throughout the chapter.

Chapter four brings us to southern Mexico, to the Tsotsil indigenous community of Zinacantán, "the land of the bats." In the fourth chapter, I examine the ways in which raced and gendered ideas about the natural perpetuate colonialism through the formation of an anthropological imaginary. More specifically, I look at anthropological literature to evaluate the legitimacy of connections they assert between modern-day mythical figure Ik'al ("Black-man") and Camazotz, the bat god of Mayan codex *Popol Vuh*. I suggest that these connections, in addition to lacking fundament, ignore the long colonial history of southern Mexico in favor of an overly static view of culture, grounded in the same concepts about indigeneity as governmental assimilation projects of the early 20th century. By contrast, I offer an alternate interpretation of Ik'al myths rooted in Mexico's history of colonialism and slavery. Additionally, I examine the ways in which present-day *zinacantecos* have capitalized on their associations with bats to promote ethnotourism, supporting hypotheses initially put forth by authors such as Nancy Farriss and Chris Goertzen, that suggest Mayan culture is defined by its adaptability.

Finally, in chapter five I examine the ways in which bat vocalizations are conceptualized by scientists. I conduct what Eben Kirksey and Stefan Helmreich have termed an "ethnography of science," (Kirksey and Helmreich 2010) examining the practices, underlying beliefs, and aesthetic expressions found in scientific laboratories and literatures, and treating Western science as a culture in itself. In particular, I examine the uses of the term "song" to describe bat vocalizations, focusing on instances in which comparisons are made to physical and neurological processes in human beings. I interrogate the ways in which music is used to place bats and humans on an evolutionary continuum, and what this signifies about how scientific negotiations to remain relevant amidst the pressures of a "post-truth" society. I suggest that by employing terminology associated with human music, biologists link their own identities with those of bats, thereby breaking down species divisions that are elsewhere reified. I then examine the ways in which the sciences deploy these theories to remain relevant, including process of audio archiving, citizen science projects, and the use of educational parody songs.

At the beginning of the chapter, I examine the online bat call database "Bat Detective." The website asks users to assist in the analysis of an extensive collection of recordings of bat calls from around the world, an effort they call "citizen science" (batdetective.org). Website users take a brief online tutorial in which they are taught to identify sonograms of bat social, searching, and feeding calls, and to differentiate them from insect or mechanical noises. Once this task is complete, users assist in analyzing the many hours of recordings on the website and upload their results. The project is a collaboration between University College London, the Zoological Society of London, Bat Conservation Trust, BatLife Europe, the University of Auckland, and Zooniverse. The "Bat Detective" database is just one example of how scientific classification systems are used to assign meaning to animal sound. Unlike Mundy's work with the bird song recordings at Cornell University, I argue that democratizing projects such as Bat Detective generate radical empathy in service of environmentalist projects, rather than

establishing categorical species difference. I also consider the ways in which this kind of project dialogues with the processes of multispecies engagement discussed in chapter one.

Research Contributions

My study reflects a rising trend of including non-human species into conceptualizations of culture and by extension, musical practice. Human beings do not live in a vacuum; as a result, our actions and behaviors both affect and are affected by the lives, movements, and behaviors of other species. At a historical moment characterized by narratives of ecological crisis, it is increasingly important that we work to understand these interrelationships, which are complex, dialogical, and transcend national boundaries. How we think about these interrelationships forms the basis for environmental and social policies that define and shape the world we live in, thus any study of the present moment that fails to take them into account misrepresents the intersections between the ecological and political that currently defines us. While anthropological and science and technology studies literature has begun to consider the complex ways in which ecologyand culture are intertwined, ethnomusicology has yet to do so in ways that accurately consider the impact of biopolitical or geopolitical forces or fully address the potential of the paradigm.

Multispecies interactions are essential to understanding and redefining what it means to be human. Previous scholarship has focused on the production of difference by demonstrating the lines that humans draw between themselves and other species. However, by re-envisioning our bodies, nature-cultures, and musical practices as *relations* between humans and other species, we come to understand humans not as isolated entities but as part of composite webs of interdependence. The implications of a multispecies approach are more than just environmental; they demonstrate how single-axis categorizations of any kind fail to accurately describe the lived experience of the 21st-century world. Understanding the pluralistic complexity of multispecies

entanglement can help to redefine anthropology, ethnomusicology, sociology, and a host of other disciplines that have focused exclusively on single identity frames. Even more importantly, considering multispecies entanglement can help us re-draw the categorizations we have traditionally used, which don't represent lived experience, potentially erasing them completely.

Disciplinary categorizations are among the boundaries that can be reworked or reconsidered by using a multispecies framework. Despite a fraught relationship between ethnomusicology and the biological sciences in the past, a multispecies approach provides an opportunity for considering the interconnectedness among multiple living beings without recourse to an evolutionary framework. This approach is beneficial to both disciplines as it provides a more nuanced perspective on the complex processes by which humans and non-human animal species act in a deeply interconnected world.

That being said, adopting a culturally situated approach like mine might not be appealing to scientists used to traditional experimentation. As such, while my eventual hope would be for my approach to foster direct communication between scientists and ethnomusicologists, the theoretical implications of my study in its present form are geared more towards those who are affected by scientific practice, rather than those who practice is. In the 21st-century United States, that includes anyone in the general public who is governed by laws justified through scientific reasoning. It is also anyone whose culture or perspectives are overlooked in favor of scientific forms of knowledge production. In essence, by adding to the existing body of science and technology studies research, my aim is to unseat broad claims about scientific superiority, objectivity, and hegemony while at the same time rejecting notions of human exceptionalism. This is a sort of middle ground between a complete rejection of scientific knowledge in favor of an overtly humanist perspective and an embrace of mechanistic evolutionary narratives that are problematic for many kinds of people. Attempting to reconcile the scientific and the cultural has been a key struggle in my own experience as someone with degrees in both Biology and (soon to

be) Ethnomusicology, and I imagine the same is true for many others in the Information Age. In the section that follows, I detail the ways in which I have used my own experiences to generate a methodology that moves away from categorical frameworks to focus on the generative possibilities of lived experience.

A "Felt" Ethnomusicology

Though theoretically this project diverges significantly from identity discourses, in many ways they are its foundation. Graduate seminars in ethnomusicology increasingly focus on questions of power and positionality in an effort to encourage work by scholars with an insider perspective on the societies they study. Such efforts are crucial to deconstructing the power differentials perpetuated by the predominance of white academics and the preference given to their perspectives.

For white academics like myself, however, the implications of the trend towards insider ethnography can be tricky. On one hand, the academic job market continues to pressure students to present themselves as experts in area studies. On the other, post-colonial critiques of anthropology, ethnomusicology, and related fields have questioned the ethical nature of traditional ethnography, particularly focusing on its relationship to colonialism.

A simple turn to topics more closely related to normative identities is also difficult because the analytical tools developed by ethnomusicology are designed to explore and analyze the Other. Decades of research have produced a finely tuned literary corpus about the Western scholar displaced from Western society, offering little insight into the Western self at home. Turning to historical musicology likewise offers little assistance; while its focus on European art music ties into narratives about hierarchy and power, its tools are designed to examine *historical* Others, since most musicologists working today are not 16th-19th century Europeans.

Even if ethnomusicology had the appropriate tools to study normative identities, whiteness and its related constructs continue to present a problem in that, unlike non-normative identities, they are not directly experienced. As Simone de Beauvoir argued, the Other is defined exclusively in opposition to a norm, but the norm is not defined at all; it is transcendent, absolute, monolithic. Otherized individuals are made to feel their positionality daily as they are constantly compared to a norm, but individuals with normative identities experience themselves as "unmarked," without identity, as representing the whole of human experience. Phenomenological approaches have worked to address the lived experience of being non-normative, particularly in gender studies (Butler 1988), but are generally ineffective when applied to normative identities because they are not characterized by constant comparison. Some recent scholarship has begun to examine the structural factors implicit in formulating normative identities, but for the most part, ethnomusicology, like anthropology before it, remains the study of the Other entrenched in its colonial history.

As Patrick Wolfe has argued, anthropology (and by extension, other disciplines like ethnomusicology) constructs its object; it is not a reflection of the pre-existing cultural ideologies of its time, but rather shapes ideologies and discourses. Anthropology is both text *and* context (Wolfe 1999: 5). In so doing, it codes and reproduces "the hegemonic process of colonial settlement" (3). Positionality is therefore not an after-the-fact reflection on anthropological methodology, nor is it only essential to unpacking discourses about colonization, survival, and their very real effects, it *is* the very enactment of colonial processes – or decolonial ones. In this dissertation, I have attempted to use my own positionality as a white academic, a former student of the sciences, and a current student of an anthropology-derived field (ethnomusicology) as a source for studying how those normative frames of analysis function in colonial societies.

Similarly, in her theory of "ethnographic refusal," Audra Simpson (2014) has argued:

> Like "race" in other contexts, "culture" was (and still is in some quarters) the conceptual and necessarily essentialized space standing in for complicated bodily and exchange-based relationships that enabled and marked colonial situations in Empire: warfare, commerce, sex, trade, missionization. Culture described the difference that was found in these places and marked the ontological endgame of each exchange: a difference that had been contained into neat, ethnically defined territorial spaces that now needed to be made sense of, ordered, ranked, governed, and possessed (96-7).

In other words, much like Wolfe, Simpson sees existing analytical frames like "difference" as a kind of categorial colonialism repeatedly perpetrated by anthropology. What might ethnography look like "when difference is *not* the unit of analysis; when culture is disaggregated into a variety of narratives rather than one comprehensive, official story; when proximity to the territory that one is engaging in is as immediate as the self?" she asks (97). Following Simpson's lead, this dissertation is a thought experiment in using personal *experience* to generate alternate frames of analysis in ethnomusicology. Though Simpson's work is largely geared towards creating spaces for indigenous authorship to contest the hegemony of white authors, I suggest that white scholars, too, can examine our own narratives more closely as a way of understanding how we have historically constructed ourselves at the pinnacle of hierarchies we have claimed to be objective. Similarly, by focusing on our lived experiences rather than on artificially constructed identity frames, we can nuance the monolithic conception of whiteness, against which all differences are constructed.

Though my dissertation does contain some elements of more traditional ethnography as a concession to the demands of the academic institution, for the most part, I use my experiences as a former student of the sciences as a framework for deconstructing human-non-human relationships, the divisions between "nature" and "culture," and the foundations of both scientific and ethnomusicological practice. Rather than focus on traditional analytical frames like race, ethnicity, gender, or socioeconomic class, I turn to my lived experiences as a person with a

normative identity to generate alternate analytical frames. In so doing, I don't suggest that the experience of whiteness is comparable to that of other races or ethnicities; I simply argue that thinking through whiteness (or able-bodiedness or masculinity or heterosexuality) phenomenologically can be productive in creating other approaches to the study of ethnomusicology that ultimately deconstruct the notion that normative identities are monolithic. In highlighting the phenomenological aspects of normative identity instead of underlying social structures that may or may not play into normative scholars' self-conception, I seek to complicate our understanding of normative identities and how they function in society.

My own experiences are primarily a framework for developing a methodology, however; this study is not an autoethnography. Rather, my research entailed a mixture of interviews, direct observation, participant observation through volunteer work, and web-based research. Throughout the five years during which I conducted my research, I interviewed a wide variety of people, including Bat Conservation International founder Merlin Tuttle, biologists Rodrigo Medellín, George Pollak, Mike Ryan, Mike Smotherman, Jorge Bolaños, and Marie Westover. I visited the Texas School for the Blind and underwent a brief training in human echolocation with Orientation and Mobility Specialist Chris Tabb. I visited natural history museums associated with the ECOSUR, El Colegio de la Frontera Sur in Chiapas and at the University of New Mexico in Albuquerque. I interviewed experimental composers Steve Parker and Adam Bzowski, conductor Brent Baldwin, and observed rehearsals and performances of musical groups ranging from horror-surf band the Bat City Surfers to the librarian band Echo and the Bats.

As a key component of my research, I became a member of Bat Conservation International (BCI) and spent two summers as a volunteer at the Congress Avenue Bridge. As a result, I was able to speak with conservationists with vast amounts of knowledge about the bat populations in Austin, and to observe the ways that tourists and other volunteers perceive and interact with bats at the bridge. The volunteer coordinators are also bat rehabilitators and

graciously allowed me to visit their bat rehabilitation area in July 2016. In addition to attending Austin's annual BatFest and San Antonio's Bat Loco in 2017, I visited Bracken Cave in June 2015, September 2016, and August 2017, access to which is restricted to members of the organization and some educational groups.

Additionally, I spent five months in San Cristóbal de las Casas, Chiapas, Mexico and surrounding indigenous *municipios*, including 6-hour-per-week intensive Tsotsil language study with Chamulan academic Antonio Gómez Gómez. While there, I interviewed indigenous rock bands Vayijel, Lumaltok, and Sak Tsevul, though some of that data did not make its way into the final draft of this dissertation. Additionally, I observed a broad range of festivals in San Cristóbal Zinacantán, including the Fiesta de San Sebastián that is the focus of the fourth chapter.

This study originated from my efforts to understand science not as a discipline, but as an identity frame. The sciences represent one of the highest forms of normative identity, being constructed on centuries of white, patriarchal, heteronormative, able-bodied ideas and practices. However, what we actually experience as participants in this social hierarchy diverges significantly from academic description. My project is ultimately an effort to reinstate the phenomenological aspects of normative identity into academic practice. In so doing, I seek to "turn ethnomusicology upside-down," thus my choice of bats as a case study is not accidental. Rather, bats, the sciences, popular and Western Classical Music, and the academic institution, all work together to offer a new kind of ethnomusicology that is felt, rather than merely considered.

Chapter Two: Bat City: Becoming with Bats in the Austin Music Scene[6]

In 1991, Bruno Latour claimed that modernity is not defined by separation from the natural world, thus destabilizing cultural anthropology's rigid delineation between the natural and the cultural. In so doing, he established a precedent by which "hybrid" problems that fell somewhere between the realms of scientific inquiry and social or political studies could be examined. His work led to an outpouring of research by authors such as Donna Haraway (2008), Anna Tsing (1995), John Hartigan (2015), and Eben Kirksey and Stefan Helmreich (2010), who have been transformative in breaking down the neat divisions between "nature" and "culture" in ways that address the social construction of scientific thought as well as the discursive and material impacts of biology on cultural thinking and political policy.[7]

In this chapter, I examine a case study that conforms to Latour's notion of the cultural-scientific hybrid — the "nature-culture" as he describes it — of Austin, Texas (Latour 1993: 7). In particular, I focus on the relationship between human beings and Mexican Free-tail Bats (*Tadarida brasiliensis*) in the city's music scene. While studies examining human beings' aesthetic relationship to animals are far from new in anthropology or ethnomusicology[8] —what I wish to emphasize by invoking Latour is that expressions of the so-called "natural" world in musical practice are not solely features of what have been dubbed "traditional" cultures. Rather, as Latour argues, we interact with the "natural" in the form of non-human animals in Western,

[6] A previous version of this chapter has been published as Graper, Julianne. 2019. "Bat City: Becoming with Bats in the Austin Music Scene." *MUSICultures* 45(1) [Special Issue on Ecologies]: 14-34.

[7] Recent years have seen a rise in interest in the question of animals and music, particularly, and perhaps surprisingly, among music scholars. On one hand, proponents of biomusicology (a term coined by Nils L. Wallin in 1991) have sought the origins of human aesthetic practices using techniques derived from evolutionary biology, while zoömusicologists (a branch of zoösemiotics) have applied techniques from the early years of ethnomusicology to animal sounds in an attempt to understand them culturally (e.g., Martinelli 2009). These approaches, while not without some problems, are valiant attempts at interdisciplinary exploration; however, for the purposes of this dissertation, I draw more directly from science and technology studies.

[8] Steven Feld's iconic *Sound and Sentiment* (1990 [1982]) is one of the earliest examples; Simonett and Seeger's contributions to *Current Directions in Ecomusicology* (2016) are two more recent examples of a rather extensive body of literature on the topic.

urban, 21st century environments daily, and they are not mere symbols: their presence affects and alters our cultural life, often in ways beyond our control. Furthermore, rather than devaluing multispecies interactions in the urban sphere as environmentalism's emphasis on wilderness and conservation has done (Cronon 1996: 7), I argue for a new understanding of ecology as a process that does not seek to separate the human from the non-human, but rather evaluates and values interspecies interactions of all types, searching for ways that humans and non-humans can (and already do) productively coexist in a rapidly shrinking world.

The chapter begins in Austin, TX in the early 1980s and examines the arrival of what was to become the largest urban bat colony in the world. After delving into colonial and nativist narratives that form the basis for fears about bats, I briefly discuss the work of conservationists aimed at turning this narrative upside down — much as a bat might — particularly focusing on the use of photography. I then close with a musical case study of "horror surf" band Bat City Surfers who describe themselves as evolutionary descendants of bats. I particularly focus on album artwork and elements of their live performances. Their acceptance of bats as identity markers and their subsequent imitation of the creatures demonstrates not only the complete revision of cultural attitudes about bats in Austin, but also the complex interspecies web of the city's music scene that situates humans and bats as part of a connected ecosystem.

The close connection achieved between human beings and bats throughout this chapter can be conceptualized, following Donna Haraway, as a process of "becoming with" (Haraway 2008: 15). Haraway's theory is material in nature, focusing on the transfer of cellular information through touch. According to Haraway, a human body is composed of relationships between skin cells, bacteria in the digestive tract, contact with pets, families, and the fungi, animals, protists, and plants in its immediate environment. Through touch, these multivariate beings shape and are shaped by one another in a perpetual, co-constitutive becoming that breaks down "the culturally normal fantasy of human exceptionalism… [Or] the premise that humanity alone is not a spatial

and temporal web of interspecies dependence" (11). In other words, just as Bruno Latour once argued that "we have never been modern," similarly "we have never been human," but are rather hybrid assemblages, human-dogs, human-fungi, cyborgs[9] (Latour 1993; Haraway 2008: 1). As I will discuss in chapter four, the deconstruction of categorical modernity is also central to the breakdown of colonial notions of "tradition" that, as Kyle Mays (2018) and others have discussed, are key strategies that have contributed to the erasure of indigenous groups.

Haraway's work radically reconsiders not only our relationships with other species but also the very nature of the self by focusing on the human body as a tactile interface with the surrounding world. However, by drawing on conventional physical understandings of the senses, Haraway's theories can be extended to include sonic representations. In other words, just as the sciences conceive of light entering the eye as a form of tactility, sound waves are also material: a vibrating body compresses molecules in the air that travel across space to result in sympathetic vibrations in another body. Therefore, by reinstating what Veit Erlmann has called the "materiality of perception" we can understand both image-making and listening as constant processes of physical contact, and thus "becoming with" (Erlmann 2010: 17). In this way, not only are we constantly in processes of becoming with the species we encounter through touch, we are also constantly made by and remaking other bodies through the production and reception of light and sound. We form assemblages not only with beings we directly encounter but also with those we *hear* and *see*.

Haraway's theories recall a concept taken from the Tsotsil Maya, an indigenous group from southern Mexico whose nature-histories I address further in chapter four. In Tsotsil thought, every human has a guardian animal spirit, known as a vayijel, who is born at the exact

[9] Though the intra-actions implicit in this chapter and throughout the dissertation are primarily biotic, rather than the kind of techno-scientific hybrid implied by the term "cyborg," I use the term to reference Donna Haraway's earlier work "A Cyborg Manifesto," which in many ways influenced her later theories about multispecies relationality. (Haraway 1985).

moment they are, and to whom they remain connected through dreams and shared sensations throughout life, though they may never encounter each other on a physical plane. In Austin, humans and bats are intertwined in a similar relationship, in which human dreaming about bats and touch through artistic and musical production leads to a mutualistic development. In fact, present-day Austin may be said to have been "born" simultaneously with the arrival of its Congress Avenue Bridge colony in the 1980s, a history I address briefly in the following section. Whether it is reasonable to extrapolate an interpretation of Austin's touristic development based on a Tsotsil concept from an entirely different part of the North American continent I leave to the reader; however, as Zoe Todd (2016) points out, it is important to acknowledge that theories such as Haraway's are not exclusively the provenance of white academics and Anglo-European history, but rather have been considered and discussed by indigenous artists and scholars as well.

As I demonstrate, Austin's artistic, touristic, and ecological development since the 1980s has been a result of deep entanglements with bats such that the technological and artistic elements of its processes of "becoming with" are not arbitrary representations of a static nature-culture, but in fact necessary to its processes of becoming. While close connections between humans and animals have traditionally been theorized as occurring solely in non-urban environments or in so-called "pre-modern" cultures, bat-human relationships in Austin are unequivocally a result of 20th- and 21st-century technological advancements that allow for contact with bats through technological and aesthetic means. They thereby blur and destabilize the notion that the natural world is somehow separate from the urban present.

FEAR OF A BAT PLANET

The title of this section of my essay, taken from the Bat City Surfers' 2015 album, seeks not only to highlight Latour's emphasis on the interplay between cultural narratives and the so-called "natural" world but also to offer a theoretical framework within which to retrospectively

understand the history of Austin's relationship to its bats. The Bat City Surfers' album title plays with Public Enemy's 1990 album title *Fear of a Black Planet*, lauded not only as an exemplar of a golden age of hip hop, but also for its critical approach to race relations in the United States (Omega Rand and Joey Muerto, interview with author, April 6, 2017). While the title is more an example of the group's off-beat sense of humour than intentional political commentary, the substitution of "bat" for "black" nonetheless clearly articulates how the delineation of what "counts" as human is the basis not only for species divisions but also for the formulation of racialized and other culturally oriented fears. In other words, the delineation between the human and the non-human has led not only to an artificial divide between nature and culture but has also acted as the basis by which human groups distinguish themselves from one another.[10] Therefore, understanding the biases implicit in extant cultural narratives about bats can also offer insight into the dynamics that exist between groups of people. By the same token, understanding non-human species' resistance to cultural narratives can lead to the revision of cultural perceptions that affect not only animals, but also people.

In the case of Austin, the Otherization of bats is central to understanding the city's eventual co-evolution with its bat colony. Initially, the city rejected the bat colony as "invaders," a process linked not only to colonial narratives dating back to the conquest of the Americas but also to more contemporary concerns about immigration. Cultural negotiations by conservationists, government officials, and artists in the Austin area were so successful that they converted Austin into what is now known as "Bat City." This process began in the early 1980s when the first large colony of Mexican Free-tailed Bats took root under the newly remodelled Congress Avenue Bridge. The then 70-year-old downtown bridge, which crosses the Colorado River, underwent reconstruction that included the addition of ¾-inch wide by 16-inch deep

[10] Ochoa Gautier (2014) has delved into this issue with great clarity and sophistication.

expansion joints (*Civil + Structural Engineer*, n.d.; Murphy 1990). Unbeknownst to the architects involved, the size of these joints was ideal for Mexican Free-tailed Bat roosting. Because the Congress Avenue Bridge colony is a maternity colony, the bats prefer tightly enclosed spaces like the expansion joints, which help to keep the hairless bat pups warm when they are born in early June.[11] The damming of the Colorado River in the 1930s and 1940s, which led to rapid increases in the human population of the Austin area, also meant that bats had to find new roosting sites since their traditional habitat (caves) became less available. By 1984, hundreds of thousands of bats had colonized the Congress Avenue bridge; an estimated 1.5 million now live there when the colony reaches its annual peak, a number startlingly similar to the Austin area's 2 million human inhabitants.

The local public's initial panic and call for extermination of the bats draws from negative depictions of bats in Austin media, and also on the longer history of human-bat interactions associated with the colonization of the Americas, as mentioned. In the early 1980s, Austin newspapers ran headlines such as "Bat colonies sink teeth into city" (Banta 1984) and "Mass Fear in the Air as Bats Invade Austin" (United Press International, 1984?). These metaphors reference invasion narratives common to horror films that often depict bats as vicious, but are also perpetuated by pest control companies and disease prevention researchers seeking greater profits (Tuttle 2017a:50; Tuttle 2017b:). Petitions were circulated to eradicate the colony and local officials declared a public health crisis, citing reports of a larger than usual number of citizens treated for potentially rabid bat bites in 1984 — despite the fact that rabid bat bites are extremely rare (Murphy 1990; Tuttle 2015: xi).[12]

[11] The Congress Avenue Bridge has become such a successful bat habitat that the Texas Department of Transportation initiated a program to design similar structures around the state to provide habitat in other urban environments.

[12] Though bats can contract rabies and pass it to humans, the notion that they are asymptomatic carriers of the disease is incorrect. Only about one in a thousand bats contract rabies (approximately the same rate as other animals) and those that do seldom become aggressive enough to attack another animal, simply dying instead. Between 1997 and 2006, there were only 17 reported cases of humans contracting rabies from bats in the United States, and there

Fear about bats dates back to the European conquest of Central America and Mexico, as evident in associations between bats and vampires. According to Wasik and Murphy, this association derives from colonial-era discourses in which depictions of half-human monsters expressed European anxieties about the native inhabitants of the Americas who were perceived to be backward, animalistic, and not quite human (Wasik and Murphy 2012: 71). These "monsters" are first described in accounts by Spanish colonist Hernán Cortés and his chronicler Gonzalo Fernández de Oviedo, who wrote of strange animals drinking the blood of horses and soldiers during their first night in Veracruz (Romero Sandoval 2013: 18). Having never encountered vampire bats prior to their arrival in the Americas (they are only found from Mexico to Argentina), Oviedo's accounts greatly exaggerated the dangers of bat bites and included graphic descriptions of blood and disease. These stories made their way back to Europe and influenced existing vampire lore, which until that time had not been characterized by biting, sucking blood, nor shapeshifting into bats (Wasik and Murphy 2012: 86). Bat-vampire associations achieved widespread dissemination with Bram Stoker's 1897 novel *Dracula* — interestingly, an anecdotal theory suggests that Stoker may have added bats to his story after reading Oviedo's accounts of bats in Mexico (Medellín, interview with author, September 4, 2017).

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has never been a documented case of someone contracting rabies from the bat colony under the Congress Avenue Bridge. In fact, early studies that suggested that bats carried rabies without showing symptoms may have in fact been pointing to the Rio Bravo virus, which affects neither humans nor bats, but does affect mice – who were the test organisms used in the study.

While no one other than a trained professional should handle wild bats, the fear generated by misinformation campaigns (often perpetuated by extermination companies and news organizations) are far more dangerous than the bats themselves, as they often lead to panic situations in which people try to eradicate bats from their homes or cities. These panic situations lead to drastic increases in bat bites simply because the terrified bat colony is trying to find a way to escape. See, for example, Vogel (2014); Bacardi Imports brochure, "The most famous bat in the world," (1984); Tuttle (1988); The Center for Disease Control, "Learning about bats and rabies" (2011). The University of Texas perpetuates these misinformation campaigns by posting signs that read "Do not touch bats" in academic buildings, listing the phone number for Animal Control. Bats found in buildings should instead be reported to a bat rehabilitator, as they may be injured. In the Austin area, the best resource is the Austin Bat Refuge (https://austinbatrefuge.org/).

Figure 2.1: Tourists gather to watch the nightly emergence of Mexican Free-tailed Bats from atop the Congress Avenue Bridge. Photo by author, 2014.

Figure 2.2: Mexican Free-tailed Bats flying in front of the iconic Frost Tower in downtown Austin. Photo by author, 2017.

The type of colonialism implicit in these narratives references not a process by which indigenous communities were "taken over" or controlled by European overlords as anthropology has tended to characterize it, but a literal and narrative replacement theorized by Patrick Wolfe in his theories of settler colonialism (Wolfe 1999: 1). Using Australia as a case study, Wolfe argues that evolutionary thinking was used as part of a "logic of elimination," whereby indigenous extinction was a foregone conclusion because indigenous blood was "diluted" through miscegenation, while white blood remained intact. Authenticity (discussed in chapter four) was a kind of stand-in for these theories of disappearing full-bloodedness, represented by narrative fictions about indigenous people that reflected nothing about indigenous experience and everything about colonizers' beliefs about themselves (204). Vampire stories in literal fiction like *Dracula* represented this kind of narrative replacement to the extreme.

Wolfe traces the logic of elimination through contemporary Australian policy, and the fictions of dangerous indigenous vampirism similarly draw forward to the present. While by the 1980s most vampire stories had been purged of Central American associations, fears of Otherness persisted not only in pop culture descriptions of bats but also in the form of anti-immigration anxieties. Similar cases in which "invasive" species have been described within the framework of nativist politics have been discussed by such authors as John Hartigan (2015), Jean and John Comaroff (2001), Hugh Raffles (2011), and Anna Tsing (1995). Helmreich (2009) also goes into great detail about the use of the term "alien" in describing invasive species — a term that has also notably been used by proponents of strict immigration policies (Mehan 1997: 258).

In a state like Texas, known for its tenuous relationship with the Mexican border and historically strained relationships with Mexicans themselves, fears about invading Others are never far from residents' minds. Since immigration reform became a major topic in US politics

of the early 1980s,[13] it is perhaps more than a coincidence that widespread panic occurred following the arrival of the Congress Avenue Bridge colony that same decade (Menchaca 2011: 281). Though Mexican Free-tailed Bats are not truly "immigrants," having migrated seasonally to and from Texas for what is believed to be thousands of years, discourses surrounding the initial arrival of the Congress Avenue Bridge colony reflected fears of invasion rooted in political concern over the rise in illegal immigration. While Austin residents may not have recognized or consciously considered the relationship between the Free-tail colony's twice-annual migration across the Mexican border and rising concerns about human immigration, the similarity in the discourses used to describe both suggests that Otherizing processes are founded on delineating what counts as "human" and what doesn't.

Anna Tsing's work with so-called "Africanized" or "killer" bees demonstrates the lack of specificity inherent in invasion narratives. Her article examines the conflation of stereotypes about Africans or African-Americans with anti-immigration narratives more recently ascribed to those crossing the U.S.-Mexican border (1995: 129). The allegedly hyper-aggressive "African" bees discussed in Tsing's case study resulted in such drastic actions as the US Department of Agriculture's construction of a barrier across the Texas-Mexico border to prevent bees from entering the United States, which Tsing describes as a combination of "fears of Mexican immigrants creeping over inadequately patrolled borders and fears of Black-White racial miscegenation" (1995: 134). On one hand, the stereotypes imposed on the bees were related to prejudices about Africans and Afro-descendants, but at the same time they were characterized as invading Others, reflecting concerns about immigration from Latin America.

[13] The United States held some of its most stringent anti-immigration policies from the mid-1960s until the late 1970s. As Manchaca discusses, policy shifts in the 1980s, culminating in the Immigration Reform and Control Act in 1986 by President Reagan, were largely motivated by depleted labour forces and concerns over U.S. security, rather than by altruism (2011: 277).

Austinites' negative response to the migrating bat colony is also useful in reconsidering the invasion narratives used to describe border crossings. As Audra Simpson (2014) has discussed in her case study about Mohawk workers traversing the borders of Canada, the United States, and Iroquois reservations, border scholarship's exclusive focus on Chicanos crossing between Mexico and the United States has led to its unilinear interpretation as an act of transgression (116). In Simpson's case study, however, crossing borders is a way of contesting and affirming Mohawk sovereignty through the use and recognition of legal documents like a passport (116). Despite the convenience of comparing the migrating bat colony to migrating Chicanos based on their regional similarity, Simpson's case might be more useful in unveiling the border crossing politics at play in Austin of the 1980s: like the Mohawk, Mexican Free-Tailed bats and their migrations long pre-date the establishment of the U.S.'s political borders. Narratives of transgression and invasion abound precisely because the bats' migration – over which human agents have little to no control – poses a direct challenge to the sovereignty of the nation and its borders not only through literal movement, but through prior claim.

Austin musicians of the 1980s noted and capitalized on these exaggerated fears and their relationship to Otherization, most notably the glam rock band The Bats. In particular, front man Bevis Griffin, the self-proclaimed "Black Rock Maverick of Texas," used bats to comment on his own experiences with discrimination as an African-American glam rock performer in a scene he describes as a space of "cultural schism"[14] in which "you could literally get harassed for just having long hair if [as a] Caucasian. [As] a black musician, it's times ten" (Griffin, interview with author, March 26, 2017). In choosing the band name The Bats, Griffin sought to draw attention to this Otherizing by acting out an exaggerated version of the fears that were projected

[14] It is worth noting that Griffin performed at the Armadillo World Headquarters with a previous group, the Skyscrapers, so he is relevant not only for his relationship to bats but also for his involvement in the aforementioned "armadillo" scene.

onto him by members of the Austin public. He chose the name because he had heard that his musical idol, Jimi Hendrix, was sometimes referred to by his side musicians as “the bat” since he often slept by day. Griffin had also read a passage in a book in which a character used the term “bat” as a racial slur in reference to African-Americans (Griffin interview with author, March 26, 2017). For Griffin, the fear associated with bats as represented in horror films demonstrated the kinds of irrational fears directed towards musicians at the time, and particularly towards himself as a black glam rock musician, which was a complete anomaly in the scene. As a performer, he drew on these cultural associations by utilizing horror tropes. He had also hoped to eventually build a bat-shaped stage on which to perform. For Griffin, bats exemplified the fears — racialized, interspecies, musical — that pervaded Austin at the time.

Returning to the present, these dynamics are clearly articulated in the album artwork for *Fear of a Bat Planet*, created by band member Joey Muerto. Drawn in comic book style, the album cover depicts a giant bat terrorizing a city, simultaneously clawing through a building, squeezing a person to death, stepping on both a person and a car, and vaporizing another person with a green ray (Fig. 3). The city appears panicked, as a group of (predominantly white) women run, lament, and attempt to retaliate against the giant monster. The excess of the image seems to parody the fears articulated above, moving them out of the realm of real-life colonialism and into the world of fantasy through the process of artistic negotiation.

Figure 2.3: Album artwork for *Fear of a Bat Planet* (2015) drawn by Joey Muerto

BECOMING THE BAT CITY

Austin's coevolution with its bat colony was slow, with changing attitudes toward the creatures largely instigated by the work of conservation biologist Merlin Tuttle and his then-fledgling organization, Bat Conservation International. Tuttle's strong emphasis on education and his work with local media, community organizers, and schools sought to bring together human beings and bats, normally inaccessible to humans due to their nocturnal nature. Most notably, Tuttle employed what he termed "ambassador bats," or domesticated fruit bats to show the public that their negative preconceptions about them were unfounded.

Tuttle is lauded for his innovative approach to photography, which offered some of the first images of bats in which the animals did not appear to be tense or aggressive. As Michael Taussig discusses (following Walter Benjamin), the mechanical reproduction of images through photography is a form of tactility that not only articulates relationships of alterity but creates new entities by redefining subject-object relationships (1993: 24). Tuttle redefined those relationships

by taking the time to get to know bat behaviors before photographing them, much as anthropologists doing fieldwork try to understand the cultures that interest them before depicting them in visual, sonic, or written media. Thus, mimetic practices of picture taking are rooted in the structures of power that exist between bat and human, not only in the act of image-making itself, but also in the process that underlies the images.

Tuttle's campaign to change negative perceptions about bats was largely successful, as evidenced by the fact that the bat colony's nightly emergences have now become a popular tourist event. They draw both locals and visitors from around the world and are listed as a "top Austin experience" on travel websites such as Lonely Planet (lonelyplanet.com) and TripAdvisor (tripadvisor.com). In fact, it took Tuttle only four years of campaigning for Mayor Lee Cooke to declare Austin "the bat capital of America" (Tuttle 2015: x). Bats themselves have benefitted from the tourist boom, as it means they are protected from eradication. Even pest control companies in Austin now practice safe bat removal techniques and exclude them from certain human-inhabited spaces rather than poisoning them.

Currently, Mexican Free-tailed Bats generate an estimated $12 million annual income for the city of Austin through ecotourism; their images are featured on items ranging from posters for local rideshare companies to purchasable souvenirs, and the façade of music venues such as the 6th street Bat Bar (Tuttle 2015: xi). The official drink of Austin, determined in an annual competition as part of the city's summer Bat Fest, is the "batini" (Smith, telephone interview with author, June 19, 2017; Sayre 2015; Alarcón 2006). Additional examples of Austin's bat fervour include: businesses such as Bat City Bartending; the Bat City Awards; celebrations in honour of National Bat Day; the mascot of Austin's former hockey team the "Ice Bats"; and Austin Community College's mascot, the "Riverbats" (Kimble, n.d.; Eventbrite, n.d.; Bat City Awards & Apparel, n.d; Cohen 2001; Austin Community College, n.d.).

The association between bats and music is particularly important because it links Austin's two most popular nicknames: "Bat City" and the "Live Music Capital of the World." Both these nicknames emerged in the early 1980s during a time when policy shifts geared towards increasing tourism were enacted by local government. As Barry Shank describes in *Dissonant Identities* (2011), following a period of economic growth that peaked in 1984 — the same year the Congress Avenue Bridge colony reached its peak size — the Austin Chamber of Commerce turned its eye to promoting Austin as a friendly city. The Texas Music Association, working in conjunction with the Chamber of Commerce, initiated a campaign to increase the presence of the professional music industry in Austin, promoting it as a key element that defines what "makes Austin special" (Shank 2011: 197, 199, 200). The success of the television program *Austin City Limits* was key in marketing this element of Austin identity to the broader public. The fact that both Austin's identity as a music city and as a bat city emerged precisely when Austin became a popular tourist destination means that they became conflated.

It is worth noting that recourse to the natural has a long history in conjunction with Austin music making. In particular, Travis Stimeling points out that the progressive country scene of the 1970s utilized natural and pastoral imagery to articulate a sense of both local identity and geographic distance from the mainstream music industry located in urban areas like New York City (Stimeling 2011: 9). Austin's pastoralism was linked to the nostalgia of the "back to the land" movement which sought to combat the pressures of modern development with a return to nature.

Yet as Latour notes, the idea that a modernity disconnected from the natural world could exist at all is a fallacy, and the same is true for Austin's construction of authenticity predicated on a return to the natural. The rise in Austin's status as an alternative music mecca coincided with the arrival of major companies like Texas Instruments, IBM, and Samsung, which contributed to massive population and economic growth that the city continues to experience

today (Stimeling 2008: 9). The simultaneous development of a mainstream high-tech culture and a musical counterculture locked the two areas into a relationship of co-dependence that has become increasingly visible over time. It is perhaps no accident, then, that the bats at the Congress Avenue Bridge — which quite literally links the urban development of downtown with the countercultural South of the city — have come to represent Austin in its current manifestation.

Bats are not the first animal species to be marketed as symbols of Austin's alternative identity. Most notably, the nine-banded armadillo (*Dasypus novemcinctus*) was the mascot of the Armadillo World Headquarters in South Austin, famous for its role in the progressive country scene of the 1970s. The venue drew its name from the ubiquitous mammal with "ears like those of a rhinoceros, a tail like that of an opossum, a proboscis somewhat like that of an anteater, and a hard, protective shell around its vitals that scrapes against rocks as it waddles along" (Reid 2004: 64), known around Texas for their "total disregard for automobiles" (Patoski 2015: 8). While on one hand the animal's "armoured" body plan paralleled the building's history as an armoury, its reputation as a pest species also appealed to the founders' perception of their venue's location in South Austin, the source of the city's countercultural movement. Interestingly, while armadillos do not undertake seasonal migrations as bats do, the gradual movement of their populations north into the United States from Mexico in the 19th century also marks them as "border crossers" in a certain sense.

The rise of the armadillo as a representation of Austin counterculture is largely indebted to Jim Franklin, who was to join Eddie Wilson and Mike Tolleson as one of the founders of the Armadillo World Headquarters, though cartoonist Glenn Whitehead had previously used the armadillo in the university satire publication, *The Ranger*. Franklin was already known for his "fetish" for depicting armadillos on posters at the time of the venue's formation (Patoski 2015: 7-8). His first poster, created for a benefit at Woodridge Park in 1968, featured an armadillo

smoking a joint and was geared towards aiding those in the local music scene who had been incarcerated for drugs (Patoski 2015: 8). It became a symbol of the Austin underground because it "embod[ied] the plight of the Texas hippies — reclusive, unwanted, scorned" (Reid 2004: 64). The response of UT Board of Regents head Frank Erwin, widely despised by the hippie community, to these images as a symbol of a "leftist plot or cult" further spurred the proliferation of armadillo imagery (Wilson and Sublett 2017: 7). Franklin also acted as master of ceremonies at the Armadillo World Headquarters, which involved wearing an armadillo mask along with a five-foot cowboy hat and Planters Peanut suit, thus establishing the armadillo as an element of the counterculture's performative identity in a more literal sense (Reid 2004: 62).

Of course, countercultural identities are predicated on a *response* to more normative cultural forms, and the armadillo was no exception. The traditional Texan identity against which the Armadillo World Headquarters – and later, Austin's bat scene – responded is exemplified by the University of Texas at Austin's mascot: the Texas Longhorn. The Longhorn, affectionately known as "Bevo,"[15] is a symbol of Texas' centuries-old cattle industry, carrying with it connotations of rurality, pastoralism, and nostalgia for a historic past. When Bevo was presented as a gift to the school during halftime of a Thanksgiving football game against Texas A&M in 1916, T.P. Buffington (class of 1892) gave the following speech:

> I have been requested to present to the University of Texas a Mascot or protecting spirit that now and in the future years will bring good luck to the institution and its teaching. Behold him! the Longhorn of Texas, emblematic as he stands of the fighting spirit of progress as well as of the more modest angel of use. He conquered the wide prairies and the forests; able, like George Barrows' tall Isopel

15 There appears to be some debate about the origins of the name "Bevo." Some suggest that it is derived from the term "beeve," a pluralization of "beef" commonly used by ranchers to refer to steers set to become food. Other theories include a reference to a popular non-alcoholic beer or the "myth" that the animal was branded by an opposing sports team from Texas A&M University, (Neff 2001; Alcalde 2013).

> Burners,[16] coming from the great house, to take his own part. In spite of tick and vile mosquito, he made a restful bed among the soft mosses and nodding flowers. He fought with the sullen fevers of southern climes and breasted with stern patience the wild blizzards of the North. Yet, withal, he fed the hungry millions, and many a dainty foot through him has walked in beauty and in safety down the roughened road of life.
>
> As the great longhorn was free to roam the wildernesses of Texas, so must the University be free to roam the world of thought, unhampered and unafraid… (*Alcalde* Dec. 1916, Vol. 5, No. 2, 101-2)

Reverence for Texas' cattle industry is readily apparent in Buffington's speech, as is a romanticization of humans' place in "conquering" the prairies and forests. Unlike the armadillo and the bat, the Longhorn is an introduced species, associated with direct human action to shape and change the natural world. The literal "branding" of the university with an agricultural species links it to a fantasy of pre-modern life, articulating a nostalgia for a time when humans were closer to the land, a wistful remembrance of a time before the technology boom. As such, Bevo, the armadillo, and the bat all serve similar functions in negotiating human positionality within a multispecies environment, a negotiation predicated on aesthetic representation. The "becoming with" implied by these multispecies negotiations, however, is a function of 21st century narratives in which urban "moderns" must recall a more "natural" past in order to understand their own decentralized position in a multispecies world, something they achieve through the act of image-making.

Bevo was not the university's first mascot; that honor goes to a Pitbull known as "Pig," who served until 1923 at which time he was given an elaborate funeral. Though Bevo first appeared as a "stunt" planned by Stephen Pinckney (class of 1911) and one hundred twenty-four other students in 1916, he was unpopular, eventually becoming the main course at a football banquet (!). It wasn't until the arrival of the second Bevo in 1932 that the Longhorn became

[16] Possibly a misspelling of English author George Henry Borrow and his travelogue "Isopel Berners, the History of Certain Doings in a Staffordshire Dingle, July 1825."

popularized as a mascot. This may have been an effort to rally around cattle ranching as a symbol in a dwindling market, threatened by the Great Depression.

Bevo's connection to the cattle industry is manifest by his handlers, a student volunteer organization known as the Silver Spurs. Many of the students who work with Bevo come from cattle ranching families, and their uniform – a burnt orange button-down shirt, white cowboy hat, and spurs – indexes their membership in that community. Their work as a part of the Silver Spurs organization is commemorated in a small museum on a lower floor of Texas Memorial Stadium, which includes artifacts, photographs, and memorials to each of the sixteen iterations of the bovine mascot.

Images in the museum suggest that the Silver Spurs have tended to be male. The pastoralism implied by Buffington's introduction of Bevo also implies masculinity, as images of the hard-working Texas cowboy rarely account for the contributions of women. In addition, Bevo typically appears at university football matches, an arena that is widely acknowledged as being exclusive towards women. As a result, the bats challenge to the dominance of cattle industry imagery also contests patriarchal narratives. In the 2010s, however, Austin is perhaps better known for its music industry than for its proximity to cattle ranching, meaning that sonic of representation and species like bats with strong associations with sound are even more indicative of multispecies processes of becoming with. Of the many currently existing bat-themed musical groups (The Bat City Rhythm, The Bat City Six, The Bat City Bombshells, Echo and the Bats, to name a few), many cite not only bats' close association with Austin as a motivation for their band name and aesthetic, but also bats' propensity for echolocation. Kathleen Houlihan, of the all-librarian, youth literacy-oriented band Echo and the Bats, described it in the following way:

> The bat is sort of the unofficial mascot of the city of Austin. Austinites feel really protective and passionate about and love their bats. And it's a weird thing to have as a mascot, so it embodies all of those wonderful things, it's a little edgy and a little kooky. There are also elements of it in a band, sound and participatory songs… (interview with author, March 24, 2017)

Echo and the Bats seek to literally embody bats in their performances by not only dressing up as them, but also by including call and response elements in their songs, which they conceptualize as similar to echolocation. This seeks to literally embody the relationship between bats and rock music as markers of Austin identity. However, just as the Armadillo World Headquarters largely drew its symbols from visual art, Austin now abounds in images that literally depict bats in musical performance. Some of these images merely show bats and musical symbols together, such as the mural on South Congress Avenue depicting a cloud of bats surrounding the statue of music icon Stevie Ray Vaughn, or bats flying around Santa Claus on the program for the annual Holiday Sing Along and Downtown Stroll. Others more literally depict bats as musical performers, such as the logo used for radio station KMFA's "Listen Local" series, which shows a bat wearing headphones, or a cardboard cut-out at the downtown Trader Joe's Grocery, which allows shoppers to assume the dual identity of musician and bat by placing their face in the frame of a cardboard cut-out of a bat wearing cowboy boots and playing a guitar (Figures 2.3 and 2.4).

However, the relationship between bats and music in Austin is more than just symbolic. Each year, the city holds its annual BatFest on the Congress Avenue bridge, combining the spectacle of the Free-tail colony's nightly emergence with musical acts and vendors. Now in its fourteenth year, the festival has gradually shifted its focus to strongly emphasize music, though initially Bat Conservation International was deeply involved in the production of the event, including setting up an information booth and receiving a portion of the proceeds from ticket sales (Smith, telephone interview with author, June 19, 2017). Though a few vendors feature bat-

related products and there is still a bat costume contest, for the most part the festival is focused around musical performances at stages on the Congress Avenue Bridge, which stop in time for the nightly emergence of the bats.

What is striking about BatFest is that the combination of the music festival and the nightly emergence of the Mexican Free-tailed Bats serves to transform the latter into a performance event. Though the bats can be seen on almost any night of the summer from many locations in the south of the city, the festival involves blocking off the entire Congress Avenue Bridge, including a designated "viewing area" on the south side near the parking lot of the Austin-American Statesman.[17] Festival visitors must purchase tickets in order to access these locations, which on any other night would be accessible free of charge. In fact, according to the event's promoter, French Smith, the central idea of the festival has to do with the location, not so much the bats themselves (Smith, telephone interview with author, June 19, 2017). However, he amends this statement by pointing out that at the time of the festival's initial creation, viewing the bat emergence was not as popular a tourist event as it is now, thereby promoting it as part of the music festival was seen as a way of engaging with the nightly feeding emergence. Whether the festival helped to promote the popularity of viewing the nightly emergence is debatable; however, the large number of participants in the 2017 festival speaks to the effectiveness of the event's promotion.

R. Murray Schafer's soundscape theories are useful for thinking through BatFest's commodification of the Congress Avenue Bridge emergence. Schafer defines a soundscape as "any acoustic field of study," which implies that a human researcher is necessary to delineate the presence of a soundscape (1994[1977]:7). His theory also comes with implicit biases that privilege natural sounds over mechanical ones, belying a belief in the separation between human

[17] Incidentally, the viewing area offers a somewhat obstructed view of the emergence, which begs the question as to what politics were involved in its designation as such.

culture and pre-existing nature. Similarly, in the case of BatFest, the emergence becomes meaningful because humans delineate its importance, pinpointing the natural sounds of the bats calling underneath the bridge amidst the cacophony of downtown Austin traffic.

When Merlin Tuttle retired from BCI in 2008, the organization became less involved with BatFest. In recent years, they have also shifted focus away from educational projects and have begun to emphasize research. The Bat Loco Bash, held in San Antonio each year, still includes BCI involvement, perhaps because of the close proximity of Bracken Cave, a BCI-owned property that houses the world's largest colony of Mexican Free-tailed Bats (roughly 15 million at its peak). In 2017, the Bat Loco Bash included a bat costume contest, visits from the "Bat Man of San Antonio" and the batmobile used in the 1960s Batman television series starring Adam West, and bat-themed activities for kids, including a "bat dance" that symbolically re-enacted echolocation. The expansion of bat festivals into San Antonio marks the success of Tuttle's conservation work in Austin and demonstrates that it has been replicated in states as far away as Wisconsin, Michigan, Minnesota, and Indiana. However, conceiving of these other bat festivals as imitations of the Austin original would be a mistake, as BCI has a presence in some other cities (including San Antonio), and members of the scientific community are shared among others. Hence the various bat festivals are a linked network originating from the same people and ideas.

Figure 2.4: Logo for Austin local radio station KMFA's "listen local" series. From kmfa.org.

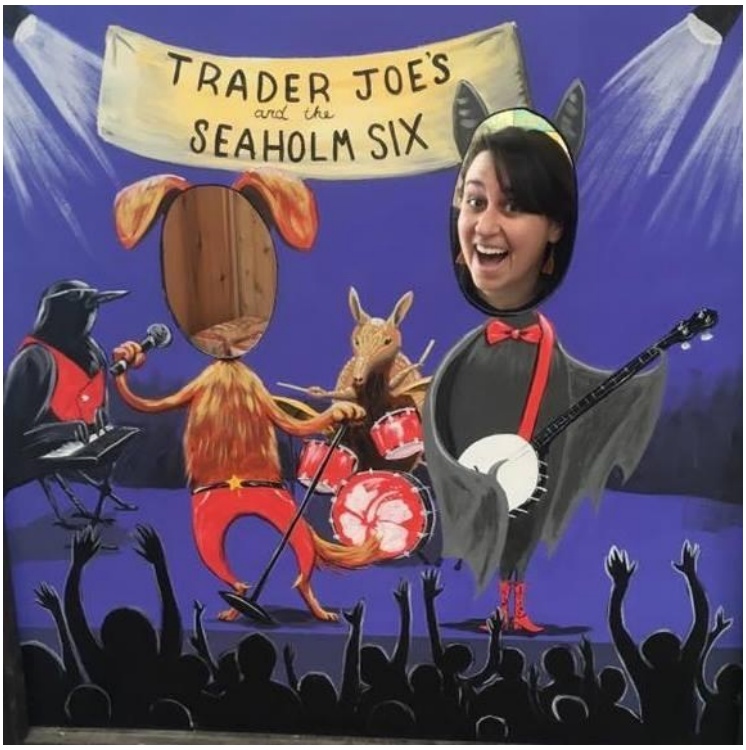

Figure 2.5: Bat cut-out at Trader Joe's grocery in downtown Austin. Photo of author by Anneke Valk, October 14, 2016.

BAT CITY SURFERS

The extent to which Austinites have internalized both music and bats as markers of identity is exemplified by "horror surf" band Bat City Surfers, who not only use bat imagery in their performances, but whose very brand carefully demarcates their relationship to Austin as a city. They chose their moniker for its straightforward description of their style and locality, which has unintentionally led them to be frequent ambassadors for the Congress Avenue Bridge bat colony, answering questions for curious tourists.[18] They also find that their merchandise sells because of their depiction of iconic buildings such as the Frost Tower, the Texas State capitol, and the UT tower. However, rather than merely being of geographical interest, the Bat City Surfers use bats to symbolically reject both Texas conservativism and the national music mainstream in a manner similar to that of the Armadillo World Headquarters.

The horror aesthetic is more than just a costume or a cartoon: the Bat City Surfers have developed a mythology to explain their origins as the descendants of bats. As their website states: "We come from a world where man-kind evolved from bats and, after joining forces to create the ultimate surf-punk experience, we accidentally transported ourselves into this dimension during a recording experiment gone horribly wrong!" (Bat City Surfers, n.d.). The close biological alignment with bats constructed by this mythology suggests not only a deep internalization of Austin's relationship with its bridge bats, but also a sense of identity as formulated through inter-species relationships. Therefore, bats are not adopted as mere symbols but are acknowledged, however humorously, as contributors to the formation of the group's ethos in its present form.

Because surf music is characterized by a lack of vocals (in contrast to the so-called "surf pop" of the Beach Boys), the Bat City Surfers rely on visual and sonic references to convey their

[18] Though the group's name may sound somewhat similar to the "Butthole Surfers," the 1980s band from San Antonio was not a direct inspiration for the Bat City Surfers' brand. They are, however, fans.

relationship to bats, rather than lyrics. Drawing from the likes of surf guitar legend Dick Dale but infusing their musical style with grungier, thrashier sounds more akin to metal or punk, Bat City Surfers utilize an aesthetic drawn from horror tropes. Sometimes these references are overt, including screening classic horror films while they perform, or excerpting audio from public domain horror films on their recorded albums (Magenheimer 2016). Visually, they wear fake blood as a "gimmick" to differentiate themselves from other surf bands, and wear bat hats, Batman belt buckles, and other symbolic representations of bats that link them to the city's countercultural identity.[19]

Perhaps most notable of these images is the band's logo, which shows three iconic Austin buildings (the Frost tower, the UT tower, and the state capitol) over two giant bat wings (Figure 2.5). However, unlike similar images from other bands or media that show bats and the city as separate entities, the Bat City Surfers logo appears as if the buildings are substituting for the bat's head, creating a techno-hybrid bat city. The all-encompassing hybridity (or perhaps coltishness) implied by the image is echoed in the group's oft-spoken mantra following their title song in performances: "we are all bat city surfers."

[19] The band members all use stage names humorously derived from horror or science fiction tropes, each with his own backstory: lead guitarist Omega Rand is "a man out of time; hailing from a bleak, distant future ruled by machines"; rhythm guitarist Joy Muerto is "the only dead man with insomnia"; bass guitarist Vampire-Hunter Hunter is "the legendary slayer of all vampire killers"; and drummer Korn Rolla is "descended from a long line of ancient, tentacled sea beasts" (Bat City Surfers, http://rer623.wixsite.com/batcitysurfers/biography-of-bat-city-surfers).

Figure 2.6: Bat City Surfers logo.

The group's sound can also be read as linked to their self-identification as bat descendants. While reverb is generally considered a key characteristic of surf music, used to evoke a "wet" sound arguably relating to the experience of "catching a wave" (Omega Rand and Joey Muerto, interview with author, April 6, 2017; Cooley 2014: 52), it is also used as a way of evoking spatiality, something that has been discussed by authors such as Peter Doyle (2005: 7). In the case of the Bat City Surfers, the spatiality implied by the use of reverb and other echoic electronic effects can be seen as imitating the process of echolocation, further emphasizing their identification with bats. They utilize octave-shifting effects, which though not immediately obvious to the listener, are reminiscent of tools known as "bat detectors," devices that scientists

use to pitch shift echolocation calls into the audible hearing range of humans (discussed in chapter five).

The Bat City Surfers' use of surf music, their reliance on technology, and recourse to horror imagery all clearly index their masculinity as well as their relationship to bats. While it might be tempting to read this masculine posturing in light of science's historical privileging of masculine bodies and ideas, when contextualized more appropriately in the history of Austin, their work creates space for expressing a kind of alternative masculinity. As with Jim Franklin's work at the Armadillo World Headquarters, the Bat City Surfer's choice of a bat – and their reliance on "alternative" genres like surf and punk – juxtaposes them with more normative masculine identities symbolized by figures like Bevo the Longhorn. We'll see another example of this with scientific parody songs in the last chapter of this dissertation. Blurring the lines between truth and (science) fiction allows the Bat City Surfers to align themselves genetically on a continuum with Chiropteran species. This genetic relationship is articulated through the use of technology in both visual and sonic image-making that results in a kind of "becoming with" bats as conceptualized by Haraway. In the act of image-making, the Bat City Surfers more literally adopt bat-like personality elements themselves — thus subverting the relationship of symbol and signifier, emphasizing the complete integration of both bat and human species in the formulation of their identity, and negotiating a place in a complex natural-cultural world.

CONCLUSIONS

The Congress Avenue Bridge colony has become, for many, synonymous with Austin's identity as a city. The process by which this has occurred is complex, involving both human and non-human actors. It has resulted in major revisions to cultural narratives surrounding bats themselves, but also to the ways in which Austinites negotiate their relationship to the natural world through music. The examples discussed in this chapter are only a small sampling of the

types of bat-related artistic production currently occurring in Austin, but they are also some of those that most thoughtfully consider human-bat relationships.

The story of Austin's bridge bats is important not only because it helps us to reconsider the relationships between humans and non-human species but also because it helps us to recognize that these relationships are present in all kinds of environments, not simply those considered "traditional" or "indigenous," as early writings by Steven Feld or studies in ecomusicology might suggest. In fact, the presence of non-human species in the Austin area has been crucial to its identity as an urban, 21st-century city. Such interspecies ties not only clarify and help establish its locality, but also articulate a form of alterity in the face of the globalizing present. As Latour pointed out in the early 1990s, the fluid relationship between nature and culture is a feature of the antimodern present throughout the world. While we might characterize modern, urban environments as lacking the influence of the "natural" world, we really "have never been modern," but remain deeply connected parts of the ecosystems that surround us.

Most importantly, in the case of Austin, these complex negotiations are drawn from processes of "becoming with" that result from mimetic representations of bats in visual and sonic media. Thus, the relationship between Austin's music scene and bats is not arbitrary but is in fact necessary for understanding how human beings and non-human animals are situated within complex nature-cultural ecosystems. It is through aesthetic practices that these relationships are negotiated, defined, and revised.

Chapter Three: Bat/Man: Bios-mimesis, Echolocation, and Spatiality in New Music

INTRODUCTION

In 1974, Thomas Nagel posed the question, "What is it like to be a bat?":

> It will not help to try to imagine that one has webbing on one's arms, which enables one to fly around at dusk and dawn catching insects in one's mouth; that one has very poor vision, and perceives the surrounding world by a system of reflected high-frequency sound signals; and that one spends the day hanging upside down by one's feet in an attic. In so far as I can imagine this (which is not very far), it tells me only what it would be like for *me* to behave as a bat behaves. But that is not the question. I want to know what it is like for a *bat* to be a bat" (Nagel 1974: 436).

With this quote, Nagel argues that we can never understand the experience of another being because we are constrained by our own physical bodies. This thinking has led humanities scholars in a variety of fields to shy away from topics pertaining to the subjective experiences of non-humans, arguing that to do so is not only anthropomorphic, it is also futile.

However, while we may never understand what it is like for a bat to be a bat, authors such as Michael Taussig and Karen Barad have demonstrated that even mere *attempts* to do so can be fruitful. Taussig's work on mimesis suggests that the attempt to become like someone or something else is "as necessary to the very process of knowing as it is to the construction and subsequent naturalization of identities" (Taussig 1993: xiii-xiv). Barad's theory of agential realism argues similarly that theorizing, experimenting and other forms of discourse are material agents that bring about and create the objects about which they extemporize (Barad 2007:55). In other words, the processes by which we "put ourselves in others' shoes," to use a colloquialism, are not only crucial inroads to reconsidering what we already think we know, they are also

creative agents that formulate subjectivities, bodies, and multispecies assemblages. Recent research in science and technology studies has offered ways of understanding human imitation of animals in terms that go beyond simple totemism or straightforward representation. As discussed in the previous chapter, Donna Haraway has described human-animal relationships as processes of "becoming with" (Haraway 2008: 15), in which living entities do not exist prior to their interactions with others but are created through processes of relationality. Similarly, Karen Barad has used the theory of quantum entanglement from particle physics to demonstrate that all matter – and therefore bodies – are interconnected, even when they no longer remain in physical proximity to one another (Tsing et al 2017: 110). The process by which Nagel relates to bats in his thought experiment, then, is not merely a case of human imitating animal, but one in which he and the bat jointly become a hybrid bat-man through association.

In the chapter that follows, I examine real-world examples in which human beings have "become with" bats. Scientists, some of whom are my interlocutors in this study, describe this process as "biomimicry," a term that designates a specific type of imitation geared towards the design of systems or products modeled after biological processes (Benyus 1997: 2). A classic example is the airplane, or more relevantly for our purposes, sonar. However, biomimicry is associated with patriarchal notions of progress and development under the aegis that all animal bodies and knowledge should serve human advancement. It further implies a definition of humanity that is exclusively male, white, heterosexual, middle-class, able-bodied, and a host of other normative characteristics. For this reason, I use a slightly altered term, *bios-mimesis,* to describe examples of Haraway's "becoming with" in the context of scientific experimentation. The invocation of the Greek root *bios* recalls Geogrio Agamben's thesis on "bare life" in which political entities invoke their power by separating biological existence from political power and rights (Agamben 2000:2-3). In the case of the laboratory experiments in the case study that follows, *bios* serves to highlight an ethical complexity that simulates the assignation of political

power through imitation of non-human species, while simultaneously denying animals their personhood through the violence of the experimentation process. The examples in the chapter thus sit in an uncomfortable paradox in which my interlocutors become hybrid "bat-men" through their material and discursive relationships with bats, thereby destabilizing human exceptionalism and identity in the nature-cultural world, but at an unfortunate cost to the participants in the human-bat assemblage.

As Audra Simpson (2014) has argued, mimesis was central to the development of ethnological and later ethnographic research, where "playing Indian" eventually morphed into "going native" (77). The question of mimesis in this chapter therefore applies not only to relationships between humans and non-human animals, but also to those humans who have been denied personhood through scientific and anthropological study. That being said, non-human animals present a particular problem because they cannot self-represent in ways that are intelligible to us, so any attempt to engage with animal subjectivity is ultimately to create these kinds of fictions. Unlike zoömusicologists who attempt to valorize the use of these techniques that have proven deeply damaging to subaltern human groups, I am not trying to say that it is simply "ok" to impose our own imaginaries onto Others, be they human or not. Rather, I am attempting to unravel the processes by which we create these imaginaries, situating them appropriately in the discourses and ideas of their progenitors. Furthermore, I suggest that as long as we can acknowledge the asymmetrical power relations that construct these imaginaries, they have the potential to gesture towards a more empathetic approach to research.

I begin by briefly glossing the history of echolocation, particularly interrogating the human-bat laboratory relationships that, following Barad's agential realism, I argue created it. I focus on the notion of "sonic sight" in which echolocation is envisioned as a method by which bats can "see" using their ears. While in many ways this section follows the work of David Rothenberg who has used the insect body plan to reconsider what it means to "hear" (Rothenberg

2003:115), I focus only briefly on the physiological nature of Chiropteran hearing at length, basing my argument more on its construction and conceptualization as a result of human/non-human interactions.

These interactions are exemplified by the second section of the chapter which discusses bios-mimetic applications of echolocation used by blind and visually impaired humans. These humans more literally address Nagel's question of "What is it like to be a bat?". Finally, I conclude with a discussion of bios-mimesis in Austin-based composer Steve Parker's work *Bat/Man*, which seeks to reconsider the possibilities of sound, its spatiality, and the ways in which multispecies interactions productively construct social and auditory processes. All three case studies demonstrate that becoming with bats through bios-mimesis expands our understanding of sound as both spatial and tactile and help us re-envision what we have previously considered to be the limits of the senses. However, the bios-mimetic examples in this chapter remain couched in and validated by traditional hierarchical institutions, such as laboratory science and Western European Art Music. As such, "Bat-*man*" is not an abstraction of "Bat-*people*," but contains and implies specific types of gender relationships, most specifically the notion that to be human is to be male. The symbolic and real violence implicated in these projects comes into tension with the radical empathy produced by self-conscious attempts to become with other species, such that two mutually exclusive moral opposites uncomfortably co-exist, unresolved, in the practices contained in this chapter. By imitating other species, the humans in this chapter therefore not only revise their own understanding of their own senses, the unitary nature of the human body, and their relationships to other species, they also come to understand the power and control implicit in the intra-actions that lead them to that understanding.

THE MULTISPECIES HISTORY OF ECHOLOCATION

Seeing with their ears

A quick Google search evidences the commonality with which the phrase "seeing with their ears" is used to describe echolocation in popular science publications. It would be tempting to assume this is merely science's inability to break free from modernist conceptions of the primacy of sight over sound, which have been thoroughly deconstructed by sound studies authors such as Jonathan Sterne, Veit Erlmann, and others.[20] However, while the scientific experiments that initially articulated echolocation were framed around the sight-sound duality, the ultimate crystallization of echolocation as a behavior and practice ultimately does not prove sound's ability to replace sight, but rather offers a redefinition of sound as inherently tactile and deeply spatial.

Sterne and Erlmann have both argued that the despite the prevalence of visual metaphors used in describing the rise of Enlightenment rationality, 18th-century practices and beliefs were neither exclusively visual nor rational. Narratives about the alleged superiority of sight are encapsulated by what Jonathan Sterne has called the "audiovisual litany," or a series of attributes that situate vision as connected to rationalism (Sterne 2003: 15). The phrase "to see with one's ears," then, hearkens back to discourses that pit sight against sound, devaluing any persons, animals, or practices for whom vision is not the main method of perception. As I will demonstrate, "seeing with their ears" is not an accurate representation of echolocation as a practice or a history, which instead requires a broader, more material understanding of sound, and of the agency of human-animal assemblages in formulating discourse. Following Erlmann's notion of "reasonance," or the blending of reason and resonance, the merging of objective

[20] See the introduction to this dissertation.

reflection with collapsed subject-object dichotomies, I argue that echolocation is spatial, tactile, and formulated by material intra-actions among many different types of bodies (Erlmann 2010: 10, 31).

In the present day, echolocation is typically understood as a navigational technique in which an (human or non-human) animal produces high-frequency sounds and listens for their reflection off of objects in their path. By analyzing the time lapse between the initial call and its return, the brain is able to infer information about the animal's direction and distance from a target object, in addition to information about its general size and composition (Wilson 1997:17). However, because early experiments studying bat navigation took place long before the invention of high-frequency microphones, the spatiality of this behavior remained opaque. Rather, bat navigation was deeply embroiled in the tension between cultural perceptions of the primacy of sight and its supposed supplanting by hearing. The conflict between these two senses eventually led to reconsiderations of the possibilities of both.

Italian scientist Lazaro Spallanzani framed the issue of echolocation around the question "how do bats navigate without sight?" In 1793, he observed that owls became disoriented when they unexpectedly blew out a candle flame with their wingbeats and was surprised to discover that the same thing did not occur with bats. In order to probe this dilemma, Spallanzani conducted a series of experiments in which he captured bats, blinded them with a hot wire to the cornea or surgically removed the eye, and then blocked one of their other senses to see if they could still navigate (Galambos 1942: 133). After having their tongues cut out, their nostrils plugged, their ears filled with wax or small tubes, and their bodies varnished and coated in flour paste, the bats were still able to navigate around his room in Italy, or back to the bell tower where they had originally been caught, leading Spallanzani to conclude that bats must have a sixth sense (Galambos 1942: 134). The sixth sense hypothesis was largely based on Spallanzani's deep-seated preconceptions about what the senses were and how they worked; if

bats did not use sight, or sound, or touch in ways that humans did, they must have some other physiological attributes.

Shortly after, Swiss scientist Louis Jurine convincingly demonstrated that functioning ears were necessary for bat navigation. However, other scientists remained skeptical, entrenched in the sight-centric rhetoric of the time in which they lived. Renowned French zoologist Georges Cuvier, for example, was quick to criticize Spallanzani's hypothesis, stating that there was no reason to assume that bats navigated by anything other than the senses as traditionally conceived. Cuvier instead hypothesized in 1795 that bats must navigate by a sense of touch. Despite his lack of experimental data, Cuvier argued that "in his opinion two types of touch exist, namely, sensation arising from actual contact with a solid body, and sensation arising in the skin due to movements of the air" (Galambos 1942: 136). What Cuvier may not have realized due to the state of acoustics research at the time was that this second type of "touch" is also remarkably similar to Müller's definition of hearing: objects in motion compress molecules in the air that reach various structures in the ear and send information to the brain.[21] The confluence of Spallanzani's sixth sense, Jurine's use of the ear, and Cuvier's theories about touch thus come together to offer a conception of hearing that not only conceives sound as deeply spatial and tactile, but that functions differently from the conceptions of hearing offered by their contemporaries. Echolocation is therefore not a form of seeing with the ears as popular science might contend, but an expanded understanding of hearing that emphasizes its materiality. Accessing broader notions of hearing relies on considering the perceptual experiences of species beyond the human.

[21] Additionally, Sterbing D'Angelo et al (2011) have demonstrated that microscopic hairs on bats' wings are directionally sensitive, meaning that Cuvier was not entirely wrong in suggesting that touch functioned in navigation during flight.

Though scientists often justify experiments like Spallanzani's with arguments about collective knowledge outweighing the suffering of an individual, Spallanzani's work was criticized for its violence to his test subjects. The argument was not on moral grounds, however, but experimental ones: some argued that his bats were not successfully able to navigate precisely because of the physical damage they experienced, which prevented Spallanzani from reaching an accurate conclusion about their navigational abilities. Spallanzani's experiment failed because he took a functional approach to what was ultimately an empathetic question – by failing to consider the phenomenological aspects of the bats' sensory experience, he was ultimately unable to arrive at a conclusion as to how the senses worked on a mechanical level. By assuming that he could not know what it was like to be a bat, he was ultimately unable to address questions pertaining to the functionality of the senses. Cuvier's invocation of the concept of "sensation," however, implies a kind of empathetic understanding of Chiropteran subjective experience. Thus despite a lack of experimental data, Cuvier's reconstruction of Spallanzani's data was ultimately more productive because it was predicated on imagining what it might be like from a bat's perspective.

At the same time, the ethical implications of Spallanzani's experiments cannot be ignored. Rachel Mundy has addressed the question of "whether knowledge [is] worth killing for" (Mundy 2018: 84) in her discussion of musical vivisection without arriving at clear conclusions. Similarly, in the case of Spallanzani, the ethical costs of his work sit uncomfortably with his conclusions, harming the victim with asymmetrical benefit to the researcher and his/her/their species. While working in the laboratory allows researchers to become with bats, each changing the other, the question of cost and benefit remains in the air, perhaps unresolvable.

Nonetheless, it would be a mistake to reject the information gleaned from Spallanzani and his contemporaries' work simply because of their violent methodologies – not least of all because advances in scientific ethics have sought to regulate animal abuses in the laboratory in

future experimentation partially as a result of experiments like Spallanzani's. Rather, the reconceptualization of sound offered by early experiments in echolocation is inseparable from its violent history, and to ignore it would be to overlook the unwilling sacrifices of many Chiropteran participants. This would deny them their political life, their *bios*, within the context of multispecies history. Understanding the importance of Spallanzani's work, then, relies on an interpretive reading in which we attempt to empathize with bats not just as winged beings who use their voices to "see" or "hear" the world around them, but also as subalterns subjected to the dominant forces of the anthropogenic institution.

Bat-Human "Monsters"

In Spallanzani's time, as (unfortunately) for many people today, bats were not considered valued individuals with phenomenological experience. So despite critiques of the scientist's methods, Spallanzani's treatment of his test subjects may not have been received with the same amount of horror as it evokes for us.[22] However, Spallanzani's work with bat senses ultimately underscores the deep-seated linkages between humans and other species in ways that reflect Haraway's theory of "becoming with," or Barad's quantum entanglement. Spallanzani considered bats to be a liminal species that existed somewhere between mammals and birds, and so believed that understanding bat hearing involved understanding the line between humanity and animality. In his *Tracts on the nature of animals and vegetables*, Spallanzani commented that

> nobody, that I know of, has made experiments upon an animal which partakes both of the nature of a bird and of a quadruped, although it is not properly either the one or the other. I speak of the bat; this animal, so disgusting and forbidding in appearance, but which is at the same time as perfect as other animals, and

[22] Medical textbooks prized consumption of bat flesh for gout, rheumatism, liver cirrhosis, and cancer, treating bats as functional agents in an environment designed to serve humans rather than as living beings (Kemp 2017: 44).

> connects quadrupeds with birds. The ambiguity in the nature of these animals, made me wish to make them respire the same air in close vessels (Spallanzani 1799: 225).

Notwithstanding the value judgements placed on bat appearance, Spallanzani's experiments were ultimately about understanding the relationship between four-footed animals and birds, and therefore the linkages between all species. Multispecies relationships according to Spallanzani were predicated on relationships of *similarity* rather than difference, an issue I discuss further in chapter five.

Spallanzani's relationships of similarity were indebted not to Darwinian evolutionary theory which would not yet appear for 60 years,[23] but to Carolus Linnaeus' *Systema Naturae,* a massive work of scientific classification that formed the basis of modern taxonomy. Linnaeus was the first to classify bats as mammals rather than birds, further emphasizing their close connection to humans.

Linnaeus' work not only established a taxonomical relationship between bats and humans; he also laid the groundwork for understanding human-bat assemblages and his conceptual formulation of "monsters." The latter creatures, which included the Phoenix, the Hydra, and the Satyr, are holdovers from mythological writings and yet make up one of the "kingdoms" of Nature defined by Linnaeus. Anna Tsing, Heather Swanson, Elain Gan, and Nils Bubandt have used monsters as a way of thinking through human-non-human relationships in the era of ecological crisis. They argue that, "on one hand, [monsters] help us pay attention to ancient chimeric entanglements; on the other, they point us towards the monstrosities of modern Man" (Tsing et al 2017: M2). Similarly, Linnaeus' inclusion of monsters in his taxonomy of life on earth points not only to multispecies assemblages that blur species divisions, but also to the

[23] A theory that has been used to justify a broad variety of abuses in culturally oriented fields, including ethnomusicology. See, for example, Stephen Jay Gould's *The Mismeasure of Man* on scientific racism and its roots in evolutionary science.

structures of violence that bring these assemblages into being. Linnaeus' monsters, like bios-mimetic practices that help us imagine what it *might* be like to be a bat, underscore deeper truths behind human-non-human relationships precisely because they exist somewhere in between fantasy and stark objectivity.

Bat-human "monsters" remain extant in assemblages formulated between bats and humans in the laboratory and continue to form the basis for scientific research on bats. In particular, as a part of fervent debates about bat phylogeny (classification based on evolutionary relationships), Australian neuroscientist Jack Pettigrew even suggested that flying foxes[24] were a kind of "flying primate" (Laird 2018: 11). In support of this, he cited bat "nurseries," Megabat menstrual cycles, and bat positioning during defecation (upright vs. upside-down), as characteristics of flying foxes that were more common to primates than other mammals. More importantly, he suggested that flying fox eyes and optic nerve wiring were primate-like and totally different from those of microbats, stating that "some bats are much less like mice or birds than they are like people" (Laird 2018: 13). This emphasis on vision seeks to de-center Cuvier and Spallanzani's work to situate echolocation as a sense equal to sight; it falls back on older narratives that consider vision to be the seat of rationality and therefore humanity. By appealing to vision-centric narratives, Pettigrew sought to validate Megabats by situating them closer on the evolutionary spectrum to humans.

Pettigrew even proffered a "fallen angel" theory in which primates evolved first with wings and then lost them in a fascinating Biblical revision of Darwin's teleological theories about the ascent of Man (Laird 2018: 13). Pettigrew's Luciferian metaphor flips Darwin on his head – much as a bat might. Rather than suggesting humans are the (white, masculine, able-

[24] Large Australian bats typically classified as "megabats" due to their size. The differentiation between insect-eating "microbats" and frugivorous "megabats" has recently been called into question, however, as a result of genetic analyses. More current taxonomies use the terms "Yinpterochiroptera" and "Yangochiroptera," evoking the Chinese concepts of yin and yang, opposing complementary forces.

bodied) evolutionary climax of millions of years of directed development, they are instead the misguided children of a natural God. The environmentalist implications of this metaphorical reversal are inescapable, as the human impact on the natural world has been conceptualized as its own geological force in an era now known as the "Anthropocene." However, despite critiques of the term "Anthropocene" offered by Haraway, Tsing, and others, Pettigrew's "fallen angel" theory ultimately underlines the same duality present in Spallanzani's experiments: it suggests that while humans and bats bring each other into being through mutualistic assemblages, these intra-actions are simultaneously predicated on monstrous asymmetries of which humans are primarily the perpetrators.

ECHOLOCATING HUMANS

Following narratives about the primacy of sight over sound, echolocation is more closely related to human disability than it is to bat navigation due to the "agential realism" of the experimental processes that created it. As I demonstrate in the following section, later experiments in the 1950s argued that understanding echolocation was important primarily because of how it could be used to "correct" blindness in humans. Blindness was conceptualized as a malady, tracing histories that saw sight as the organ of thought and the lack of ability to think as madness (Erlmann 2010 :44). However, bats are not blind, and therefore while parallels with bat echolocation did lead to the productive development of techniques that can assist blind humans in navigation, these techniques do not really answer questions about what it is like to be a bat.

More specifically, Donald R. Griffin and Robert Galambos repeated Spallanzani's experiments at Harvard University in the 1950s, arguing that studying echolocation was relevant because of its applications to blind humans. Griffin and Galambos, responsible both for the term "echolocation" and for our present-day understanding of it, performed their experiments not on

able-bodied bats, which have perfectly adequate vision, but on bats that were deliberately blinded, just as Spallanzani did. In other words, not only did they place alter-abled humans in the same social and experimental category as non-human animals, their experiments ultimately do not tell us about bat navigation so much as they tell us about whose sensory experiences "count" as human experiences. Echolocation does not tell us what it is like for a bat to be a bat as Nagel argued, because bats are not blind. Rather, it tells us what it is like for a blind *human* to be a bat.

Unlike Spallanzani, Griffin and Galambos used reversible methods of impairment for their bats, both to eliminate potential bias due to injury and also to allow them to retest the bats afterwards. Bats were blinded with colloidin (a glue-like substance) which could be removed after the experiment, and deafened by means of glass tubes placed in the ears. While undoubtedly these methods still caused some discomfort, at minimum the bats retained possession of all of their sensory organs.

Given his work with the National Resource Defense Committee to develop live bats as a possible bomb-delivery system during World War II,[25] and considering that his work on echolocation occurred in the 1950s, Griffin's work on blindness reflects broader currents within the research community that understood disability in terms of a social project to help recuperating veterans (Couffer 1992:10). As such, he conceptualized blindness as a trauma-induced injury, making parallels between humans and the mutilated bats in his and Spallanzani's experiments somewhat more appropriate. However, because bats underwent these traumatic injuries as a result of the experimental process, his work on echolocation does not really tell us about their navigational abilities in a healthy state. Furthermore, because most healthy bats are

[25] Griffin's involvement in the project, which was to attach bombs to live bats and release them over Japan, was minimal compared to some other players, although he did conduct experiments to test the weight carrying capacity of bats in service of the project (Couffer 1992:35). In later years, when his work turned towards addressing the issue of animal consciousness, he regretted his part in the project.

not blind at all, the crystallization of echolocation as a process through Griffin and Galambos' experiments tell us more about human conceptions of disability than it does about able-bodied bat navigational abilities.

Griffin's work highlights the stigmatized nature of blindness, including claims that "blindness is always a tragedy for human beings" and that "If faced with the hypothetical choice of evils, to become deaf or blind, few but the most devoted musicians would choose blindness" (Griffin 1959: 129; Griffin 1974: 297). These statements, along with generalizations about the "inherently superior" nature of light waves as opposed to sound waves, underscore fictions of normalcy that construct alter-abled individuals, as well as non-humans, as both Other and inherently inferior, a topic that has been addressed at length with the rise of disability studies (Griffin 1974:297). Griffin's use of blind humans in experiments similar to those he conducted with bats (though without the mutilation) also recalls a long history of abuse of alter-abled humans, including their use in freak shows, as a way of confirming what Rosemarie Garland-Thomson has called the "normate," a "social figure through which people can represent themselves as definitive human beings" (Garland-Thomson 1997: 8).

Despite its conceptual shortcomings, Griffin's research has led to a widely used curriculum that offers blind people a standardized approach to learning how to echolocate, something that Chris Tabb, an orientation and mobility specialist at the Texas School for the Blind, has suggested allows them to more independently navigate the complex, vision-centric 21st-century world. As with Spallanzani's experiments, Griffin and Galambos' work sits in an uncomfortable paradox, based on problematic presuppositions and violent methodologies, yet provides useful data. Because one of the central arguments in this chapter is that it is productive to imagine what it is like to be someone other than you are, I visited with Chris Tabb in 2017 in order to experience firsthand if not what it is like to be a bat, at least what it is like to be a human using biomimetic tools derived from the study of bats. First, Tabb asked me to close my eyes for

about 20 seconds and then to describe what I heard. Primarily I focused on a large fan (probably the air conditioning) in the room. I also heard something that I thought was an airplane (actually it was a lawn mower) outside, and some movements from the people in the other cubicles outside the door. “Did you hear the sound of your own breathing?” he asked. I hadn’t listened for it. This exercise demonstrated that as a sighted person, I already listened for information about my environment, and knew how to filter out sounds that were habitual or unnecessary to navigating space. Removing sight simply made the information more noticeable. This underlined the point that echolocation is not simply a form of seeing with the ears but is predicated on a deeper understanding of hearing and the role it plays in conveying information to many kinds of bodies.

Tabb’s next exercise had me close my eyes again. This time, he took a large board and placed it on either side of my head and asked me to say which side I thought it was on, while he tried to make as little noise as possible when he moved it. I didn’t make any kind of active sound to try to identify where it was, I was just supposed to listen. Rather than consciously identifying any particular information about the placement of the board (which actually turned out to be wrong when I did try to consciously do that), I was able to feel the board on either side of my head, as a sort of heat, or pressure, something that Daniel Kish describes “ear pressure.” This exercise showed that we can hear how objects alter the ambient noise in a room, giving information through the air about their location and general size and shape.

In Tabb’s final exercise, I walked slowly towards a wall, making a constant “shhhh” noise with my mouth. The first time, he tapped me when I got close enough to the wall that I might hit it. The second time, he asked me to stop when I thought I was close enough. Interestingly, like the board exercise, I “felt” the wall before I actually reached it. Thus extending Haraway’s theories to understand sound as tactile is more than a theoretical maneuver – it is also reflective of the lived experiences of those who use sound as a means of navigation.

Most of his students, Tabb said, learned to use sonic information before they knew what "echolocation" was called or had the opportunity to really refine it as a skill. Tabb's job was to help teach them to more effectively use the technique: to employ vocal clicks with more refractive properties, for example, or ways of codifying the sounds created by certain materials or objects. In essence, Tabb's work is literal evidence of the interpretive and social nature of hearing. Tabb's students and I were able to train ourselves to assign meaning to the sounds we heard in different ways. On the one hand, humans already use their ears to infer information about their surroundings; on the other, that information can be shaped and codified by socialized learning, clarifying and articulating the information.

Though as Tabb demonstrated, echolocation relies on listening practices already used by both sighted and blind human beings, bats remain prominent in the discourse surrounding it. World Access for the Blind founder Daniel Kish, in many ways the "poster boy" for human echolocation, frames himself as a Deleuzean "bat-man" in a 2015 TED talk as he describes how he navigates the world using a system "just like a bat's sonar." He also used the acronym "BAT" (Blind Adventure Team) for a group he used to lead, signifying the importance of the animal in constructing his identity as a blind human. Again, because bats are sighted, Kish doesn't see precisely like a bat, but rather becomes a hybrid bat-man – a title he willingly accepts – by attempting to reproduce much of the sensory experience of a bat. Because Kish was sighted as a young child, images form in his visual cortex when he hears sound. Spallanzani's phrase "seeing with the ears" may be an oversimplification of the highly spatial sonic process some animals employ, yet Kish is literally able to see images produced by echoes from sounds he makes with his mouth; his brain has been retrained to produce visual imagery from sonic information (Kish, "How I use sonar to navigate the world").

Kish acknowledges some physiological advantages that echolocating bats have over humans, most notably their ability to produce ultrasonic vocalizations. This has led him to

develop his own technological, biomimetic instruments to overcome human limitations. Higher-frequency sounds give much higher resolution information than lower-frequency sounds due to their short wavelengths which bend less around objects as they travel through the air. Echolocating bats, able to produce and hear ultrasonic vocalizations, are therefore able to perceive the world much more clearly than echolocating humans can. In order to compensate for this, Kish's foundation has begun developing an instrument they call the SoundFlash, a head-mounted unit producing high-frequency sounds modelled on bat chirps, but within the human audible spectrum (Kish 2009: 31-33). The much higher frequencies produced by the electronic unit give the wearer greater auditory acuity. While the user of such headgear may not literally experience what a bat does, imagining what it *might* experience has led not only to new understandings of the senses but also to the development of new technologies with practical applications.

BAT/MAN

Austin-based experimental composer Steve Parker has used instruments similar to Kish's SoundFlash bios-mimetically to reflect on the spatial nature of sound and the relationship between human beings and bats. In particular, his piece "Bat/Man" encourages participants to use echolocation devices to commune with bats emerging at the Congress Avenue Bridge. As discussed in the previous chapter, the arrival of Austin's colony of 1.5 million Mexican Free-Tailed Bats in the early 1980s led to a cultural explosion that not only uses bats as emblems of the Austin's culture of "weirdness" but also helps us reconsider the relationships between human beings and other animals in Western, 21st-century urban environments. Parker's work is not the first to utilize the Congress Avenue Bridge bats as an aleatoric element of a musical piece ("Bat Beats" by Adam Bzowski, for example, used the physical conformation of the bats colony's nightly emergence to trigger electronic sounds). Parker's piece, however, perhaps most

thoughtfully considers the relationships between human beings and bats through the use of bios-mimesis.

Parker states that his piece is both about affecting human perceptions of bat calls and about imitation between species – humans imitating bats, and in a way bats imitating music. To achieve his goals, he gave his performers a number of different acoustic instruments to be played at the Congress Avenue Bridge including conch shells, a choir with acoustic megaphones, and funnel horns (created with oil funnels attached to garden hoses and swung around in a circle). All of these instruments were based on the concept of "throwing echoes" and took advantage of the acoustical properties of the bridge itself to act as a kind of bios-mimetic echolocation.

Parker also more literally used devices common to human echolocation including toy clickers and handmade echolocation devices called "Sondols" (Sonar-Dolphins). The Sondols used in Parker's piece are based on a model originally designed to assist blind people, thus evidencing multiple layers of bios-mimesis. Parker's work is not the first to utilize Sondols as musical instruments, however; it draws inspiration from Alvin Lucier's 1968 work "Vespers." Lucier's piece, which acknowledges his debt to scientific work on echolocation by claiming to be "Based on the work of Donald R. Griffin," is designed

> For any number of players who would like to pay their respects to all living creatures who inhabit dark places and who, over the years, have developed acuity in the art of echolocation, that is, sounds used as messengers which, when sent out into the environment, return as echoes carrying information as to the shape, size, and substance of that environment and the objects in it (Lucier 2012: 15).

"Vespers" is largely aleatoric, asking performers to traverse the performance space blindfolded or in dark glasses, creating an auditory image of the space using Sondols. For inspiration, the composer suggests that performers "Dive with whales, fly with certain nocturnal birds or bats (particularly the common bat of Europe and North America or the family Vespertilionidae), or

seek the help of other experts in the art of echolocation." Lucier's piece therefore lays the groundwork for Parker's use of human echolocation as a way of bios-mimetically adopting the senses of other species. While for Griffin and Kish this bios-mimesis was geared towards the development of practical solutions to aid blind humans, for Lucier and later Parker it involves philosophical reflection on the properties of sound and the limits of human experience.

In addition to the use of Sondols, Parker's *Bat/Man* composition also included a percussive transcription of a Mexican Free-Tailed bat call and real-time pitch shifting of the sounds emitted by the bat colony as it emerged (Parker, personal communication). The technique of pitch shifting, used in bat identification devices known affectionately as "bat detectors," was also convolved with pre-recorded electronic content, turning the sounds produced by the bats more literally into music. Thus while performers on the ground offered their own sounds to the bat colony (in the form of conch shells, acoustic megaphones, etc.), they also sought to include the voices of the bats themselves as components of the performance. As with BatFest, signaling the importance of bat calls amidst the cacophony of human-made sounds implies human assignation of meaning, a kind of "making bats musical." Parker acknowledges this by emphasizing, "It's not meant to be a duet with animals. It's about the futility of anthropomorphizing animals but also at the same time doing it."

Parker acknowledges the asymmetry of the bat-human interactions in his piece but still considers the bats in the colony to be (albeit somewhat unwilling) performers. Panoramic Voices director Brent Baldwin, who conducted the performance, referred to them as "that set of performers with the wings and hanging upside-down." "I like to think that they enjoyed it," he continues, "and I enjoyed working with them too." While on one hand, the piece allows for careful reconsideration of the properties of sound and echolocation, it also delves into the complex issues of animal subjectivity addressed by Nagel and others at the beginning of this

chapter. Parker's musings on the possibilities of sound and echoes remains deeply connected to the biomimetic process by which he obtained that information.

Bat/Man is also implicated in the complex power dynamics inherent to bios-mimesis. When I spoke to Bat Conservation International founder Merlin Tuttle about Parker's piece, he suggested that interventions like Parker's had led to a decrease in the roosting bat population over time, though it was unclear how. The bat colony lives in a noisy urban area, and that the sounds produced by the musicians were at a much lower pitch than the bats' hearing range, yet Tuttle believed that the regular disturbance provided by tourists at the bridge ultimately affected the colony's health. Nevertheless, Parker's piece, like the cultural phenomena discussed in the previous chapter, also helped generate awareness among Austin's public about its bat colony, and by extension about a variety of problems facing bat populations worldwide today. The piece thus has a complex, dual nature that both engendered empathy and caused harm, much like Spallanzani's experiments.

On an aesthetic level, Parker's work remains embroiled in the tenets of avant-garde classical music performance, a genre dominated male composers, by technology, and by Western ideas about innovation and performance. Bats are very much the subjects of the performance rather than agentive in that their calls and their nightly emergence are utilized as content for the piece without real interaction between species. Whether true agentive participation by bats in a human musical performance is even possible remains to be seen, and perhaps would require a re-thinking of more foundational ideas such as "performance."

The philosophical considerations generated by Parker's piece and similar bios-mimetic undertakings have helped to deconstruct hierarchical narratives such as the exclusive provenance of sight in the development of 20th century rationality (Sterne and Erlmann) or debilitating narratives about the alter-abled (Kish), while simultaneously leaving other hierarchical narratives involving gender and technology intact. We find ourselves in an uncomfortable paradox, one in

which Parker, Kish, Spallanzani, and Griffin seek to become the other without ever really being anything but themselves.

CONCLUSIONS

Sound studies research has made great strides in unpacking the cultural preconceptions that surround our understanding of the senses, reconfiguring them in ways that address the physical, material, and embodied aspects of auditory experience. However, our understanding of these phenomena become more complicated when we address the many different *types* of bodies that affect and are affected by sound. In particular, understanding the relationships between bodies in a multispecies assemblage challenges the rigid boundaries between sight and sound and addresses the complex, integrated nature of sensory experience.

Scientists, advocates for the blind, and musicians have all attempted a decentering of the human experience through the process of bios-mimicry. As the above examples demonstrate, my interlocutors have used bios-mimesis to revise their understanding of their own processes of knowing. More specifically, while Nagel may have been right in stating that we can never know what it is like to be a bat, through bios-mimetic processes of becoming with bats my interlocutors have come to understand aspects of what it is like to be bat-men. By studying how bats hear, researchers and performers have ultimately discovered that their own ears work differently than expected. And we, the observers, have learned that as both Taussig and Barad suggested, imitative processes are generative rather than reflective, and deeply necessary to processes of knowing.

Nevertheless, bios-mimetic processes remain embroiled in ethical complexities in that we must continually ask whether the ends of knowledge justify the means. Performances such as Parker's may raise awareness about environmental issues, but at the same time contribute to the decline of local populations. Similarly, laboratory research such as undertaken by Spallanzani

and Griffin contributes to radical reconceptions of sound and the limits of mammalian bodies, but it is founded on practices that ultimately do violence to those very bodies. Perhaps asking "what is it like to be a bat?", or perhaps more accurately, "what is it like to be bat-man?" not only tells us that humans and bats are embroiled in co-constitutive relationships of becoming but also that becoming is a crucial tool for reflecting on our own positions of power.

Chapter Four: *Muk'ta Sotz:* The Anthropological Imaginary in Zinacantán and San Cristóbal de las Casas

> *Para nosotras y nosotros, el murciélago es uno de los dioses del pueblo Tsotsil; la palabra Tsotsil viene de esta raíz, tsots, tsotsiltik, los murciélagos. Entonces, los tsotsiles somos descendientes del dios Tsots, que es el dios murciélago. Y esto lo podemos ver actualmente. La vestimenta de nuestras autoridades está hecha de lana, es de color negro, tienen adornos en la cabeza y usan las sandalias… y cuando se muevan, aparentan ser murciélagos. Si uno se fija bien, son los murciélagos caminando…*
>
> For us, the bat is one of the gods of the Tsotsil community; the word Tsotsil comes from this root, *tsots, tsotiltik*, the bats. Therefore, the Tsotsiles are descendants of the god Tsots, which is the bat god. And this can be seen in the present. The dress of our authorities is made of wool, it is black, they have adornments on their heads and wear sandals… and when they move, they seem to be bats. If you look carefully, they appear to be bats walking…
>
> - Ruperta Bautista Váquez (translation mine)
>
> In the end, what is anthropology but the ultimate form of ethnic tourism, the endless quest for self-understanding through the exotic other?
>
> - Pierre L. Van den Berghe, *The Quest for the Other* (1994), 32

The above quote by Ruperta Bautista is printed on the wall of popular tourist hangout Café TierrAdentro in San Cristóbal de las Casas, Chiapas, Mexico.[26] The author is an important

[26]TierrAdentro is an EZLN (Ejército Zapatista de Liberación Nacional)-themed pizza restaurant on one of the main tourist avenues in San Cristóbal. Though I don't discuss the impact of the EZLN on tourism in this chapter, the militant indigenous movement of the 1980s and 1990s is a major motivation for tourists to visit highland Chiapas. For many North Americans and others, the EZLN represents indigeneity in ways that align with liberal ideas about rebellion and governmental restructuring. Most tourists don't have a full understanding of the implications of EZLN's political message, however, and choose to purchase EZLN-themed handicrafts or visit one of the many "*caracoles*" (Zapatista communes) as part of a vacation rather than offering any lasting support. The widespread effects of the EZLN on San Cristóbal are present in the pervasive symbol of the red star and the black facemask, the weekly showings of documentary films about the EZLN at local movie theaters, Zapatista dolls for sale at the craft market, and political graffiti adorning almost every building in the city center. In 2018, when I was in Chiapas, the EZLN had put forth a political candidate for the upcoming presidential election, la Marichuy, and they were a

figure in the Tsotsil literary revival movement, but her work also functions in the growing phenomenon of *ethnotourism*. Her description of Tsotsil bat symbolism exemplifies what I refer to as the "anthropological imaginary" in Chiapas: a sense that indigenous peoples are more connected to nature than their white counterparts. Chiapas thus presents an important counterpoint to Austin in my case study: not only are allegedly "modern" cities as equally situated in the natural world as the "traditional" societies they have pitted themselves against, but assignations of the natural have been foundational to colonialism. In Chiapas, decades of research by anthropologists has imposed a damaging imaginary centered on the figure of the bat, onto Tsotsil *municipio* Zinacantán, obscuring the role of colonial violence in fashioning indigenous relationships to the natural and perpetuating a discursive violence of their own.

Using a woven pillowcase from Chiapanecan *municipio* San Andrés as a point of departure, Chris Goertzen describes ethnotourism (or "ethnic tourism") as an escapist form of travel predicated on visiting places conceptualized as "traditional" or "authentic." However, tourist perceptions of allegedly authentic sites clash with the histories of violence that created them. For Goertzen, ethnotourism in Chiapas is an extension of the "invasions" by Protestant missionaries in the 1930s and by anthropologists in the 1950s. Both groups viewed indigenous peoples as pure and uncorrupted, ignoring centuries of turmoil, violence, and cultural accommodation (Goertzen 2010: 35). In fact, Goertzen argues that the features that make ethnotourism appealing today "resonate with a colonial and modern history unsurpassed in Mexico in terms of the ill-treatment of Indians, and consequently of friction between the few Ladinos in power and the many Indians forced to endure a parade of humiliations" (Goertzen 2010: 29-30).

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pervasive presence in the main square collecting signatures and offering rallies containing speeches, folk and rap music.

Indigenous peoples are not simply victims of ethnotourism, however; in Chiapas, like in many places in Latin America, indigenous groups have effectively used ethnotourism as a means to attain economic prosperity and political power. As in the case of Andean music discussed by Jonathan Ritter (Ritter 2012: 337), Tsotsil communities have capitalized on their popularity among European, Mexican, and U.S. tourists by producing commodities and controlling access to cultural centers. In addition, tourists visiting from abroad have the ability to expose mistreatment of indigenous peoples to the outside world, something that Chiapanecans have used as an effective bargaining tool in negotiations of power with the Mexican government (loc 524). Despite the racist underpinnings of the anthropological imaginary, ethnotourism has placed value on indigenous culture in ways that allow for natives to renegotiate their position within the broader sociopolitical system.

Most studies of ethnotourism have focused on its economic dimensions but further study remains to be done on its ideological basis in anthropology. In this chapter, I examine the anthropological imaginary as imposed by investigative "invaders" within Chiapas and their conceptualization of the natural, focusing on the formulation of associations between bats and the *municipio* of Zinacantán in the 1950s. As Kent Redford (1991) has argued, the overemphasis on the relationship between indigeneity and the natural world has roots in the myth of the noble savage (46). Similarly, Analisa Taylor demonstrates that metaphors comparing indigenous peoples to fertile land under *indigenismo* policies served as a means of effeminizing, and as a result, disempowering them (Taylor 2009:3). As such, understanding indigenous peoples as more "natural" than non-indigenous peoples not only references colonial histories, it also devalues adaptation and change.

Similarly, delineations of "the natural" are rooted in efforts to deploy scientific theories in the service of anthropology. As Patrick Wolfe (1999) has argued, anthropological notions of authenticity have historically been caught up in evolutionary discourses. Colonists justified

indigenous erasure by viewing indigenous groups as historical predecessors to Europeans, whose demise was made readily apparent as they made contact with their inevitable "future" selves (whites). Furthermore, genetics were used as a way of confirming the impending demise of indigeneity, as indigenous blood was seen as diluted when mixed with white, while white blood remained pure despite mixing. Thus while this chapter may seem to be a regional departure from the previous two, anthropology's roots in biological science evidence the continuity between 20th- and 21st-century constructions of nature in the laboratory and the city with anthropology and tourism in Mexico.

Furthermore, as discussed in chapter two, bat migrations present a challenge to political borders such as those between Texas and Mexico. Because Mexican Free-Tailed bats migrate from Texas as far south as Chiapas (and likely much further), Chiapas and Austin are a part of the same system. This chapter is therefore not intended as a comparison, but a continuation of the story of bat-human relationships begun in chapter two.

Following a brief introduction to the 35-year longitudinal study known as the Harvard Chiapas project, I deconstruct the work of Sarah C. Blaffer who argued that dark-skinned trickster figures (known as Ik'al)[27] in Tsotsil myth are cultural "relics" of the Mayan bat god Camazotz. I argue that Blaffer's work and that of other anthropologists artificially created Zinacantán's bat symbol as a result of racist associations between indigeneity and the natural, which later became incorporated into constructions of community identity through tourism. Modern-day denominations of Zinacantán as "*la tierra de los murciélagos*" (land of the bats) and its inhabitants as *sots'leb* (bat people) derive not from the preservation of an ancient bat totem;

[27] Literally "Black man" in Tsotsil. I use the spelling "Ik'al" as I was taught by my Tsotsil instructor during fieldwork instead of Blaffer's somewhat complicated "H?ik'al." The simpler spelling is a product of conferences discussing spelling standardization in the 1990s, as is the use of "s" instead of "z" in "Tsotsil". The apostrophe indicates a glottal stop. See Rus and Rus, 2012, "The *Taller Tzotzil* of Chiapas, Mexico: A Native Language Publishing Project, 1985-2002," in *Decolonizing Native Histories: Collaboration, Knowledge, and Language in the Americas*, ed. Florencia Mallon, Durham: Duke University Press, pp. 144-174.

rather, they result from an imposed anthropological imaginary blind to the dynamic and generative effects of colonialism. Moreover, Blaffer's later transition to studying primatology evidences the scientism that underscores her anthropological efforts.

I then offer a new theory regarding the historical origins of Ik'al proposed by Chamulan scholar Antonio Gómez Gómez. Gómez Gómez suggests that rather than a holdover of a pre-Colombian bat, Ik'al instead references African slaves who were brought to Chiapas during colonization. As argued by Goertzen, Nancy Farriss, and others, the myth of Ik'al is a result of centuries of colonial violence, rather than a fossil of an inert culture that existed prior to the arrival of Europeans.

Nonetheless, bat symbolism has been incorporated into *zinacanteco* life in the manner of the "invented tradition" theorized by Hobsbawm (1983). Invented traditions are "responses to novel situations which take the form of reference to old situations, or which establish their own past by quasi-obligatory repetition" (Hobsbawm 1983: 2); in other words, they are practices designed to index the past, despite the fact that they may be created "within a brief and dateable period – a matter of a few years perhaps – and establ[ish] themselves with great rapidity (1)." The invented tradition of *la tierra de los murciélagos* is evidenced by the presence of bat symbols in Zinacantecan advertising and handicrafts as well as bat imagery in the indigenous revival movement, as demonstrated by the epigraph from Ruperta Bautista. In the latter part of this chapter, I examine an example of bats in the indigenous musical revival, focusing on *bats'i'rock* ("true rock") group Sak Tsevul and their song "*Muk'ta sotz*" (Large Bat).

The anthropological imaginary is predicated on a denial of what Kyle T. Mays has termed "indigenous modernity" (Mays 2018:13). While some artists such as Sak Tsevul have attempted to capitalize on the anthropological imaginary, taking control of imposed narratives for their own ends, other artists have engaged with what Audra Simpson has termed a politics of "refusal" (Simpson 2014:11). Towards the end of the chapter, I turn to Tsotsil rock group Vayijel

as a demonstration of this act of refusal, which fails to conform to anthropological ideas of indigeneity through their music. Though Vayijel are from Chamula, a neighboring *municipio* to Zinacantán, and their work does not feature bats, they nonetheless offer an instructive alternative to the music of Sak Tsevul and evidence the extent to which anthropological interpretations of indigenous-natural relationships misrepresent the realities of indigenous experience.

Interrogating the imposition of bat symbolism on Zinacantán by anthropologists is about more than simply correcting a narrative: it demonstrates that Western ideas about modernity's separation from the natural world (deconstructed in chapter two) are foundational to colonial dynamics. Ana María Ochoa has discussed this issue at length in *Aurality* (2014), in which she demonstrates how sound was used to differentiate between who "counted" as human in colonial Colombia, basing her theories on Foucault's biopolitics, Agamben's "bare life" concept, and Ludeña's "zoopolitics." Ochoa argues:

> The voice, especially, was understood by Creoles and European colonizers as a fundamental means to distinguish between the human and the nonhuman in order to "direct the human animal in its becoming man" (Ludueña 2010, 13). Thus the relation between the ear, the voice, and nonhuman sounds became particularly important in a colonial context in which the question of such a boundary troubled, in different ways and for different reasons, the many peoples that originally populated, willingly came, or were forcibly brought to the Americas (Ochoa 2014: 5).

In other words, colonial projects in Latin America were centered on defining who was human and who wasn't, a debate that was negotiated in many instances by sonic means. Returning to our case study, by defining *zinacantecos* as "bat people," Blaffer and other anthropologists not only established a boundary between Western humans lacking a connection to the natural world and allegedly animal-worshipping indigenous people, they also created a shorthand for denying indigenous humanity by associating them with the "less-than human." This lack of humanity is

contested by musicians such as Vayijel, who reposition themselves as modern subjects, representing their own language and relationship to the natural world through rock music.

My ability to correct imaginary anthropological narratives is limited due to my own positionality which Wolfe argues is "not just central to the issue, it *is* the issue" (Wolfe 1999: 3) when it comes to assimilation and appropriation of indigenous spaces, academic or earthly. As a result, my attention to uncovering processes that produced the anthropological imaginary of *Zinacantán*'s relationship to bats takes precedence in the chapter and my reading of Gómez Gómez's and Vayijel's challenges to the anthropological imaginary are brief. I use the Gómez Gómez's work and that of Vayijel to demonstrate anthropology's failure to fully comprehend its Tsotsil objects of study, but I also aim to leave space for further contributions by indigenous scholars. The purgatorial space between creation and destruction implied by the anthropological imaginary is also present in this chapter, as the fieldwork on which it is based is founded in the very anthropological imaginary that it purports to deconstruct. I went to Chiapas in search of the kind of pervasive bat symbolism found in Austin, TX, and the relatively brief time I spent in Mexico was not unlike the experience of the many ethnotourists I encountered there. I therefore see this chapter not as an attempt to establish my authority as a scholar of indigeneity in southern Mexico, but rather as a reflection on the perspectives of Western travelers such as myself. To conclude, I therefore return to the question posed in chapter three: is research ethical? And perhaps more importantly, is *my* research ethical? I conclude by reflecting briefly on my own position within colonial academic structures.

THE ANTHROPOLOGICAL IMAGINARY: HISTORY AND BACKGROUND

My concept of the anthropological imaginary is indebted to scholar Patrick Wolfe, who has vividly and convincingly demonstrated the extent to which "authentic" depictions of indigeneity are fictions of the colonial imagination. Wolfe argues that these fictions can never be

innocent but are deployed by both policy makers and the academy as a means of oppressing indigenous peoples. In this section, I describe the processes throughout Mexico, but particularly in Chiapas, that led to the creation of an imagined indigenous "authenticity" based in conceptualizations of pre-conquest purity and a deep-seated connection to the natural. Like the laboratory experimentation in the previous chapter, anthropological fictions are creative endeavors generated by researchers through ethnographic research, yet they are deeply detrimental to the subjects they purport to describe.

The "anthropological imaginary" refers not only to the work of anthropologists within the academic institution, but also to broader currents of thought codified by government policy. In particular, the "*indigenismo"* policies of President Lázaro Cárdenas (1934-40) configured indigenous people as wards of the state in need of rescue from poverty and ignorance (Taylor 2009: 3). *Indigenismo* policies promoted a "romantic, folkloric image of the Indian as stoic, abject, and mysterious," and cast the state in the role of defender (Taylor 2009: 3). Such policies configured indigenous groups as timeless in a way that racialized the difference between tradition and modernity, casting the indigenous person as a residual figure – an anomaly – and the mestizo as a modern subject.[28] Though the official structures associated with *indigenismo* are no longer in place in Mexico, the narrow and shifting definitions of indigeneity created under Cárdenas' presidency still form the basis for new policies concerning the role of indigenous peoples in the country (Taylor 2009: 4-5). The perpetuation of colonial forces throughout governmental and social structures is an example of what Pablo González Casanova has termed "colonialismo interno" (internal colonialism) (González Casanova 2006: 130).

Indigenismo policies were supported and solidified by the work of anthropologists. The Instituto Nacional de Indigenismo (INI), an organization dedicated to understanding as much as

[28] Johannes Fabian addressed this issue in *Time and the Other* (1983), discussing the "denial of coevalness" that situates anthropologists in the modern present while relegating the ethnic Others to the distant past.

possible about indigenous groups in Mexico, opened the doors of its first Regional Coordinating Center in San Cristóbal in 1950. INI's director from 1948-1970, Alfonso Caso, was also the founder of the Mexican School of Anthropology; this demonstrates the blurred lines between anthropology and politics at the time. INI used the work of anthropologists to find out as much as possible about indigenous groups, thus weaponizing anthropological knowledge with the aim of assimilating indigenous groups into broader Mexican culture.

In 1957, Evon Zartman Vogt's founded the Harvard Chiapas Project partially to examine the impact of *indigenismo* policies on indigenous culture. His more than three decade-long study trained U.S. graduate students in fieldwork methodologies, focusing on questions pertaining to the ability of local residents to maintain traditional ways of life despite the external pressures of modernization. Over the course of the project's trajectory, Vogt and his students developed English-Tsotsil dictionaries, built houses for themselves to live in the indigenous *municipios*, and published hundreds of articles and books describing life and ritual in the region.

Vogt and his students' work has acted as a touchstone for most subsequent anthropological research in the area, including assertions of the bat-human associations that concern us in this chapter.

Vogt was not the first to anthropologist to work in the area, however. By the time Vogt arrived in San Cristóbal, Danish archaeologist Franz Blom and his wife Gertrude had long since established their house, Na Bolom, as a research center in San Cristóbal (Vogt 1994:118). Na Bolom, whose name is both a play on the Blom's name and means "House of the Jaguar" in Tsotsil, had originally been constructed to be a Catholic seminary, but under the ownership of the Blom family became an important meeting place for anthropologists, museum, and hotel simultaneously. Blom was one of the first archaeologists to excavate the Mayan city of Palenque as well as nearby archaeological site Moxviquil, and his wife Trudi was renowned for her photography of tribes of the Lacandon jungle. While Blom and his wife did not work directly

with the indigenous communities surrounding San Cristóbal, their presence evidences a long-standing tradition of treating Chiapas as a region in need of archaeological and anthropological study.

Though Vogt's project was partially designed as a way of examining the pressures of government involvement in indigenous communities, his work left some of *indigenismo's* narratives intact. His focus on questions pertaining to tradition and modernity underscores a belief that "pure" indigenous systems remained more or less the same underneath superficial impositions by colonizers and the Mexican government. This not only suggests a conception of indigenous culture as essentially static, it also bears traces of the salvation narratives used by local officials to justify policies associated with assimilation.

Authors such as Nancy Farriss have demonstrated that indigenous groups in Mexico were far from static even prior to colonization, thus relegating claims like Vogt's to the realm of the anthropological imagination. Throughout their history, the Yucatec Maya experienced repeated military "intrusions" from other indigenous groups, leading them to interpret the arrival of the Spanish as only another revolution in the cycles of time (Farriss 1984:20). While Western historians have marked the arrival of Europeans in Latin America as a crisis in an otherwise peaceful history, Farriss argues that the Maya experienced so much turmoil prior to colonization that they didn't see subjugation by Europeans as a significant change. "It is only when the Spanish break into this *dynamic* scene [of Mayan conflict with other pre-Colombian cultures]," she argues, "that we [Western scholars] question the compatibility between change and cultural survival" (8). In fact, Farriss argues that adaptability was a defining feature of pre-Colombian Mayan culture (8-9). In other words, the static Mayan culture posited by Vogt was in fact a product of centuries of contact, conflict, and accommodation, something that only becomes apparent when situated historically.

The anthropological imaginary relegates Mayan culture to a static past by drawing direct parallels between present-day peoples and archaeological findings. Chris Goertzen has argued that "it is tempting to believe … this traditional culture came under siege only recently … that assertion would not merely be false but would obscure a critical factor in the formation of the threatened culture. It is likely that … local identities and associated expressive culture… has intensified over many centuries as a cumulative defensive reaction to threats to this culture" (Goertzen 2010: 34-5). By making arbitrary connections between modern-day Tsotsil Mayans and their ancient counterparts, Vogt and his students not only ignored centuries of cultural contact in favor of a view of a "pure" Mayan society, they also erased a history of violence that continues to define Mayan identity in the present.

In what follows, I offer an interpretation of myths of the figure known as Ik'al, or the "Black-man," that derive not from pre-Colombian sources, but from colonial history, including interpretations of myth and histories offered by present-day indigenous scholars. I not only interrogate the formulation of the anthropological imaginary by examining its sources, I seek to unveil anthropologists' underlying preconceptions about history, nature, and indigeneity, all of which play a part in the historical erasure implied by their work. In fact, *zinacantecos*' more recent adoption of bats as an identity symbol is a result of the colonial interventions of anthropologists and ethnotourists and must be appropriately situated in their history to be understood.

IK'AL AND CAMAZOTZ: DRAWING PARALLELS TO THE POPOL VUH NARRATIVE

The basis for the associations between modern-day figured Ik'al and bats comes from the work of anthropologist Sarah C. Blaffer. Blaffer examines structural similarities between the "Black-man" of present-day Tsotsil myth and the "death bat" of ancient Mayan codex, the Popol Vuh. Though she conducted no fieldwork in southern Mexico, Blaffer's work is based on

folktales and field notes collected by Vogt and his students, and as a result many of the elements of the anthropological imaginary established by the Harvard Chiapas Project remain prevalent in her work. Most importantly, her decision to seek cultural meaning in ancient codices rather than in colonial history underscores a perception of indigeneity as a relic of the past.

Anthropologists working in Mexico tended to consult ancient texts more frequently than elsewhere in Latin America because of the exceptionally large quantity of native works that were preserved before and during colonization. While in other parts of Latin America colonizers established control by destroying all indigenous texts,[29] Spanish priests in Mexico collected some of them. They also undertook ethnographic research and wrote orthographies, grammars, and vocabularies of the native languages with the purpose of using them in evangelization (Faudree 2013: 35). As Paja Faudree (2013) argues, these texts have featured prominently in indigenous revival movements; however, they have also been used (and often misinterpreted) by anthropologists as they construct particular views of indigeneity.

Among the pre-colonial texts used by the Harvard Chiapas Project is the Quiché epic known as the Popol Vuh narrative.[30] The Popol Vuh narrative is a Mayan "mythistory" of the creation of the world, copied by 17th-century Dominican friar Francisco Ximénez (Woodruff 2009:13). The original Quiché copy of the text has disappeared, leading scholars to interpret Ximénez's Spanish translation as a faithful depiction of Mayan ideology despite its readily apparent Christian overtones. In fact, Néstor Quiroa has argued that de-historicized interpretations of the codex have overlooked its function in evangelization projects, which significantly affected the representation of Mayan beliefs in the text (Quiroa 2017: 242).

[29] This did occur in Mexico as well, but to a lesser degree. One particularly extreme example of this tendency are the idolatry trials of 1562 overseen by Fray Diego de Landa, in which "the wholesale destruction of Maya codices …[resulted in] the gradual extinction of a priestly class who could interpret them, and the general decline in literacy after the Conquest (including a total loss of the ability to decipher the pre-Colombian glyphs" (Farriss 1984: 291, 313).

[30] Following Quiroa (2017) I employ the term "Popol Vuh narrative" throughout this chapter rather than the title *Popol Vuh* to imply doubt about the narrative's status as a single book with a single, hieroglyphic origin.

Nonetheless, most anthropologists to date consider the Popol Vuh narrative evidence of ancient Mayan thought and have used it to search for extant cultural retentions among present-day peoples.

The Popol Vuh narrative is the basis for anthropology's imaginary association between bats and Zinacantán. In *The Black-Man of Zinacantán* (1972), Blaffer argues that modern-day Tsotsil figure Ik'al ("Black-man") is a reincarnation of death bat Camazotz who appears in the Popol Vuh narrative. Her argument centers on the concept of "anomaly," which she defines as an individual or behavior that transgresses social norms behaving "unnaturally," "like animals," or existing "in and out of time" (193, 198). She argues:

> both [Ik'al and bats] are anomalous. Black-man, who is possibly a cannibal and apparently ignorant of correct behavior, is neither man nor animal, neither social nor entirely anti-social. He longs for company and is constantly petitioning the saints to give him someone, yet this protestation disguises murderous intentions… If any animal can be considered anomalous, the bat can. Bat are furry mammals who give birth to live young, yet they also fly like birds. The bat is further singled out for special treatment by being nocturnal, by living in dark places (caves and hollow trees), by sleeping upside-down, and by having the blood-diet of the vampire (loc. 1477-86).

For Blaffer, Ik'al and other "spooks" in Tsotsil myth are anomalies, acting as morality tales for what happens when people transgress the social roles assigned to them. The anomaly is centered on a concept of difference in which existing outside of normative identity is coded as morally corrupt or inhuman. Later work that posits Ik'al/bats as the *defining* feature of *zinacanteco* identity by using terms like "the people of the bat" (Laughlin 1988) ultimately positions indigeneity as an anomaly in itself. Colloquial references to Zinacantán as "*la tierra de los murciélagos*" (the land of the bats) and to *zinacantecos* as "*sots'leb*" (bat people) are a direct

result of Blaffer's work,[31] not because the indigenous community read and internalized it,[32] but because of its influence on other anthropologists and later ethnotourists coming to Chiapas. The Zinacantán-bat association aligns with Western conceptions of indigeneity by configuring *zinacantecos* as "like animals" that exist "out of time" because they are more deeply linked to the tradition of their Classic Maya predecessors than to their colonial history.

In addition to her conceptualization of anomaly, much of Blaffer's argument focuses on superficial physical similarities. In particular, she argues that "both [Ik'al and bats] are black, both live in caves, both are considered scavenger robbers associated with

blood. The H?ik'al has wings attached to his feet, and, to some extent, the same could be said of bats" (loc 1474). However, when we examine the text more directly, Blaffer's parallels seem tenuous. Camazotz appears in the following story in the Popol Vuh narrative in which "Hero Twins" Hunahpu and Xbalanque pass through his cave in the Underworld:

> Y luego otra vez en la casa de los murciélagos, que no había más que murciélagos dentro, una casa de murciélagos, tomadores grandes brutos, así como Caquitzam era su matanza, que luego perecían los que llegaban á su presencia, y allí estuvieron dentro; pero durmieron dentro de sus cerbatanas, y no fueron mordidos por los murciélagos, y allí se estuvieron por un grande murciélago que vino del cielo, y se manifestó cuando fue hecho por él, y tomaron consejo. Toda la noche estaban reboleando y decían *quilitz! quilitz!* Así estuvieron diciendo toda la noche, y parando todos, ya ni uno de los murciélagos se movía, estaban pegados á la punta de la cebatana, y dijo Xbalanque á Hun-ahpu: ya habrá quizás amanecido; ¡veamos! Y queriendo ver, sacó la cabeza á la boca de la cerbatana; quería ver si había amanecido, y luego fue cortada su cabeza por el Gamazotz, quedando sólo el cuerpo de Hun-ahpu; ¿qué ha sido esto? dijo, si se habrá ido Hun-ahpu! ¿cómo ha sido esto? y ya no se movía, sino que se estaba acostado. Y luego se espantó Xbalanque, ¡hay, hay! desdichado: esto dijo: y luego fueron á

[31] The name "Zinacantán" also allegedly derives from the Nahuatl word "tzinacantli," which means "bat," though the significance of the linguistic parallel remains unclear.

[32] Scholars in the indigenous revival movement may be familiar with Blaffer's work, but Chiapas' extremely high rates of poverty and illiteracy make it unlikely that she is widely read among other members of the community.

> poner la cabeza al cementerio, que así lo había ordenado el Huncame y Vucub-came…. (Ximénez 66-7)[33]
>
> And once again [they went to] the house of the bats, which had nothing but bats inside. A house of bats, large brutish [blood] drinkers, who killed like Caquitzam, such that those that came to their presence perished [leaving their remains] there inside. But they [the Hero Twins] slept inside their blowguns and were not bitten by the bats. There they were when a large bat appeared from the sky and they took counsel. All night long [the bats] were circling, saying "quilitz! quilitz!" They said this all night long. Then, all landing on the end of the blowgun, not one of the bats moved. Xbalanque said to Hun-ahpu: "perhaps it is dawn; let us see!" And wanting to see, he stuck his head out of the end of the blowgun. He wanted to see if it had dawned, and then his head was cut off by Camazotz, leaving only Hun-ahpu's body behind. "What was that?" [Xbalanque] said, as if Hun-ahpu had gone! "What has happened?" And [Hunahpu] no longer moved but was lying still. And then Xbalanque was frightened, ay, ay! unhappy: this he said: and then he went to put the head [of Hunahpu] in the cemetery, as Huncame and Vucub-came had ordered… (translation mine)

This passage tells us quite little about Camazotz, other than that he lives in a cave and he murders his victims by beheading. It tells us next to nothing about his coloration or physical shape. Various translations have exaggerated depictions of Camazotz and his bats, some referring to him as the "snatch-bat" (Tedlock 1996: 125-6) or going into greater detail about the "*inumberables murciélagos que volaban hambrientos, batiendo, furiosos, sus alas*" ("innumerable bats that flew hungrily, beating their wings furiously," Abreu Gómez 2003: 154). Some even go so far as to describe them as "great beasts with snouts like blades that they used as murderous weapons" (Christianson 2007: 172). Interestingly, while most translations of the passage do not include descriptions of Camazotz or his bats' physical form, they do preserve the onomatopoeic representation of bat sounds ("quilitz!").

The reductive physical features that Blaffer uses to link Camazotz to Ik'al fall apart further when we examine the text more closely, particularly her emphasis on his blackness.

[33] I have updated some of the spellings in this quote to reflect modern Spanish orthography.

Scholars do not question the interpretation of Camazotz as a bat; however, Blaffer's assumption that all bats are black belies not only her lack of knowledge about the biodiversity of bats in Mesoamerica, but also the broad variety of representations of bats in Mayan artefacts. Caves in the Yucatan peninsula housing the remains of nomadic humans from 10,000 BC along with the remains of 24 species of bats suggest that humans have co-existed with multiple bat species for centuries (Navarro 61; Arroyo-Cabrales 1992). Presently, 165 species of bat live in the area designated as Mesoamerica (Navarro 2013:583), many of which are depicted in Classic Mayan ceramics and include variations in ear shape, nose leaves, and the presence or absence of a tail (Navarro 2011: 64). Perhaps most significantly, many of these species are brown, not black, something that seems unlikely that the Maya would have failed to notice if bats were such significant symbols in their culture.

Furthermore, Brady and Coltman have used ceramics to demonstrate that bats had a great diversity of meanings in Mayan culture. Ceramics were molded into the shape of bats, including the Qaaw'a Sotz (lord bat) from Copán, and a whistle found near Campeche in the shape of a bat's head with a headdress and human body (Navarro 2013: 591). Bat images are also found painted on ceramics, such as in the Balam-Kú plate (Navarro 2013: 591), and in glyphs. They may have been used either as a way of identifying a particular sculptor (Navarro 2011:65; Navarro 2013: 592), or to designate a particular territory. Copán's city-state emblem glyph, for example, is a bat, suggesting that the bat was either a protector of the city or the city was named after it (Navarro 2013: 593). Perhaps most notably, bats are a symbol of one of the months in the Mayan calendar, known as tzotz (Navarro 2011: 66; Navarro 2013:593). While most archaeologists have tended to interpret all Mayan bat symbolism as evidence of Camazotz since 1904,[34] ceramics often show bats killing their victims through licking blood (as real vampire bats

[34] When Eduard Seeler's identified a bat on a Late Classic ceramic vessel excavated by Dieseldorff

do) or removing the heart instead of beheading them as depicted in the Popol Vuh narrative (Brady and Coltman 2016:228-230). Though murderous, Ik'al also kills using different methods from Camazotz, as we will see below; and, as Blaffer notes, he seems to be defined more by his sexuality than his propensity for dealing death. Sublimating all bats under the umbrella of Camazotz therefore ignores the pluralistic relationship that the Maya had to bats in favor of a convenient historical parallel that doesn't really represent bats' significance within the culture.

Though Blaffer's hypothesis is primarily structural, later anthropologists sought to find more direct evidence for the significance of bats in Zinacantán, though this too falls apart under scrutiny. In *People of the Bat* (1988), Robert Laughlin, a graduate student of Vogt, cites a potential origin myth for Zinacantán's status as the "land of the bats." The myth is also taken from the writings of Dominican Friar Francisco Ximénez:

> They worshipped the sun and made sacrifices to it, and to the full rivers, to the springs, to the trees of heavy foliage, and to the high hills they gave incense and gifts… [the zinacantecos] called themselves Zotcil Vinic which is the same as saying batman… Their ancestors discovered a stone bat and considered it God and worshipped it (Ximénez 1929: 360; qtd Laughlin 2).

Notwithstanding the lack of biographical information available about Ximénez which makes a more contextualized analysis of the quote difficult, Ximénez's story is suspect even based on mere linguistic evidence. He suggests that *zinacantecos* derive their name from the phrase "Zotcil vinic" (Tsotsil vinik, in modern spelling), but "ts" and "s" are different sounds in Tsotsil, and the words "tsots'" and "sots'" have completely different meanings. The name of the language, which begins with a "ts" sound instead of an "s" or a "z", may therefore be derived not from the Mayan word for bat at all, but rather from "tsots'", which essentially means "strong." "Sotcil vinic" could refer to "strong men" instead of "batmen," undercutting the theory and the bat-zinacanteco association completely.

Furthermore, as with the Popol Vuh narrative, Xímenez is not a reliable narrator in the sense of directly transmitting Mayan belief to the modern-day reader. Simply accepting the story of Camazotz in the Popol Vuh narrative or the alleged origin story of the stone bat as an archaeological "find" overlooks the colonial history under which these texts were produced, and the potential effect that history has on representing Maya beliefs.

In her search to find the ancient origins of modern-day myth, Blaffer's work ignores the complexity of Mayan beliefs about bats while at the same time imposing qualities like timelessness, non-humanity, and connection to the natural onto modern-day *tsotsiles*. Archaeological evidence suggests that unifying features attributed to bats misrepresent what were likely very diverse understandings of both live and mythical bats. Furthermore, by treating them as an "anomaly" and then drawing comparisons to Tsotsil identity, Blaffer is ultimately suggesting that Tsotsiles themselves embody characteristics representative of *indigenismo's* racist ideologies.

Interestingly, following her anthropological work, Sarah Blaffer went on to become a renowned primatologist. That her work in anthropology should carry forward some of biology's evolutionist tendencies – and the colonial racism that they imply – should not be a surprise, perhaps. In any case, it clearly evidences the continual impact of evolutionary rationalizations on the field of anthropology in the present day.

OTHER INTERPRETATIONS: IK'AL AS AFRODESCENDANT

Blaffer's characterization of Ik'al differs significantly from her more nuanced understandings of Camazotz. Unlike Camazotz's propensity for beheading, which may be his

only definable feature, Ik'al is present in many mythical modalities[35] that configure him as hypersexual, rather than murderous:

> "H?ik'al,[36] as he is described in myth and in conversations with Tzotzil informants, is a small, black-skinned, curly-haired creature who wears wings or some other flying device on his feet. He lives in caves and comes out at dusk to steal chickens and to molest people. A thief and a murderer, he also carries lone women off to his cave and keeps them there. H?ik'al's most striking feature is his sexuality; he has a six-foot-long, death-dealing penis. Women raped by Black-man become superimpregnated. In some cases the woman swells up and dies; in others, her children begin to appear within three days of conception and then keep coming, one child a night. A common complaint concerning H?ik'aletik [37]is that they 'breed too fast." Despite this potency, Zinacantecos are convinced that there used to be many more Black-men than there are today. Formerly, they could not leave their houses for fear of Black-men. One Zinacanteco narrates: "The spooks have gotten fewer. Long ago we couldn't go outside until nine o'clock. At three o'clock you close up the house, close the door… Supplies of wood and water must be stored ahead of time; all needs must be attended to inside the house." (loc 507-519)

On one hand, Blaffer describes Ik'al as an individual character within myth; however, statements like "they breed too fast" cause him to function more like a race or species.

As Eric Lott (1993) has argued, hypersexuality like Ik'al's was a key feature in stereotyping male blackness in the Americas in ways that were used to justify the continual repression of

[35]Blaffer describes several mythical modalities in which Ik'al appears:

1) Ik'al comes to a woman's house and murders her while she is cooking corn. The neighbors hear corn boiling over on the fire, but it is actually the blood of Ik'al's victim.

2) Ik'al accosts a traveler and they fight. Ik'al dies, and the man (or men) goes to rescue one of his victims or visits his home.

3) Ik'al is lonely and asks San Sebastián el Martir and San Lorenzo for one of their children. He goes on a quest, but does not really get one of their children. Moral about pious people being protected from Ik'al. (533-543)

[36] Alternate spelling of "Ik'al." See note 1.

[37] -etik is a form of pluralization in Tsotsil, so "H?ik'aletik" refers to many black men.

Afrodescendants (Lott 1993:23).[38] Ik'al's hypersexuality suggests that rather than a bat, he may represent a stereotyped African or Afrodescendent.

As authors such as Moore (2014) have argued, blackface tropes from the United States were not only reflected in Latin American blackface traditions but influenced them, so it is not illogical to extend Lott's interpretation to Mexican blackface (26). Additionally, Laura Lewis, in *Chocolate and Corn Flour* (2012) has demonstrated that slavery led to a great degree of mixing between black and indigenous Mexican populations, an issue often ignored in anthropological work on indigeneity. As a result, the restrictive definitions of indigeneity offered by Vogt and Blaffer lead them to overlook more complex racial dynamics in favor of simplistic totemistic ones.

I owe my interpretation of Ik'al as an Afrodescendent to Antonio Gómez Gómez, a Chamulan scholar with whom I had the privilege of studying Tsotsil language for several months. In the introduction to his Tsotsil-Spanish bilingual edition of one Ik'al story, Gómez states:

> En las communidades indígenas existen narraciones sobre espantagentes. Algunos afirman haber tenido encuentro con ellos, sobre todo con un personaje muy común que es El Negro. Este cuento se narra en diferentes versiones, con muchas variantes, ya que se supone existieron, en la región de los Altos, varios negros. Este personaje se presenta como un ser superior a cualquier ser humano; pero si retrocedemos y analizamos en la historia conforme fueron sucediendo los hechos, nos damos cuenta que estos relatos se originaron desde la llegada de los conquistadores españoles quienes trajeron esclavos negros para su servicio. Años más tarde los hacendados y los dueños de las fincas cafetaleras compraron esclavos negros para el trabajo manual.
>
> Dadas las precarías [sic] condiciones en las que vivían los negros, no faltaba quien se rebelara en contra de sus patrones, y ante el temor de ser castigados severamente por su osadía, escapaban hacia las montañas sin rumbo fijo; después, al encontarse sin alimento, se dedicaban a robar a los habitantes

[38] Black and mixed-race women were also perceived as a source of sexual danger, particularly *mulatas* in Latin America (Madrid and Moore 2013).

> cercanos, y por su condición de fugitivos sólo salían por las noches, aprovechando muy bien su aspecto de color negro para causar pánico y confusión a los caminantes nocturnos. Démosle rienda suelta a nuestra creatividad e imaginemos a un negro al que nada más se le ven los ojos y los dientes blancos en la oscuridad, haciendo gestos espantosos, berrinches, utilizando un lenguaje extraño, saltando y aventando piedras a la única vereda transitable, la cual estaba cubierta de árboles… ¡espeluzante! ¿verdad?, mejor iniciemos la narración.
>
> In the indigenous communities there are narrations about spooks. Some claim to have encountered them, above all a very common character known as The Black Man. This story is narrated in different versions, with many variants, suggesting that there were many black people in the highland region [of Chiapas]. The character is presented as superior to human beings; but if we backtrack and analyze the story as the events occur, we realize that these stories originated with the arrival of Spanish colonizers who brought slaves for their service. Years later, the *hacendados* and owners of the coffee plantations also bought slaves for manual labor.
>
> Given the precarious conditions in which blacks lived, there were many who rebelled against their masters, and fearing severe punishment for their daring, escaped to the mountains without a fixed destination. Later, finding themselves without food, they turned to robbing the nearby inhabitants; because they were fugitives, they only went out at night, taking advantage of their black skin to cause panic and confusion among nighttime travelers. Let's give our creativity free reign and imagine a black man, of whom nothing can be seen but his eyes and white teeth in the darkness, making frightening gestures, causing a ruckus, using a strange language, jumping and throwing rocks on the only passable path which is covered with trees…Spooky, right? We'd better begin the narration… (Gómez Gómez 2000: 1-2; English translation mine).

The story that follows the introduction to Gómez's book features Ik'al. Tired of living alone in a cave, he kidnaps an indigenous woman, impregnates her, and holds her prisoner as his wife. The ensuing child – born after only three days of pregnancy – helps his mother escape and return to her home with her, but she dies after only a few days. Vowing vengeance on all black-men, the child returns to the mountains and dedicates himself to killing Ik'al. The story closes by suggesting that no more black people live in or around Chamula because of the efforts of Ik'al's son.

As suggested by Gómez's introduction, the story intersects in many ways with the history of slavery in the region. African slaves first arrived in Mexico with the 16th-century Spanish invasion, arriving from Cuba with Cortés and Pánfilo de Narvéz, and also accompanying Francisco de Montejo on his Yucatán campaign (Richmond 2004: 1). Bartolomé de las Casas, the Bishop of Chiapas touted for his efforts to reduce the ill-treatment of indigenous people, in fact advocated for Africans, not indigenous people, to be used for labor in the colonial system. "Because de las Casas argued for the substitution of black slaves for Indian subjugation," argues Douglas Richmond (2004), "the bishop has been accused of having thus caused the introduction of African slavery into the New World," including receiving permission to bring African slaves to Chiapas, where they worked on huge sugar plantations run by Dominican monks (2). De las Casas later expressed remorse that his actions had led to the bolstering of the African slave trade, writing that the legislation should have been "applied equally both to the Negro as to the Indian" (Browning 1930: 9).

More particularly, the story of Ik'al parallels stories about runaway slaves known as *cimarrones* – a term that Gómez uses in the title of his version of the story ("Ya' Yejal J-Ik'al/El Negro Cimarrón"). The *cimarrones* organized a series of revolts that resulted in the Spaniards giving them permission to create settlements after realizing how difficult they would be to subdue. Spaniards offered these communities autonomy in exchange for requiring the residents to become slave catchers, which eventually contributed to the decline of slavery in Mexico (Richmond 2004: 10). And because only one third of the slaves brought from Africa were women, many African men took indigenous women as wives, just as Ik'al does in the story. This ensured that their children would not become enslaved, since colonial racial politics ensured that children would have the same status as their mothers, not their fathers (10).

Gómez's interpretation situates Ik'al in recent colonial history, rather than hearkening back to a pre-conquest ideal shrouded in colonial ambiguity. While Blaffer's attempt to read

Ik'al as a bat might be an interesting thought experiment, it is founded on a conception of indigeneity that ignores not only the details of the source material, but indigenous interactions with other racial and ethnic groups. Despite this contrary evidence, Blaffer's insistence on interpreting Ik'al as a bat belies a deep-seated bias.

Blackface and the Feast of San Sebastián

The interpretation of Ik'al as a stereotype of an Afrodescendant is supported by the feast of San Sebastián, which includes *zinacantecos* costumed as Ik'al in blackface. While on the one hand, locals in San Cristóbal told me to attend the festival because "the *zinacantecos* dress up like bats," no one seemed to be able to elaborate on the significance of this activity. As I discuss in the following paragraphs, my observations attending the festival in 2018 further suggest that Ik'al's connection to the history of slavery in Chiapas is significantly more pronounced than his possible connection to Camazotz.

Blaffer uses accounts of the San Sebastián festival to further her argument about Ik'al being a remnant of Camazotz, and by extension, a bat. The festival, which occurs in mid-January and lasts nine days, is the last annual duty of the cargoholders (*mayordomos*), or z*inacantecos* occupying positions of religious authority for the duration of a single year, before they pass their position on to a successor (Vogt 1970: 19). According to the cargoholders' ascribed role in the event, they dress as "Spanish Gentlemen," "Spanish Ladies," Whitemen (*Kaxlanes*), Jaguars (*Bolometik*), Crows, Spanish Moss Wearers, or "Black-men" (*Ik'aletik*) (Vogt 1970: 86). It is these blackface representations that Blaffer uses to further her argument that Ik'al might be a bat.

As in the case of her literary arguments, Blaffer's interpretation of Ik'al as a bat has to do primarily with his physical features, in this case represented by costuming. Photographs included in Blaffer's book demonstrate that while everyday fashion in Zinacantán has changed significantly, costuming for the festival remains largely the same. In the 1970s as today, the

Ik'aletik paint their faces black and have extended sleeves that look somewhat like bat wings. However, they also wear bright orange pants and scarves, which seem difficult to reconcile with the image of a bat. Perhaps more significantly, they carry short whips, which could represent the *cimarrones* forced to become slave catchers in exchange for their autonomy. In addition to the fact that the Tsotsil word "Ik'al" literally means "black one," Blaffer's argument seems increasingly tenuous when viewed in light of contemporary practices.

Blaffer examines events at the festival in light of Ik'al's narratives in order to underscore her argument about bats. Part of the festival includes a ritual known as the climbing of the "Jaguar Tree," in which blackfaced Ik'aletik and other costumed figures climb a large tree stripped of its bark just outside the church (Figure 4.1). As they do so, the other cargoholders threw taxidermied squirrels bedecked with ribbons at them, which they tried to catch. Blaffer suggests that the squirrels are meant to represent the wives of the *mayordomos*, in what appears to be a rather complicated series of events policing female sexuality.[39] As discussed in the previous section, the focus on sexuality links the practices of the fiesta of San Sebastián more to Afrodescendant narratives than to those contained in the Popol Vuh.

Accounts of the festival's origins offered by Vogt further underscore that the anthropological imaginary, not deep-seated *zinacanteco* belief, is the origin of bat associations at the festival. According to Vogt, the jaguar tree is evidence of the 16th-century Catholic story about Saint Sebastian, for whom the festival is named. Saint Sebastian, a military figure and favorite of Roman Emperor Diocletian, was revealed as a Christian (a crime in the eyes of the Roman state). Sebastian admitted to his religious beliefs and then urged other Christian soldiers to die under torture rather than renounce their faith. The Roman courts sentenced Sebastian to be

[39] Throughout the narrative she also appears to confuse Ik'al with the figure of a *pukuj*, or spook, who serves a similar yet unrelated purpose in Tsotsil lore. As a result, I have chosen not to deal with the specifics of her interpretation of the events of the festival, focusing more broadly on the parallels she draws between Ik'al and Camazotz.

lanced with arrows while tied to a stake; miraculously he survived this punishment, only to only to be sentenced a second time to death by clubbing (Vogt 1976: 159; see also https://www.catholic.org). Vogt sees parallels between the squirrels thrown at the jaguar tree and the lances thrown at St. Sebastian.

Zinacantecan religion, as with many indigenous groups in Latin America, is highly syncretic, so direct parallels with Catholic narrative don't accurately reflect indigenous belief. In the Zinacantecan version, San Sebastián was a Captain led by a General with two daughters. The General wanted San Sebastián to marry one of his daughters, but he refused. For that the General sentenced him to death. The general took San Sebastian to the woods in Oaxaca and tied him to a tree, where animals came out of the forest and tried to kill him. There were two jaguars, two toucans, two "savages," two Lacandon[40] natives, and many Ik'aletik or Black-men – precisely the costumes adopted by *zinacantecos* at the feast of San Sebastián (Vogt 1976: 160).[41] The Chiapanecan version of the San Sebastián story continues with a series of other attempts on his life, which he miraculously survives, and ends with the construction of a church in his honor in Zinacantán.[42]

The story maintains many similarities to the Catholic version of events but situates them in local geography, including mentions of local animals and other indigenous groups. While it might seem logical for an outsider like Vogt to classify Ik'al as a bat in order to better underscore

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[40] The Lacandon jungle is located in southern Chiapas and stretches into the Yucatán and northern Guatemala. Its inhabitants are Maya-descendent and are some of the few indigenous groups believed to have escaped assimilation by European colonizers in the 16th and 17th centuries. They therefore maintain the reputation of practicing a "purer" form of Mayan culture to this day. Trudi Blom was best known for her photography of groups in the Lacandon jungle.

[41] I was not able to verify this account during my fieldwork. Most of my contacts had no idea about the origins of the festival. One person suggested that it was a re-enactment of a scene from the Popol Vuh, but to my knowledge, no such episode exists.

[42] I have also encountered alternative narratives about the founding of Zinacantán and the various indigenous communities in highland Chiapas. These stories configured saints as people who led the Mayans to sources of water following the 7th-century drought that may have caused the decline of the great Mayan cities. However, I have been unable to verify these accounts with any additional sources.

the broader narrative that animals attacked San Sebastián in the Oaxacan woods, he does not. Rather, he characterizes the Ik'al as one of a variety human groups that are described metaphorically as "animals" by the storyteller: the Lacandones, the "savages," and the Black-men. This suggests a hierarchical conception in which certain groups perceived as closer to animals are treated as beneath others. Though Vogt ultimately situates *zinacantecos* at the top of the hierarchy in his retelling of the San Sebastián story, it ultimately underscores the influence of the anthropological imaginary in constructing indigenous Others as more "natural" than other groups.

Figure 4.1 Continued on next page.

Figure 4.1: Climbing the Jaguar Tree at the fiesta of San Sebastián, with *mayordomos* in blackface as Ik'al and *Bolom* (jaguar). Photos by author, January 2018.

ETHNOTOURISM

Chris Goertzen and Pierre L. Van den Berge have each discussed the continuities between anthropology and what they term "ethnic tourism," particularly focusing on the ways in which both processes Otherize and stereotype indigenous people (Goertzen 2010: 35; Van den Berghe 1994: 32). Van den Berghe, who accompanied Vogt as part of the first research team of the Harvard Chiapas Project, sees ethnotourism as a sustainable form of travel in that it involves learning about local peoples. Goertzen, by contrast, argues that even well-meaning and intellectually curious tourists cause damage to the people they visit (Goertzen 2010: 40). At the same time, Goertzen argues that ethnotourism can promote positive changes in local communities, providing a source of income. As discussed earlier, a touristic presence can also

alter relationships between indigenous communities and the government, either leading to rectification or discouraging tourists from spending their money in the area.

The case of Zinacantán and its bats demonstrates how pervasive anthropological discourse has dictated the expectations of foreign visitors. *Zinacantecos* have been able to capitalize on the false sense of authenticity promoted by the anthropological imaginary in order to produce goods and services for financial gain. In San Cristóbal, bat symbols are marketed along with jaguars as symbols of Mayan identity (Figure 4.2). In Zinacantán, a taco cart next to the church in the central square proudly portrays its relationship to bats, and the local radio showcases posters depicting bats (Figures 4.3 and 4.4). San Cristóbal even has its own "Bat Store," evidencing a correlation between *zinacanteco* "bat people" and the DC Comics character Batman. A local tour guide mentioned to me that he had seen *zinacantecos* purchase Batman paraphernalia because it depicted bats, even though they didn't know the significance of the comic book character.

A pillowcase found at the artisan market in San Cristóbal evidences the kind of repressive authenticity sought after by tourists (figure 4.2). The embroidery depicts a number of readily recognizable animals native to southern Mexico, including bats pollinating a large tree, a cougar, a horned guan (type of bird), a spider monkey, and a porcupine. Though these animals clearly represent Chiapas, the women who sold them were not always able to describe what the animals were. This may be in part because they were for sale in the highlands, while most of the animals depicted were from the lowlands, or because many of the species – the cougar, most notably in this case – are extremely rare or even endangered, and not likely to have been experienced first-hand by the women who made the pillowcases. This is even more evident in the case of stuffed toys also sold at the market, which often took the form of giraffes, elephants, and other animals that are not found in Chiapas, even in zoos. There were even toys made in the shape of EZLN revolutionaries! The pillowcase therefore represents and eco-tourists ideal of Chiapas' flora and

fauna, rather than a reflection of the lived experiences of the women who embroider and sell them.

A t-shirt for sale at many of the tourist stalls in the center of San Cristóbal exemplifies the simultaneous marketing of bats and Mayan authenticity perfectly (Figure 4.5). The shirt clearly depicts the classic Batman logo of a bat in silhouette with outstretched wings enclosed in a yellow oval, but stylistically references Mayan archaeological findings with its use of curlicues and intricate patterning. The shirt recalls a 2015 art exhibit in Mexico City that depicted Batman in a variety of more "Mexican" styles arguably because the superhero represented the kind of figure needed by a city with "Gotham-like" levels of crime (Fernández de Castro 2015). At the same time, its blend of popular culture and archaeology suggests a commodified version of Mayan culture entrenched in natural symbolism, yet dissociated from its deeper meaning through the medium of pulp art.

Most people that I spoke to in San Cristóbal and Zinacantán were unable to explain why bats were important in the area. Two boys running the Sots'leb taco cart by the church in Zinacantán told me, "*pues… los zinacantecos somos la gente del murciélago*," (well… we [*zinacantecos*] are the people of the bat), but couldn't elaborate.[43] Similarly, Zinacantecan women weren't willing to elaborate on why their short shawls were referred to as "bat wings." The most elaborate response I received was from an elder during the fiesta of San Sebastián, who told me that the association with bats was "from a long time ago." While bat symbolism is prevalent in and around Zinacantán, responses such as these suggest not a lack of cultural memory surrounding the significance of bats, but its imposition as a significant symbol by anthropologists. As in the case study discussed by Geoff Baker in Cuba (2011) involving

[43] Obviously, it is also possible that the people I spoke with were not willing to share the intimate details of their beliefs with an American stranger. However, the responses seemed consistent across a broad variety of demographics and cultural situations, suggesting that the anthropologists' insistence on the historical value of bats to Zinacantán had left a lasting impact, despite the lack of more deeply rooted significance.

politically engaged rap, the presence of academics has led to the creation of an "invented tradition" in Chiapas.

Local musicians also take advantage of the bat as a symbol of indigeneity. In particular, Sak Tzevul (Lightning Bolt), formed in 1996 by Damián Martinez, perform a song entitled "Muk' ta sotz" (Large Bat) that addresses bats and their relationship to local indigenous identity. The group is part of a broader current of indigenous rock known variously as "etnorock," "rock en Tsotsil," and "bats'i'rock" ("true rock") that combines elements of traditional music with rock substyles such as blues (Lumaltok) and metal (Vayijel) in an effort to repopularize Tsotsil language, myths, and culture among indigenous youth (Tapia 2014). Unlike other groups in the scene, which is primarily based in bars in San Cristóbal, Sak Tsevul advertises mystical indigeneity, claiming that their concerts "transcurre[n] entre efectos de luces y humo que evocan el misticismo y sonidos de las montañas que caracterizan a los pueblos originarios de los Altos de Chiapas" (their concerts "occur amidst smoke and lighting effects that evoke the mysticism and sounds of the mountains that characterize the originating communities of the Highlands of Chiapas"; saktsevul.com). Additionally, their music includes rock versions of Tsotsil folk song in a manner akin to the "global pop" theorized by Tim Taylor (1997), which may be part of the reason why they are the only Tsotsil rock group to have performed widely on the international circuit.

The video for "Muk' ta sotz" juxtaposes concert footage and stills with video of Zinacantecan festivals. Symbols such as brightly ribboned hats, *copal* incense, and pine branches all index Tsotsil ritual in the video. The video also shows *zinacantecos* playing traditional instruments (harp, various drums, small flutes) though notably those sounds are absent from the track, which features only a rock combo. This is a video clearly designed for outsiders, who do not need to understand the barely intelligible lyrics in order to understand that the song is about indigenous mysticism.

Figure 4.2: Pillowcase showing bats from tourist stall in San Cristóbal de las Casas. Photo by author, September 5, 2017.

Figure 4.3: Taquería Sot'sleb, Zinacantán, Chiapas. Photo by author, Sept. 18, 2017.

Figure 4.4: Sign advertising Zinacantán's local radio station, Radio Murciélago. Photo by author, Jan. 8, 2018.

Figure 4.5: Batman-Mayan syncretic t-shirt from tourist shop in San Cristóbal. Photo by author, Sept. 2, 2017.

As Martínez described it to me, the bat in "Muk' ta sotz" is deeply connected to the concept of dreaming, an important feature of Zinacantecan beliefs. Zinacantán healers are believed able to send their spirits out to explore in the nighttime, a process which Martínez metaphorizes as a bat in the title of the song (interview with author Jan 22, 2018). However, when asked further about the significance of bats in Zinacantán, Martínez responded by citing Vogt's work rather than his own experiences, as many *zinacantecos* that I spoke to did. This suggests that while Martínez may have utilized the bat as a symbol of identity in his music, it remained connected to the history of anthropological intervention in the area rather than housing a more deeply felt significance. Furthermore, it functioned as part of an ethnic imaginary of what indigenous concepts and symbols should be represented in his music if he wanted to represent Zinacantán to the broader world.

Though Martínez grew up in Zinacantán, he is not ethnically Tsotsil, nor are many of the other performers who have cycled through his group in its twenty-year history. Critics of Sak Tsevul particularly point to the two Japanese violinists that played with the group in the early 2010s as evidence of their questionable indigeneity. This critique also comes amid claims that Martínez "stole" songs, performers, and opportunities to perform internationally from other groups, who as a result have received less support from governmental institutions allegedly geared towards promoting indigenous art. This has led to conflicts with other indigenous rock groups in the area, most notably the grungier-sounding Chamulan group Vayijel, who see Martínez as misrepresenting indigeneity, in addition to spuriously "performing" indigeneity himself. As such, for many indigenous people, Martínez's work – and his connection to bats – is just further evidence of the imposition of Western ideas about the connection between indigeneity, animals, and the natural world.

Rock en Tsotsil does address indigenous relationships to the natural world – just not in the simple totemistic way suggested by Martínez. Vayijel, formed nearly a decade after Sak

Tsevul, uses their music not just as a vehicle for repopularizing indigenous language among youth but also to communicate, rework, and reconsider indigenous stories and cosmology. Though Vayijel are not from Zinacantán, nor does their work deal with representations of bats, they are relevant to the present study because they demonstrate that there are other ways in which indigenous musicians articulate their relationship to the natural world – including ways that allow for contesting the hegemony of anthropological narratives about indigeneity. Vayijel's work demonstrates that existing conceptualizations of indigenous-animal relations are a product of colonialism and therefore must be reconsidered.

Vayijel's choice of rock demonstrates what Kyle T. Mays has described as "indigenous modernity," posing a direct challenge to the traditionalism of *indigenismo* policies and ethnotouristic expectations (Mays 2018:13). Rather than using traditional acoustic instruments (in Chiapas, most likely the harp), Vayijel's use of electric guitar, bass, and drums index modernity. Not only do they require electricity to be used, they are also made of "non-traditional" materials, and most likely imported – all features of modern cosmopolitan society. Like hip hop, rock is also a genre historically associated with rebellion and protest. For Vayijel, the choice of a rock medium therefore signifies what Audra Simpson has termed a politics of "refusal" in two ways: by invoking rebellion symbolically and by offering an alternate representation of indigenous identity (Simpson 2014: 11).

Furthermore, like the hip hop artists interviewed by Kyle T. Mays, Vayijel use their rock music as a way of passing on stories, concepts, and language to a younger generation. Mays argues that hip hop serves as a kind of continuation of older storytelling traditions, and the same might be said of Vayijel. However, recontextualizing old stories in new musical contexts also offers a changing, modern reflection on a historical past, in ways that represent changing indigenous beliefs and practices.

In a similar vein, Luis Cárcamo-Huechante has discussed Mapuche radio programs in Chile, particularly demonstrating how radio can disrupt what he terms the "acoustic colonialism" of large-scale national media (2013: 51). By promoting music in Tsotsil via mass communication platforms like YouTube, Vayijel achieves something similar. The presence of their language and their narratives interrupts hegemonic representations of rock music, bringing its pluralism to center stage.

Kux Kux	**Lechuza**	**Owl**
Ali kuxkuxe K'ot la me svulanot Oy la me k'usi tas k'an ta xalvot	La lechuza Llega a visitarte Hay algo que quiere advertirte	The owl comes to visit you There is something that it wants to warn you about
Ali kuxkuxe k'otlame svulanot Oy la me k'usi tas k'an ta xalvot Mume k'usi ta valbech'el Me k'ot svulanote ta nae Muyuk ma k'usi cal Nakano ox me chas bijumtasot	La lechuza llega a visitarte a tu casa Hay algo que quiere advertirte No le hagas nada malo, No la lastimes cuando llegue a visitarte Porque el ave no te está haciendo nada malo, Sólo te advierte que debes tomar precauciones	The owl comes to visit you at your house There is something that it wants to warn you about Don't do anything bad to it, Don't hurt it when it comes to visit you Because the bird is not doing anything bad to you, It's only warning you that you should be careful.
Ali kuxkuxe K'ot la me svulanot ta ak'ubal K'alal la cha vayee Ali kuxkuxe k'ot la me svulanot Oy la me k'usi tsk'an ta xalvot	La lechuza Llega a vistarte en la noche Cuando tú estás durmiendo La lechuza llega a visitarte a tu casa ¡Hay algo que quiere advertirte!	The owl comes to visit you at night When you are sleeping The owl comes to visit you at your house There is something that it wants to warn you about!
K'alal la cha vayek'ot La me ok'uk ta naa Yun la me oy k'usi tsk'an ta xalvot yaiuuu	Cuando tú estás durmiendo, Llega a llorar a tu casa ¡Y es porque necesita decirte algo!	When you are sleeping, It comes to cry at your house And it's because it needs to tell you something!

Figure 4.6 Continued next page.

K'ot la me svulanot tan a uuu K'alala la cha vayee	La lechuza Llega a vistarte a tu casa Cuando tú estás durmiendo	Comes to visit you in your house When you are sleeping.
Ali kuxkuxe	La lechuza.	The owl.

Figure 4.6: Lyrics of Vayijel's "Kux kux." English translation mine; Spanish translation by Oscar Campos at https://lyricstranslate.com/es/kux-kux-lechuza.html

In "Kux Kux," (Owl; Figure 4.xx) for example, lead singer Oscar López reworks the Chamulan saying that "when the owl hoots, an Indian dies,"a *mestizo* saying that has led many in Chiapas to persecute owls as symbols of bad luck: By reinterpreting this saying through a Chamulan lens, López demonstrates an alternate way of relating to animals – something that Kyle T. Mays would argue is a key strategy to decolonize society and scholarship (Mays 2018:134). Similarly, the name of the group itself comes from the Tsotsil conceptualizations about animal-human relationships. As mentioned in chapter two, in Tsotsil thought, every human has a guardian animal spirit, known as a *vayijel*, who is born at the exact moment they are and to whom they remain connected through dreams and shared sensations throughout life, though they may never encounter each other on a physical plane. The members of Vayijel wear masks symbolizing their spirit guardians while they perform.

In addition to their work in language and culture revitalization, Vayijel's work demonstrates a move away from colonial, hierarchical relationships between humans and animals. The concept of a vayijel itself moves away from totemism or straightforward representation, which subjugates the animal in the service of the human. Additionally, songs like "Kux kux" suggest other ways of mobilizing multispecies relationships, something that is ultimately both environmentalist and decolonial, that relies on re-envisioning human-non-human relationships in order to be achievable.

The concept of the *vayijel* overlaps with Haraway's "becoming with," demonstrating the indigenous origins of many currents in environmentalist thought. In both theories, humans and non-humans mutually constitute one another, remaining connected even when not in direct contact. While the anthropological imaginary of the Harvard Chiapas Project and subsequent ethnotourists considers indigenous relationships with the natural to be symbols of an ancient past, when examined in greater depth, they instead evidence contemporary ecological sensibilities that reflect multispecies entanglements in ways that intersect with the ideas of 21st-century scientists.

SOME REFLECTIONS ON FIELDWORK AND ETHICS

Laughlin, Vogt, and Blaffer came from a school of thought in which the anthropologist could be objective, maintaining his, her, or their distance from a community while still observing and documenting it in its "purest" form. However, it is clear in examining their work that the anthropologists' expectations about relationships between indigeneity and the natural world ultimately skewed the representation of cultural processes they sought to uncover. Their work ultimately affected the people they worked with, both in terms of creating expectations of tourists and in dictating history to the local population.

The anthropological imaginary is both generative and destructive, creating new forms of cultural practice that are based on racist ideologies and a denial of colonial history. Whether these forms of practice are ethical, I leave to the reader, but their effects in the case of Zinacantán cannot be ignored. As Farriss and Goertzen argued, the features that make Zinacantán appealing to tourists are the result of anthropological colonialism.

My work is certainly not exempt from these colonial dynamics, and my relatively short time in Chiapas makes me far from an "expert." Rather than focus on my authority to speak for *zinacantecos* in correcting their history, however, I see this chapter as a reflection on my position as a long-term ethnotourist, examining an anthropological imaginary in a field closely allied with my own. I, too, came to San Cristóbal and later Zinacantán expecting to find "the people of the bat," something that colored my interactions with the people I met in Chiapas and determined the types of experiences I

sought out during my time there. Though I have briefly addressed the ways in which indigenous academics and musicians have contested the impositions of the anthropological imaginary, this chapter remains primarily an expression of the histories that create anthropological fictions, and a reminder of the importance of situating them in the positionality of their authors – including myself. As Wolf argues, this approach ultimately creates more room for discussions about culture, in that it decenters a single viewpoint and provides room for many to express their own experiences with culture contact.

Chapter Five: Sciencing About Music

Introduction: Science is Culture/In Defense of Science

Figure 5.1: Illutration from Radiolab blog entry, "Is that a Lark I Hear? A Nightingale? Surprise! It's a Bat" by Quoctrung Bui (Krulwich and Bui 2014).

In October 2014, the popular WNYC science podcast *Radiolab* posted an article on their blog summarizing research by bat communication scientists. The website included audio clips of bat calls with humorous "translations" of their supposed meanings, as well as an image of a bat dressed in a bowtie and moustache in the stereotype of a classical vocalist (Figure 1; Krulwich and Bui 2014). While presumably none of the researchers mentioned in the article actually believe that bats sing opera, the article's tongue-in-cheek humor nonetheless offers insight into scientific definitions of singing. Scientific studies of animal song naturalize Western classical music by tracing

its evolution through the animal kingdom, a move that has been highly criticized by cultural theorists.

Radiolab, and the many scientists whose work contributed to the article, are far from the first to offer scientific interpretations of animal communication as "singing." In fact, the argument that animal sound is an evolutionary predecessor of human singing originated with Darwin, who argued:

> That animals utter musical notes is familiar to every one [sic], as we may daily hear in the singing of birds. It is a more remarkable fact that an ape, one of the Gibbons, produces an exact octave of musical sounds, ascending and descending the scale by half-tones; so that this monkey "alone of brute mammals may be said to sing." From this fact, and from the analogy of other animals, I have been led to infer that the progenitors of man probably uttered musical tones, before they had acquired the power of articulate speech (Darwin 2006 [1872]: 1309-1310).

Recent years have seen a revival of interest in the evolutionary origins of human music, particularly its relationship to animal song, including the rise of fields such as biomusicology and zoömusicology (see introduction). What role does this Darwinian revival play in the 21st century?

As "trendy" as engagements with the sciences may still seem to cultural theorists, the inauguration of President Donald Trump in 2016 ushered in a new era that directly challenges scientific hegemony. A report published by the Union of Concerned Scientists in 2018 expressed concern about inappropriate federal interference in scientific policy and the White House's refusal to acknowledge expert consensus on climate change has received widespread media coverage (Union of Concerned Scientists 2018). A

proliferation of publications concerning scientific survival in the post-truth era and cultural phenomena such as the March on Science in 2017 and 2018 evidence broader cultural debate about science's changing role in present-day society (Lynas 2018; Miah 2017; Vernon 2017). As such, understanding the crossover between the sciences and culturally-oriented fields in the 21st century is increasingly complex as scientists work to combat challenges to their work through increased education and "citizen science" projects, discussed later in this chapter. Furthermore, claim about science's unchallenged hegemony should be nuanced within this cultural milieu.

Science is a culture, developed around a shared set of values, practices, and a historical body of knowledge. While this is a dangerous claim to make in the current political climate, I think it is necessary in order to understand the complex ways in which scientific discourses function in society, both in the laboratory and outside of it. This chapter examines scientific beliefs about music and singing from the perspective of scientists, attempting to understand the ways in which scientific culture positions itself in relation to music, something that I argue it uses to contest narratives that challenge its cultural hegemony. Adopting a cultural perspective on the sciences is not an attempt to disprove the legitimacy of their findings; it simply implies that scientific knowledge is produced by human beings despite its claims to objectivity, and as a result is subject to the motivations of the humans who conduct it. I therefore follow Karen Barad's theory of "agential realism" (addressed in chapter three), understanding scientific practices as both constructed and real, created through their own discursive and material agency. My approach is distinct from philosophical engagements with the sciences because it re-

inscribes scientists into science, looking at people and practices whose experiences may be inconsistent with the kind of broad theoretical generalizations made when authors attempt to "prove" that science is merely cultural (see introduction).

Because scientific knowledge is produced in and by authoritative institutions, situating it in cultural theory is a high-stakes endeavor, despite the precedent of authors like Foucault (1989[1966]). Science has traditionally formed the basis of policy decisions made by governments and other institutions of power worldwide, so untangling the cultural underpinnings of scientific practice is paramount to deconstructing potential biases that become fact and then law when scientists – or their detractors – fail to acknowledge the subjectivity of the experimental process. At the same time, bringing this sort of optic to the sciences is not the same as questioning the value or veracity of scientific consensus. It is distinct from the "post-truth" politics of Donald Trump's presidency because it seeks to refine and improve upon scientific process, deconstructing power imbalances rather than pushing an arbitrary agenda in the interest of politics, monetary gain, or increased ratings. The media's failure to uncover not just scientific findings but also scientific *processes*[44] has resulted in uninformed citizens who cannot

[44] As Brent Crosson has argued, a key element of understanding science on its own terms is being able to differentiate between evidence and proof. In his work in Trinidad, Crosson demonstrates that both petroleum scientists and *obeah* practitioners perform experiments that offer evidence of particular phenomena, but neither is able to offer definitive proof. The key difference between the two practices is that geological scientists imagine proof as an unattainable goal towards which evidence continually strives, while the *obeah* practitioner has simply "given up on proof" (Crosson 2016).

Orna Darr, furthermore, has addressed the role of laboratory sciences in the courtroom in 17th century witch trials in constructing the notion of proof commonly misapplied to the sciences today. Laboratory sciences, when involved in legal proceedings, are asked to provide definitive proof when in practice, they only offer evidence (Darr 2013). This conflation has led not only to misunderstanding of scientific practices, but also to their devaluation by political groups (like climate change deniers) who assume that proof is possible through scientific means or that mere "evidence" is tantamount to opinion.

differentiate between well-conducted experiments and those deliberately manipulated for personal gain.[45] Deconstructing the misconception of science as an objective monolith is therefore crucial for developing responsible scholars and responsible citizens who can distinguish between scientific inquiry and political manipulation. Previous ethnomusicological engagements with the sciences have failed to appropriately contextualize scientific findings in their histories and practices. Rather than conflate modern scientific theories with hundred-year-old scientific ideologies, I examine the 21st-century revival of Darwinian engagements with culture, questioning how they function differently in the present-moment than they did in the 19th century. This chapter is therefore not an Adlerian attempt to legitimize ethnomusicology by adopting scientific methods, but rather an attempt to situate scientific culture – and by extension, 21st-century Western culture – in current politics. I am not proposing an alternative ethnomusicological methodology in this chapter, at least not one that takes decontextualized scientific data and tries to incorporate it into theories of culture as scholars such as Becker (2004) have done. Instead, I advocate for "thinking with" (or perhaps simply "thinking through") scientific culture as a way of illuminating structural hierarchies in Western culture. Unlike studies that vilify science in effort to uncover

[45] Bruno Latour's work has addressed the relationship between science and politics at length. Works like *The Modern Cult of the Factish Gods* argue that science is treated with almost religious reverence in modern society, and that scientific "facts" are no more than the fetish objects of 20th- and 21st-century Western society. Other works like *Politics of Nature* and *Facing Gaia* demonstrate the paralysis of political movements predicated on traditional ideas about nature, which perpetuate rather than rework existing power structures. In essence, Latour argues for a conflation of many types of categories, radically rethinking the relationships between supposedly diametric opposites like "nature" and "culture," "science" and "politics." Because these concepts are deeply entangled in the 21st-century West, I follow Latour in arguing that in order to understand social forces, we need a deeper and more contextualized understanding of the sciences and their role in constructing them.

social imbalances, I suggest that examining scientific philosophy, practice, language, and belief more deeply can serve to complicate hierarchical categories. Working from inside the sciences ultimately uncovers its practitioners' efforts to regain control in a political climate characterized by abject denial in the interest of short-term gain.

In this chapter, I offer an ethnomusicological perspective on the practice of "sciencing" about singing. Rachel Mundy has argued that early debates by Darwin and Spencer about the origins of music ultimately "produce a practice of hearing biocultural difference, where song [becomes] a measure of other species' worth" (Mundy 2018: 19). By examining recent scientific work in animal communication in a more nuanced manner, I demonstrate that the construction of evolutionary relationships between animal vocalization and human singing are instead predicated on *similarity*. The relationship of similarity constructed by animal song studies results from efforts to collapse species categorizations, rather than their delineation as argued by Mundy. Though similarity and difference are entangled concepts, a closer look at the underlying motivations behind animal song studies exposes efforts to decenter human beings from cultural narratives, rather than reifying their place at a social apex.

In the first section of the chapter, I demonstrate the importance of examining present-day scientific projects rather than historical ones by glossing existing arguments about sound recording and its function in categorizing species difference.[46] Focusing on Rachel Mundy's work in the bird song archives at Cornell University, I address the ways

[46] Samuels, Meintjes, Ochoa, and Porcello (2010) have argued for the flipside of this argument, re-inserting sound as a methodology for ethnography. My argument, on the other hand, uses sound as a way of arguing against historicism in the study of the sciences.

that preservationist attitudes associated with audio "taxidermy" functioned in differentiating humans from non-humans. I then offer a counterpoint to Mundy's argument by examining the "citizen science" project, Bat Detective, which seeks to erase notions of species difference through the production of environmentalist narratives founded in radical empathy. Like Merlin Tuttle's photographic work in chapter two, Bat Detective seeks to "humanize" bats by positioning humans and bats as entangled in the environmentalist crisis of the Anthropocene. Democratizing projects like Bat Detective demonstrate scientific efforts to make their processes more transparent and accessible to counteract anti-science politics.

In the second section of the chapter, I address scientific debates regarding the evolution of singing, particularly looking at how biologists conceptualize bird and bat song. Despite the somewhat problematic nature of early attempts to situate non-humans as the evolutionary predecessors of human singers, I argue that present-day animal communication studies emphasize synchronic similarity rather than evolutionary difference. This similarity is predicated on understanding singing as a neurological process rather than a structural object.

Science education songs exemplify further attempts to maintain legitimacy in the "post-truth" era. In the final section of the chapter, I examine the use of parody in science education music, which seeks to make science accessible to a broader range of students. Making science "cool" also implies ironic signaling of its status as "nerdy," something that reflects previous work on whiteness in hip hop (Kajikawa 2009). Parody song

therefore creates space for the expression of alternative identities associated with science. In addition, it demonstrates

scientific manipulation of neurology in the service of memorization.

Rather than offer a radical re-interpretation of singing based on interdisciplinary academic engagement, this chapter seeks to reassess current discussions about music's relationship to biology that are currently being discussed in Western society. I argue that a more carefully situated interpretation of animal song studies underscores the ambiguity inherent in Western construction of culture, as well as scientific negotiations under political pressures that challenge its hegemony. Just as Austin's bat-music phenomenon deconstructed the notion of Western separation from the natural world in chapter two, this chapter demonstrates that 21st-century science is centered on conversations regarding the relationships among species and their relationships to cultural production.

DIFFERENCE IN THE MUSICAL MUSEUM: A TALE OF TWO TAXIDERMIES

Taxidermied Bodies

Donna Haraway has demonstrated that taxidermic representations of the norm in natural history museums carry raced and gendered significance. Working in the African Hall of the American Museum of Natural History, she traces the history of Carl Akeley who collected and mounted the specimens in the museum. A friend of Teddy Roosevelt, Akeley's collection reflects the 26th president's reputation for masculine dominance over the natural world both in technique – "shooting" charismatic African mammals with both a gun and a camera – and in his presentation. Despite claims to realism, the African hall

showcases able-bodied adult male specimens, forging an Edenic version of nature that situates the patriarchal white male at the apex of the food chain (Haraway 1984-5: 36-7). The holotypes of the natural history museum offer a deeply biased view of the natural world, excluding any being that diverges from the norm as "unnatural."

Rachel Mundy extends Haraway's work to the musical museum, arguing that scientific practices associated with recorded sound are responsible for the very concept of categorical difference. Examining recordings of bird song in the archives of the Cornell Lab of Ornithology and comparing them to early ethnomusicological recording practices, Mundy suggests that style has been a way for ethnomusicologists to negotiate changing attitudes about difference throughout history (Mundy 2014: 735). Organological collection practices by ethnomusicologists such as Sachs and Hornbostel – as well as auditory collecting by the likes of Alan Lomax, and more recently, the Natural History of Song Project – were used to formulate style typologies. They posited an ideal "audiotype" that represented an entire genre, or sometimes a group of people (Mundy 2014: 743). Mundy traces the history of the audiotype to the rise of the scientific "holotype" in the 19th century, a single taxidermic specimen preserved in a museum as an exemplar of an entire species (Mundy 2018: 45). Mundy argues that in music as in science, the (auditory or physical) "bodies" of these specimens were used to define the norm, Otherizing any individual or practice that diverged from it.

However, my interlocutors in the science department at the University of Texas argue that the holotype is not meant to represent a Platonic ideal, but simply a possible example of a species. As an example: Alfred C. Kinsey, best known for his work on

human sexuality, was a professor of entomology. His work collecting wasp specimens and observing their variation led to his embrace of a wide spectrum of human sexual practices as "normal," claiming that "one of the most startling and most significant biologic phenomenon is…that no two individuals are alike" (Jones 2004: 332). So: while Mundy's critique of the Platonic ideal is justified, it reflects more Simone De Beauvoir's claim that Others are defined by their relationship to a norm than the underlying beliefs of actual biologists.

In addition to categorization, taxidermic practices like those described by Mundy and Haraway reflect Victorian drives towards preservation. In *The Audible Past* (2003), Jonathan Sterne argues that late 19th- and early 20th-century sound reproduction technologies paralleled the rise of canning and embalming, marketed amidst pervasive narratives about preserving "the voices of the dead" (Sterne 2003: 289). The RCA Victor logo known as "His Master's Voice" exemplified Victorian overlap between sound reproduction and the deceased: the logo shows a dog listening to a gramophone, which was meant to demonstrate that new sound reproduction technologies were so accurate that even a dog could be fooled into thinking that its deceased master was somehow still able to give it commands (Sterne 2003: 302). The goal of 19th century sound reproduction was not faithful preservation, then, but preservation such that the deceased could continue to perform a social function in the family (Sterne 2003: 297). This was even true of early anthropological projects, which used audio recording to preserve indigenous languages from the perceived risk of "dying out" (Sterne 2003: 311). The collection impulse was

not just a form of documentation but perceived as a way of holding on to vast diversity of life before it disappeared.

The issue of preservation in the face of extinction has become even more prevalent in the Anthropocene, when widespread disaster narratives decry climate change and species extinction. Museum collectors seek to ameliorate the impact of global warming by collecting species that might go extinct and thus preserving memory of nature that existed before human intervention. In the Anthropocene, Rachel Poliquin argues that taxidermy is a kind of longing to "become with" nature that is rapidly slipping away. Following Stephen Kellert, she suggests that even destructive acts – like taxidermy – "can be viewed as an extension of an innate need to relate deeply and intimately with the vast spectrum of life about us" (qtd Poliquin 2012: 9). Unlike the holotypes discussed by Mundy and Haraway, taxidermy in the Anthropocene is based in a need to encompass and relate to pluralistic forms of existence.

Taxidermied bats exemplify human longing in the Anthropocene in a variety of different ways, not only as collected examples of mammalian diversity, but as harbingers of global warming. The Museum of Southwestern Biology, which I visited in 2018, houses one of the three largest mammal collections worldwide, consisting of 300,000 specimens preserved in rows upon rows of compacted shelving. The museum houses drawers upon drawers of preserved bat bodies, each sorted according to genus, species, and location collected, evidencing a holdover from the Victorian-era scientific need to catalogue and organize life, thereby establishing dominion over it (Figure 5.2). The University of New Mexico, which pioneered the concept of "holistic vouchers," stores

skin, skull and post-cranial skeletons along with preserved samples of up to seven tissues (heart, kidney, liver, lung, spleen, muscle, and blood), genetic information (karyotypes), and ecto- and endo-parasites, all of which can be viewed in person or via an online database. Faculty members and graduate students prepare the specimens by removing part or all of the skeleton, the innards, and drying the skins in side rooms off of the main museum. It is impossible to view specimens in the humidity-controlled drawers without some sense of disquiet, as cotton batting peers out from where the animals' eyes used to be.

Bats are considered an "indicator species" because they are particularly susceptible to the ravages of climate change, and their presence and population health is considered an index of the ecosystem as a whole (Bat Conservation Trust 2019). Because they perform important ecological functions worldwide, including pollination and insect control, bats threatened by habitat loss, lack of food, and in some places, human predation[47] suggest that the entire ecosystem is in peril. In the United States, for instance, hibernating bat populations have recently been threatened by a fungus known as White Nose Syndrome, which has led to as much as ninety percent species decline in some areas. Though the disease does not affect humans, insect population explosions as a result of fewer predating bats could have extreme implications for agriculture, leading to

[47] Bats as "bushmeat" in Africa is of particular concern to many environmentalists, and (incorrectly) cited as one of the origins for the recent outbreak in Ebola. Human predation on bats is of course particularly complicated because it often occurs in places where other sources of food are rare, and of course implies a kind of colonialism in which people are asked to give up traditional food sources for the sake of environmentalist narratives imposed from the outside. However, Merlin Tuttle has demonstrated some effective work in Southeast Asia in which locals were able to obtain sufficient income from ecotourism that they no longer needed to eat local bats, instead viewing them as an economic resource.

severe increases in pesticide use or drastically lower crop yield (Wisconsin Department of Natural Resources 2018). As a result, bat collections are of increasing value as scientists work to determine the potential effects of climate change on the biology of different species worldwide.

In addition to their importance in understanding the effects of climate change, bat museum collections are crucial to immunological research, particularly looking at their role as reservoir species for diseases that affect humans. John A. Burns from the University of Hawai'i and the Instituto Conmemorativo Gorgas (Panama) have both collaborated with the Museum of Southwestern Biology at the University of New Mexico to study bats' role in transmitting hantaviruses that can cause serious pulmonary problems in humans (Museum of Southwestern Biology). Similar discussions of bats' role in transmitting Ebola have proved controversial and unfounded, but nonetheless evidence the increasing contact between bats and humans as a result of habitat loss due to climate change (Merlin Tuttle's Bat Conservation). Shared diseases imply shared biology, underscoring physical conceptions of human-bat similarity rather than difference.

Figure 5.2: Former Museum of Southwestern Biology employee and biology graduate student Marie Westover demonstrates storage of bat specimens. Photo by author, November 20, 2018.

Taxidermied bats serve environmentalist narratives beyond the storage drawer as well. At the Congress Avenue Bridge in Austin, for example, Bat Conservation International volunteers use taxidermied specimens to demonstrate what a "real" bat looks like. They show them to tourists and visitors who would not otherwise be close enough to the many bats flying overhead to see them as more than dark specks against the sky. Bat Conservation International has recently changed its focus from public education

to research into White Nose Syndrome, and as a result the few opportunities that tourists have to view bats "up close" – even dead bats – are used to make bats seem more empathetic, or even "cute." As Roman Krznaric has argued, engendering radical empathy through proximity is key to environmentalist strategies. Close contact with threatened species in any form makes their plight more immediate and their connection to the lives of tourists and locals more real.

Perhaps more importantly, the bats used at the Congress Avenue Bridge were not specifically killed and collected for the purposes of taxidermy as they often are for museums. Many of the specimens derive from failed rescue attempts by the directors of the Austin Bat Refuge, an organization that rehabilitates injured bats found around the city. While the ultimate goal is re-releasing bats into the wild, some have a permanent home at the refuge, and when their lives reach their end, they become immortalized as taxidermy specimens for purposes of education. The ethics of the bats used by BCI are therefore less tenuous than those used in scientific collection, in which live animals are captured and killed specifically for the purpose of taxidermy. Additionally, they are used as a way of making scientific practices more transparent to the public.

Notably, taxidermied bats are also part of an aesthetic that suggests another kind of longing, one exemplified by goth aesthetics. In my experience volunteering at the Congress Avenue Bridge, many visitors shared tales of finding antiques with bats inside them, or of trying to preserve roadkill bodies so that the animal death could become more "meaningful." These visitors share a predilection for the macabre, leading them to collect bat skulls or skeletons, bugs, and other goth-inflected paraphernalia to position

themselves outside the norm implied by the holotypes of 19th-century taxidermy. The kind of alternative Othering implied by the aesthetic of taxidermy is prevalent throughout Austin, epitomized by such institutions as the Glass Coffin Vampire Parlour that sells taxidermied bats among its many "oddities, curiosities, vintage [and] spooky home décor" (https://www.facebook.com/TheGlassCoffin/). The Glass Coffin recalls the cabinets of curiosities of the past described by Poliquin in which the exotic, the strange, and the eclectic were used to evoke wonder at the diversity of the natural world. Aurelio Voltaire, a well-known goth singer featured at the Austin Vampire Ball in 2018, even created a series of YouTube videos entitled "Gothic Homemaking" in which he demonstrates how taxidermy might be creatively used to decorate a house in a cozy yet macabre style. Taxidermy therefore functions as a symbol of gothic Otherness, a deviation from the mainstream and yet a symbol of belonging to a subculture that can be carefully constructed in a perverse imitation of Martha Stewart.

At the same time, while Bat Conservation International is careful to police the creation of taxidermy for educational purposes, a burgeoning trade in bat taxidermy has led to widespread, unregulated killing of bats worldwide. Though importers of taxidermied animals must obtain a license, there are no restrictions on how animals are killed. This results in widespread killing of bats particularly in Indonesia and China in order to support U.S. importers like Voltaire. Even bats that are allegedly "ethically sourced" are most likely deliberately killed for the purposes of trade, since bats are notoriously difficult to breed in captivity and cannot be "farmed" as other kinds of animals can be (Hugo 2017). Thus as Poliquin argues, while taxidermy may be used by

goths to evoke a sense of group solidarity or to articulate a relationship with the natural world, it is done so in a way that is largely destructive to the very natural world it seeks to connect with.

Taxidermied Sounds

Rachel Mundy suggests that recordings of animal song served a similar function to preserved museum specimens, acting as a sort of auditory taxidermy to be dissected (or vivisected) at the researcher's leisure. However, unlike Mundy's use of museum taxidermy to demonstrate categorical difference, audio taxidermy in the age of the internet ultimately serves environmentalist narratives of interspecies empathy. In particular, the Bat Detective website seeks to democratize the production of science and access to scientific archives as a "citizen science" project that allows users to decode bat communication calls online, to be included in studies by bat communication researchers. Organized by scientists from University College London, the Zoological Society of London, the University of Auckland, the Bat Conservation Trust and BatLife Europe, Bat Detective posts audio clips of bat calls from around the world onto their website, where a brief online tutorial teaches users how to identify different types of sounds. The data collected from the Bat Detective website is meant to be used in the development of more accurate bat identification software (Figure 5.3). The preservationist ethos of the project – though not entirely exempt from charges like those made by Mundy and Haraway – ultimately operates by situating humans and bats in mutualistic narratives of ecosystem fragility.

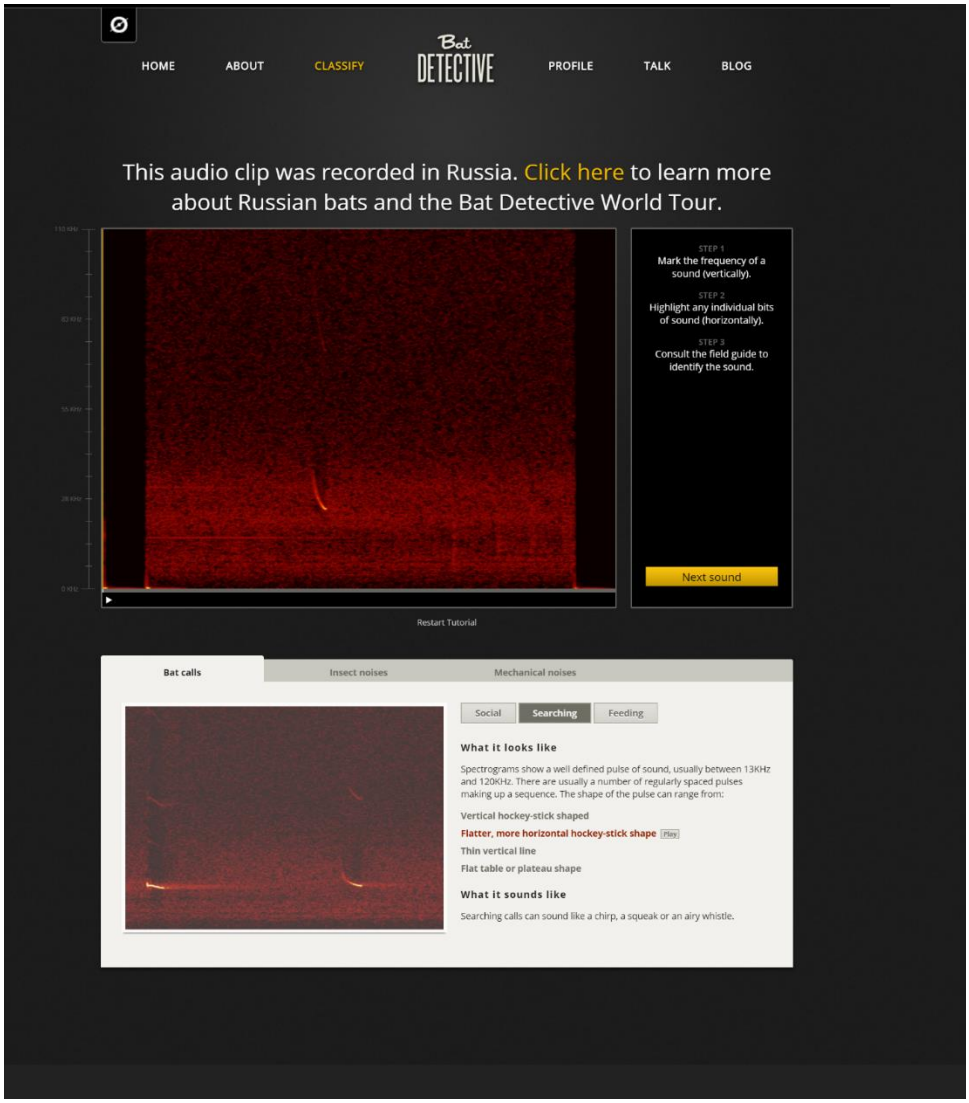

Figure 5.3: Screenshot of "searching" call on the Bat Detective website, February 21, 2019.[48]

[48] www.batdetective.org

The audio examples are collected from volunteers around the world using what are affectionately known as "bat detectors." The handheld devices pitch shift bat calls into the audible hearing range of humans, along with providing a spectrogram of the sound. Because bat calls are highly stereotyped based on species and function, the waveform produced by the bat detector makes visual identification of particular types of calls by particular types of species very easy to differentiate. The fact that scientists use their eyes to visually identify the calls, rather than aurally analyzing them, offers a reverse kind of synesthesia to the examples offered in chapter two: while Daniel Kish and others like him have used bios-mimesis to see with their ears, scientists studying bat calls in the present day listen with their eyes. This act of translation, like the poetic interpretations on the *Radiolab* blog, demonstrates an effort to reconfigure bat communication – and aurally-dominated sensory experience – as intelligible to humans, something done to encourage empathy.

The Bat Detective website draws on climate change discourses to encourage involvement, not just concerning the potential of species extinction, but using the health of bat populations worldwide as an indicator of planet-wide climate aberrations. The website argues that bats "serve as an early warning of climate change, like a canary in a coal mine," since they are distributed worldwide and particularly sensitive to the impacts of human (batdetective.org). By involving laypeople in the scientific process, the citizen science model acts as a way of generating the kind of radical empathy discussed by Roman Krznaric, in which people are only able to be invested in broader social issues

when temporal and physical distance are reduced, and they put themselves in the shoes of another being.

The ethos of preservation is apparent in all kinds of bat museum studies, be they through the collection of physical bat bodies for the purposes of education or the collection of bat sounds to represent living, breathing species across the globe. Though preservationist attitudes have been greatly critiqued in the social sciences, in the biological sciences they serve a different function. If humans have been the cause of the decline of non-human species worldwide, scientists argue, it is up to humans to reverse the damage by learning about the ways in which we are dependent on the many species that inhabit our world. The preservation implied by environmentalism, then, is evidence of a kind of nostalgic longing described by Poliquin – a nostalgia for a past that hasn't even arrived yet.

Efforts to involve laypeople in the processes of data analysis and collection seek to combat pervasive anti-science narratives. By involving the community in scientific efforts, citizen science projects contest claims about scientific elitism as well as offering analytical tools by which non-scientists can better understand scientific practices and findings. Using citizen science projects, scientists communicate the continued relevance of their discipline and train ordinary citizens to more thoughtfully consider the anti-science media messages that surround them.

SINGING/EVOLUTION/BRAINS

As with her work on museum collection, Rachel Mundy argues that 19th- and early 20th-century debates about bird song were at the root of understanding the stratification of human culture. According to Mundy, placing human culture on an evolutionary spectrum reflected social evolution more than biology by establishing a hierarchy by which Western communication was at the apex of thousands of years of development. Studies of bird song solidified power dynamics in a society already predicated on social class and racial hierarchies.

While the 19th-century public may have appropriated Darwin's theories in order to justify narratives of social progress, in the 21st century they serve a different purpose entirely. As a result of political threats to scientific practice, attempts to naturalize cultural practices are efforts to maintain the field's legitimacy in the face of contradictory arguments. Responding not only to cultural critiques by broadening their choice of case studies, scientists seek to naturalize musical behaviors in a way that erases cultural difference, ultimately proposing human/non-human similarity.

Scientific definitions of animal singing are structural, based on the length and function of a vocalization. For both birds and bats "songs" are classified as more elaborate and stereotyped than "calls," which are shorter and may be uttered in isolation. Functionally, calls are involved in short-distance communication, while songs are related to courtship or territorial behaviors, often performed by groups of birds or over larger distances (Smotherman et al 2016). While these are of course fluid categories with many vocalizations existing in a grey area between the two classifications, the typological focus

on differentiating between "singing" and "calling" species has been used as a key component of determining the evolutionary relationships between humans and non-humans.

Structural categorization of singing is indebted to Western music theory in ways that can be problematic. The notion that "singing" is more elaborate than "calling" underscores Enlightenment-derived narratives about music as more culturally advanced than speech, as evidenced by genres like *recitative*. *Recitative*, by definition, reflects a 17th century attitude that song is a heightened form of speech; essentially a more evolved form of communication than mere talking. By using similar frameworks to differentiate between "singing" and "calling," scientists ultimately suggest that culturally-derived speech-song categorizations are in fact natural and therefore definitive.

Similarly, structural analyses of animal singing have been used to naturalize other aspects of Western music theory. For example, Zatorre (qtd. Underwood 2012) conducted a study attempting to determine the connection between bird song and human song by looking at the frequency of known scale tones in bird song.[49] Because the incidence of scale tones was low, Zatorre (and the popular journalists who reported on the study) concluded that bird song was not, in fact, music. In a similar vein, Brown et al (2004) conducted a study in which patients were subjected to a PET scan to determine the neuroanatomy of melody production vs. harmony production. These studies show a

[49] Though Western theory conceives of scale tones as "natural" in that they are derived from the overtone series, decades of research in ethnomusicology has challenged this idea by demonstrating the wide variety of tonal practice across the world that have no relationship to the overtone series.

strong Eurocentric bias because they focus on differentiating between musical types based on their auditory structure.

This study might have been valuable if conducted with highly trained Western classical musicians, as an analysis of different problem-solving strategies, perhaps, as tonal harmony is governed by a very rigid set of analytical rules (and, in most cases, could not really be considered a "creative" endeavor.) However, Brown et al. framed their study by suggesting that harmony is what separates animal music from human music – perhaps looking for the evolutionary separation between them. They based this on the fact that there is no observed animal music with vertical organization (i.e. homophony). This is, unfortunately, indicative of a very strong Eurocentric bias, as the kind of harmony they describe is deeply rooted in the common practice period of Western classical music. There are many other approaches to music across the world which include call and response systems, heterophony, hocketing, or what is termed "singing up over" in the Kaluli tradition (Feld 1981). To suggest that these types of non-harmonically based musics are "not music" or somehow less evolutionarily advanced is deeply problematic. Similarly, studies like Zatorre's are problematic from a scientific perspective because birds and humans are not believed to share a recent common ancestor. Assuming that *all* non-human animals are predecessors to humans implies a kind of Othering that is not supported even by scientific theory. While studies on more closely related species might still be problematic for social theorists, those that draw broad connections across all animals do not accurately represent evolutionary theory or well-situated cultural theory.

Eurocentric structural narratives have been used since Darwin's time to formulate evolutionary narratives suggesting that singing developed earlier than speech. These theories have been termed the "musilanguage" or "prosodic protolanguage" hypothesis and suggest that human beings developed a form of communication based in non-lexical, music-like inflections before they developed speech (Fitch 2006: 475). Vocalizing animals – particularly those who are believed to be more direct evolutionary precursors of humans – are evidence for these theories, since they produce sounds that contain information content but do not produce language in the human sense. According to these theories, human singing is closer to animal communication than human speech, and animal singing may prove to be fundamental in understanding human communication.

However, the biological notion that (some) animal sounds can be considered music is not accidental, nor is the term "song" a misnomer when applied to whales, birds, or bats. Neurology, like music, is a Western practice that seeks to break down the reification of Western separation from the natural world and human exceptionalism. Scientists find remarkable similarities between human brain function in different musical contexts despite cultural differences, suggesting a redefinition of music based as a physiological activity in the brain, rather than an auditory structure (McLucas 2011: 5). Rather than using structural analysis as a method of comparison, then, neurological studies reconsider music and cultural practices as processes occurring within and from human and non-human bodies, emphasizing their functional similarities, rather than their artificial differences.

Recent research in the realm of neurology challenges simplistic notions of evolutionary hierarchy by situating comparisons between human and non-human communication as synchronic equals. Though neurological studies use evolutionary justifications to demonstrate evolutionary continuity between humans and non-human animals, what ultimately results from more direct analyses of human and non-human brains is an acknowledgement of their ecological coexistence, a mutualistic understanding of the many kinds of bodies that remain situated in inter- and intra-actions in the nature-cultural world. These intra-actions are predicated on a conceptualization of sameness that situates human beings in an entangled ecology that forms the basis of environmentalist narratives.

Neurological communication studies reframe the concept of music by examining it as a physiological activity, rather than an auditory structure. These studies are based on the long-standing theory that different parts of the brain perform different functions which can identified and compared to determine the physiological sites of particular behaviors. Studies on the mechanisms and evolution of human speech date back to the 19th century, when scientists Paul Broca and later Carl Wernicke famously localized areas of the brain responsible for the production and reception of speech. Though phrenology was no longer in fashion, Broca and Wernicke's research was in many ways indebted to it, particularly in the attitude that different physical structures in the brain conferred specific, unique functions. Both men worked primarily with patients with brain impairments, whose damage to areas of the superior temporal gyrus made them either unable to produce fluent, intelligible speech or unable to understand it. "Broca's area"

and "Wernicke's area" continue to be taught in many situations as the parts of the brain solely responsible for speech.[50] In the present day, localized brain areas can be determined in the laboratory with the use of an MRI or other brain-imaging technology that measures the electrical impulses of firing electrons. Laboratory technicians observe participants' behaviors – often instructing them to perform particular tasks – which they correlate to particular areas of the brain as they light up on a screen. I myself participated in one of these studies in 2012 at the University of Oregon demonstrating that different parts of my brain were active when passively listening to music than when I imagined I was playing a musical instrument. By searching for a physiological locus of a musical behavior instead of deconstructing its aural features, scientists seek to erase cultural differentiations between musical types and to offer an expanded definition of musical practice.

The current belief about brain function, however, is that it does not operate in isolated areas. Rather, brain function involves systems of neurons that link areas across the entire brain. While speech production and reception do involve the superior temporal gyrus, they also involve motor control areas in the basal ganglia and cerebellum as well as prefrontal areas associated with executive function (Liebermann 2007; Callan 2007). Karl Lashley, in the 1950s, suggested that the root of syntax and other creative behaviors, actually derives from mechanisms originally designed for motor control, which we have since learned are governed by the FOXP2 gene (Fisher and Scharff 2009). Most

[50] Broca's area is a site on the frontal lobe of the dominant brain hemisphere believed to function in speech production. Wernicke's area is located in the temporal sphere of the left hemisphere and believed to be involved in the comprehension of speech.

importantly, scientists argue that while emotional centers of the brain can be involved in speech production or reception, they do not have to be (Smotherman, personal communication). We know this intuitively as we can have an emotional response to something that we are told, but we can also speak abstractly about facts that do not carry emotional weight for us.

In the case of song, however, we are not so easily able to disconnect our emotional brain centers. These centers are typically understood to develop first in humans and are often characterized in introductory psychology courses as an example of our "primitive brain" because they are also believed to have evolved first. Multiple studies have demonstrated the connection between "the primitive brain" and song by examining mother-infant interactions. As an isolated example, one study showed that infants' attention to singing is much greater than to speech (Nakata and Trehub 2004). Others show that song typically precedes speech in mother-infant communication, and still others characterize child babbling (a sort of infant "protospeech") as closely related to song. This is particularly significant because infants do not have fully formed prefrontal cortices, including some of the areas responsible for speech production. Yet without a completely developed brain, they are still able to process and respond to song.

Some research on musical evolution uses bird song as evidence, despite the fact that differentiation between the ancestors of birds and humans predates the evolution of birdsong. Though we colloquially term bird sound "song", most of these studies draw parallels between bird song and human language. However, birds, like most non-human animals, lack the same prefrontal development that adult humans have, so this is not a

good comparison. They do, however, have many analogous structures in the hindbrain, as well as a variant of the FOXP2 gene. Though few studies draw connections between animal music and human music, based on what we know of neural anatomy, this really seems to be the best connection. To date, animal music studies have examined different "dialects" in the same species in isolated geographical areas, syntax, seasonal repertories, response to urban environments, and sexual dimorphism. Species studied include zebra finches, gibbons, humpback whales, the North American pika, and Mexican free-tailed bats (Brown et al. 2004; Fitch 2006; Mayra 2011; Haffner 2010; Smotherman personal communication.) Animals have been shown to have unique song repertories performed in certain locations and at certain times of year and to creatively adapt these songs depending on context.

The majority of neurological studies involve the use of Western classical musicians, suggesting that they are not entirely exempt from the accusations of naturalization inherent in more structurally-based studies. However, an increasing number of studies are expanding beyond Western classical parameters, focusing on on-the-spot creative expression in freestyle rap (Dietrich 2012) or looking at the importance of bass sounds and rhythm, traditionally not privileged features of Western classical music (Neuroscience News 2018). These studies reflect the influence of ethnomusicology in challenging Western definitions of music.

Additionally, W.T. Fitch (2006), in an overview of the arguments for and against the animal-human song connection, works closely with noted ethnomusicologist Bruno Nettl, and focuses on the evolutionary benefits of music, rather than superficial structural

characteristics. His most compelling argument involves the adaptive function of music. As he points out, there have been demonstrated cases of amusia that were determined to be genetically based (Peretz and Hyde 2003). This means that genes for musically able and non-musically able people both exist in the population. Some authors have taken this to mean that there are genes underlying human musicality, though others have found this questionable.

Additionally, musical ability does not seem to be an adaptive trait, as it is energetically expensive as well as loud, which in a natural situation might attract predators. However, musical ability has not been phased out of the population; in fact, it is overwhelmingly dominant. It has also been present in the population for what fossil evidence suggests is over 30,000 years, meaning that it is not simply too new to be selected out completely. Rather, scientists argue that music must serve some function, or it would no longer be present in the human gene pool. The key to determining what this function might be is in drawing connections to animals, and considering music as biologically-based and necessary, rather than frivolous entertainment.

Other authors contest this claim, turning to Darwin's theory of sexual selection to explain the persistence of maladaptive traits, such as musical ability. As Michael J. Ryan argues in *A Taste for the Beautiful*, females of a given species select for their preferred traits even when they are costly for males. Ryan argues that this is representative of a kind of species-specific aesthetic, though there are certainly theories about whether this species-specific aesthetic demonstrates a male's fitness because of his ability to expend the energy on aesthetic traits.

Narratives such as those presented by Fitch have dominated the neurological and evolutionary search for the origins of music for much of its history, despite superficial changes in technology or case study. However, an article published in *Nature* in 2016 demonstrates the increasing challenge to animal song studies. The article examined the perception of consonances among a relatively isolated indigenous group in Bolivia, ultimately arguing that because Tsimane' Bolivians showed no preference for consonance over dissonance, aesthetic features of music must be culturally learned rather than innate (McDermott et al 2016).[51] The article offers scientific justification for decades-old ethnomusicological claims, though notably without referencing its theories and using a significantly less nuanced methodology. Perhaps more significantly, the article led to a great deal of debate among researchers, suggesting increased tension regarding claims about behavioral (and by extension, cultural) supremacy over biological narratives (Hoeschele 2017).

"UNDER THE STARS AT MIDNIGHT": BATS AND MUSIC IN SCIENCE EDUCATION

In effort to combat shifting narratives about the importance of science to broader culture, scientists have used music as a form of education. The rise of educational science music parallels increasing public engagement with the sciences in the 1980s and 1990s, evidenced by the parody songs from television shows *Bill Nye the Science Guy*. Science

[51] The researchers played both musical consonances and dissonances for participants from the U.S., from Bolivia's capitol La Paz, and from a Tsimane' indigenous community and asked them to rank their preferences. Based on the idea that indigenous Bolivians were "isolated" from Western culture (a problematic claim in itself), the authors argue that the Tsimane's lack of preference for consonant sounds demonstrates that particular features of musical sound are exclusively cultural, not innate.

educational videos have proliferated rapidly with the rise of YouTube and are now being considered as a part of culturally responsive science curriculum, a term that encompasses teaching techniques that seek to affirm students' identities (Allgaier 2012; Ladson-Billings 1995; https://therhymebosome.wordpress.com/; https://www.sciencewithtom.com). Music genres like rap not only contribute to breaking complex scientific topics into digestible pieces, they also seek to make science "cool" or relatable by responding to cultural trends popular with students and by creating space for the expression of students' own backgrounds in the classroom.

Scientific educational song tends to rely heavily on the use of humor and parody. While on one hand, this evidences scientific theories about the function of pleasurable emotions in solidifying memory, it also embodies Linda Hutcheon's definition of parody not as "ridiculing imitation," but as "repetition with critical distance that allows ironic signaling of difference at the very heart of similarity" (Jäncke 2008; Hutcheon 1986-7: 185). In so doing, science education music relates to broader discussions about the ironic signaling of whiteness in genres like rap. As Kajikawa (2009) has demonstrated in his discussion of Eminiem's "My Name Is," musical parodies of whiteness in rap were more successful than attempts at direct racial crossover in that they acknowledged the racial dynamics at play. Similarly, if scientists use genres like rap to become relatable to students, signaling science's normativity through parody is crucial. Additionally, like related genre "nerdcore,"[52] science educational music creates space for the expression of

[52] A style of hip hop centered on topics pertaining to "geek culture," like comic books, video games, science fiction, and anime (Ronald 2012).

alternative identities by juxtaposing scientific culture with the more normative identities signified by popular music (Ronald 2012).

Texas A&M biologist Michael Smotherman's "Under the Stars at Midnight" uses parody song to convey information about bats while simultaneously expressing alternative Texan identity. The song, written by undergraduates in his lab, is accessible via his website (https://www.smothermanbatlab.com/) with printable lyrics, video, and accompanying hand motions. It is set to the tune of "Deep in the Heart of Texas" in a fascinating reversal of traditional Texan values. As discussed in chapter two, changing attitudes about bats in Austin contributed to the revision of cultural values, attitudes, and practices, underscoring a move away from the traditional pastoralism emphasized by figures such as Bevo the Longhorn and towards a valuation of "weirdness" symbolized by the bat. Smotherman's song fits perfectly into these changing narratives of Texan identity in that it rewrites a Texan folksong to include information about a previously maligned – now highly valued – order of animals. That these attitudes are dispersed through the medium of children's song suggests an effort to instill a new sense of Texan identity in a younger generation as well as a valorization of Texan identity that includes the contributions of scientists.

Science's engagement with music is also an attempt to hijack the neural circuitry of the brain in the service of memorization. Though the use of music in science education makes learning more accessible to a broader range of students, it also operates from the standpoint that music's physical origin in the human brain inherently allows it to carry information content. Musicologists such as Anne Dhu McLucas (2011) have examined

the brain function involved in memorizing music of oral traditions, looking at the ways that musical structures reflect known memory cues, such as melodic contour and timing (McLucas 2011: 33-8, 43). Scientists, who are familiar with these techniques and their neurological significance, capitalize on them in their use of educational songs.

Science education songs often include physical gestures that move scientific findings from the realm of abstract concept to embodied cognition. The "bat dance" performed at the Bat Loco festival in San Antonio,[53] for example, describes the process of echolocation including gestures that mimic. The embodied elements of the dance not only aid in memorizing facts about echolocation, they imply the kind of imitative "becoming with" described in previous chapters of this dissertation. By imitating bats, the participants in the bat dance situate themselves within the subjective experience of an echolocating bat, ironically signaling species difference in the same way that Eminem signaled whiteness.

The use of parody in science education songs simultaneously demonstrates an effort to combat critiques about science's accessibility and reflects scientific attitudes about music, memory, and information content. On one hand, the use of music functions as culturally responsive pedagogy, making scientific information more accessible and creating space for the articulation of alternative identities. At the same time, parody reflects scientific definitions of singing in more subtle ways, particularly in emphasizing

53 While the bat dance is not set to a pre-existing tune, it nonetheless contains many elements of parody, including claims to have been performed by "Batney Ears" – presumably a play on the name of pop singer Britney Spears.

the tension between similarity and difference both in terms of students' cultural background and in terms of the species difference implied by studies of animal song.

CONCLUDING THOUGHTS

Critiques like those proposed by Rachel Mundy about the categorization of difference produced by scientific studies of animal song should not be discounted, as they evidence the ways in which institutional bodies exclude (human and non-human) persons by classifying certain identities as normative. While in the 19th century, scientific categorization sought to establish social hierarchy, its revival in the 21st century evidences attempt to maintain it in the face of political challenges. Similarly, some animal song studies can be problematic in that they attempt to naturalize Western music theory.

However, situating naturalization discourses in their historical context reveals contradictory motivations behind their revival. Recent studies have attempted to address the social inequalities pointed out by critics by including a broader range of musical genres in their neurological studies. Similarly, scientists have sought to include a broader range of participants in their practices by "citizen science" projects such as Bat Detective and by the use of parody song to appeal to students from a wide range of cultural backgrounds. Maneuvers such as these are efforts to democratize science, its findings, and its practices, decentering it from the social hierarchy. At the same time, they are also efforts to legitimize science's continued relevance in the "post-truth" era, seeking in some ways to maintain its privileged social position.

The “post-truth” era portends a changing social role for the sciences, even as its practitioners navigate new chains of communication with the public. Scientific practices are becoming rapidly more transparent as scientists combat misinformation campaigns by recruiting the participation of laypeople. As in chapter two, we can no longer consider the “natural” (or the “scientific”) and the “cultural” as separate spheres; the 21st-century is defined by the increasingly obvious interplay between them.

Conclusion: Coming Out of the Bat Cave

"Becoming With" Bats

The various case studies presented in my dissertation demonstrate that humans and bats are entangled in processes of "becoming with" that emphasize the blurred boundaries between nature and culture. Haraway's (2008) conception of "becoming with" is a materialist theory suggesting that entities compose one another through the transfer of cellular information; however, her theories can be extended to aesthetics if we understand sight, sound and the other senses as a kind of touch. Sound is material, composing both the bodies that make it and those that receive it. As such, we "become with" not only the other entities we "touch" in the traditional sense, but also those that we see and hear.

"Becoming with" bats led to the formulation of an alternative music-bat nature-culture in Austin. Prior to the 1980s, Austinites were bombarded with narratives calling for the extermination of the rapidly growing bat colony at the newly-constructed Congress Avenue Bridge which were justified by colonialist and anti-immigrant narratives. Horror imagery derived from the early colonization of the Americas elided with invasion narratives derived from the presence of other human border-crossers. Biologist Merlin Tuttle brought humans and bats into greater contact with one another and changed those narratives such that bats became a symbol of Austin's growing countercultural identity. The interdependence between Austin's bat colony and its music scene is evidenced by music groups such as the Bat City Surfers, who situate their music

production in narratives about evolution from bats. Rather than reinforcing colonial-era discourses, the Bat City Surfers re-signify horror and science fiction tropes as a means of expressing pride in Austin's counterculture and their own dependence on non-human beings.

The rise of the "Bat City" shows that 21st-century urban environments are not separate from the natural world but depend on it. Austin is a prime example of Bruno Latour's claim that "we have never been modern," but are instead embroiled in nature-cultures formulated by multispecies intra-actions. While music scenes such as Austin's have traditionally been conceptualized as "cultural" phenomena created exclusively by humans, the arrival of the bat colony at the Congress Avenue Bridge demonstrates that even the most "modern" of human undertakings are a result of ecological "becomings."

"Becoming with" bats occurs on an individual level as well as among broader populations. In 18th-century Italy, bats contributed to narratives about sight and sound in the laboratory, ultimately shaping human perceptions of disability and their "solutions." While Thomas Nagel argued that we will never know what it is like to be a bat, echolocation research shows that attempts to understand non-human subjectivity have ultimately redefined the limits of the human body and its capabilities. Advocate for the blind Daniel Kish demonstrates that imagining what it might be like to be a bat ultimately led to the development of tools that assist the blind and visually impaired in navigating the 21st-century world. Echolocation offers a revised understanding of sound as spatial and tactile, deconstructing narratives about sight's supremacy over sound couched in Jonathan Sterne's "audiovisual litany."

In addition to demonstrating how scientists "become with" bats in the laboratory, chapter three demonstrated Karen Barad's theory of "agential realism." "Agential realism" is the idea that discursive practices – including both science and ethnomusicology – bring the objects of their study into being. In the case studies from chapter three, "bat-man" Daniel Kish evidenced hybrid subjectivities created by scientific experimentation: while we may never know what it is truly like to be a bat, scientific experimentation has taught us what it is like to be bat-man.

However, some scientific practices are ethically ambiguous. Though scientific "becoming with" bats has led to both the reconsideration of the human senses and the formulation of hybrid bat-human subjectivities, it employed violent methodologies. Early scientific experimentation on echolocation was particularly destructive, relying on damaging or removing sensory organs from live bats. This violent history sits uncomfortably with the productive conclusions, of researchers. We should not dismiss the findings of echolocation researchers, yet science as a discipline must be appropriately situated in its own violent history.

Chapter four underscored the importance of situating nature-cultural analyses in their appropriate histories by examining the imposition of the anthropological imaginary on Zinacantán, Chiapas. While representations of bats in Austin belie shifting narratives about immigration, ecology, and "weirdness," in Mexico, bat-human narratives have been imposed from the outside. Anthropologists, like evangelizing priests before them, imposed racist narratives that associated indigeneity with the natural world onto *tsotsil* communities, denying more recent colonial history in favor of drawing artificial

connections with an ancient past. Parallels between mythical figure Ik'al and Camazotz from Mayan codex the Popol Vuh are unfounded, based on structural impositions by Blaffer and the tendency of other anthropologists to take the writings of Francisco Ximénez as literal depictions of early Mayan cosmology. Efforts to impose totemistic relationships with bats onto *zinacantecos* evidence the pervasiveness of narratives put forth by *indigenismo* politics that posit indigeneity as a relic of a forgotten past. Associations between indigeneity and the natural are a result of 21st-century modernity, not of a pre-colonial past.

Tsotsil scholar Antonio Gómez Gómez suggests that rather than referencing the Popol Vuh, present-day depictions of Ik'al recall the history of slavery in Chiapas. Traits like hypersexuality in Ik'al narratives evidence stereotypes about Afrodescendants, further exemplified by the use of blackface at the feast of San Sebastián. The history of enslaved Africans intersects with indigeneity in ways that deconstruct the anthropological imaginary of a pure, ancient relic. Continued efforts to impose natural narratives on indigenous groups ultimately deny the complexity and violence of indigenous history.

Zinacantán's status as *la tierra de los murciélagos* is an invented tradition, one that *zinacantecos* have capitalized on in order to promote tourism. The sale of bat handicrafts and bat iconography on posters and buildings demonstrates the pervasiveness of Blaffer's bat narrative. Tourists and anthropologists have come over the course of many decades to Zinacantán in search of an "authentic" indigeneity, and *zinacantecos* have worked to keep up the charade, despite the fact that most are unable to describe the origins of the relationship.

In chapter five, I discuss the revival Darwinian theories that naturalize animal singing in the 21st century. Scientists negotiate their cultural capital through the use of parody songs. These songs, in addition to making science accessible to a broader range of students, exemplify scientific theories about singing as a neurological process occurring in the human brain. Additionally, parody comments critically on the simultaneous similarity and difference between humans and non-humans, bringing the issue of "animal song" full circle.

WORKING WITH THE SCIENCES/WHAT IT MEANS TO BE HUMAN

Ethnomusicological engagements with ecological and post-humanist topics are on the rise if this year's annual Society for Ethnomusicology meeting is any indication. However, the simple addition of non-humans into existing cultural narratives does little to challenge the foundations of our field. My work attempts to follow post-human engagements to the full extent of their implications, arguing not only that human practices are situated in ecological becomings, but that the very concepts of "nature," "culture," and "humanity" need to be re-addressed.

Topics like ecomusicology, biomusicology, and cultural sustainability[54] highlight shifts in international discourse about environmentalism without fully interrogating their own foundational philosophies. As public conversations about species extinction and wildlife preservation in the 1970s morph into the industry and energy-focused

[54] Sustainability theories also repeat the mistakes of comparative musicology in that they attempt to metaphorize scientific processes and apply them to cultural phenomena, a topic that deserves greater attention in a different study.

discussions of the 2010s, it has become increasingly popular to offer eco-minded analytical frames in many different fields, including ethnomusicology. However, such frameworks fail to consider what terms like "nature" really mean, nor do they examine the complexity of multispecies intra-action in sufficient depth to come off as more than propaganda. While it is absolutely imperative that ethnomusicology weigh in on discourses like climate change and sustainability, they must do so in a way that does not mindlessly reproduce cultural narratives without understanding their function in creating 21st-century Western society. My dissertation has attempted to address many different kinds of multispecies entanglement in an effort to illuminate the complexity of living as a human in the Anthropocene.

Part of a more nuanced effort to engage with environmentalism involves turning to its foundational discipline: the sciences. While critiques of early ethnomusicological engagement with the sciences have been highly critical, they fail to situate science in present-day politics, something that overlooks the motivations and discursive maneuvers made by scientists themselves. Failure to acknowledge the linkage between scientific findings and scientific practice is highly irresponsible and comparable to "post-truth" media coverage that conflates evidence (or emotional draw) with proof. Ethnomusicologists undertaking work involving the sciences must therefore be willing to take the time to become as immersed in scientific culture as they would in the culture of another country as part of more traditional ethnographic studies.

COMING OUT OF THE BAT CAVE

Bats serve as a convenient metaphor for the reversal of perspective implied by a multispecies approach to ethnomusicology. In a field traditionally conceptualized as "cultural," understanding music as part of a nature-culture means up-ending our conceptions about what "counts" as ethnomusicological study. This does not mean a simple turn to applying ethnomusicological methods to the sounds produced by non-humans, but understanding musical practice as situated among relationships of many kinds of beings. We must "come out of the bat cave," as it were, of our past methodologies into a deeper understanding of how we as scholars, the people we study, and the many non-humans that intra-act with them work together to create 21st-century society.

Past work by authors such as Steven Feld in many ways prefigures the new kind of ethnomusicology I am proposing, but it remains couched in discourses about the Other. Rather than examining "natural" relationships in "pre-modern" societies, I suggest a re-evaluation of human-non-human intra-actions wherever we, the researchers, happen to be. This could entail valorizing our intra-actions with urban "pest" species as I do in chapter two (what about raccoons? crows? grackles? termites?) by examining their effect on our daily life and aesthetic practices. It could entail tracing the production practices of musical instruments that we already own (are they leather? wood? gut? what non-human bodies are reformulated for our musical use?). Or it could involve looking more closely at the relationships we have with our pets – a relationship so pervasive in

the 21st-century U.S. that it has led to a multi-million-dollar industry including products like "music for cats."

Ethnomusicological analyses situated in non-human entanglement is only one implication of my study, however, and I certainly do not advocate for all ethnomusicologists to incorporate science in their research. In my case, these topics emerged from a re-consideration of the normative aspects of my identity, as a former student of the scientists, living in a city with a bat fetish. What my dissertation ultimately proposes is a turn away from using single-axis social categories as frames of analysis because they misrepresent the experiences of those who do not conform to a single analytical category. This is a theory of intersectionality in that it suggests a methodology entangled in many different kinds of frames. More importantly, it is a methodology based on lived experience – a technique that challenges the rigid categories and physical boundaries imposed by colonial and academic structures.

WHERE DO WE GO FROM HERE?

Certain aspects of my attempt to address normative identity with a multispecies approach have been more successful than others. My efforts at more "traditional" ethnography did not really reflect the immersive approach that is preferred today, though hopefully my work offers some useful conclusions about the imposition of anthropological narratives (including my own) onto Others during fieldwork. Similarly, the topic of music and the brain is vast and merits much more detailed treatment than I have been able to achieve here.

Moving forward, there are many ethnographic threads that I have not been able to flesh out in this dissertation, in part because they differ geographically or involve non-humans other than bats. In particular, I conducted several interviews with and observed performances by several Tsotsil rock bands that did not make their way into this study. I also observed and interviewed multiple Mexican biologists, whose work I have yet to incorporate into my theories about animal song and museum collection. The implications of bat taxidermy in goth aesthetics and its relationship to music were also briefly mentioned in chapter five but deserve more in-depth treatment, as does Austin's vampire community. Despite the somewhat diffractive methodology I have employed by focusing on multiple geographic and temporal case studies, the expansion of these additional topics will offer a more kaleidoscopic view of 21st-century "becoming with" bats, something that I think better reflects the experience of living in the "modern" world.

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