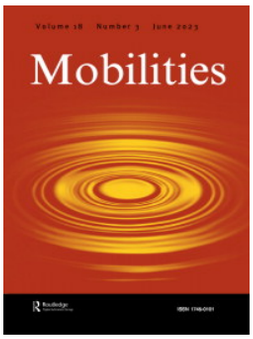

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Living with deadly mobilities: how art practice takes care of ethics when anthropomorphising a medically important parasite

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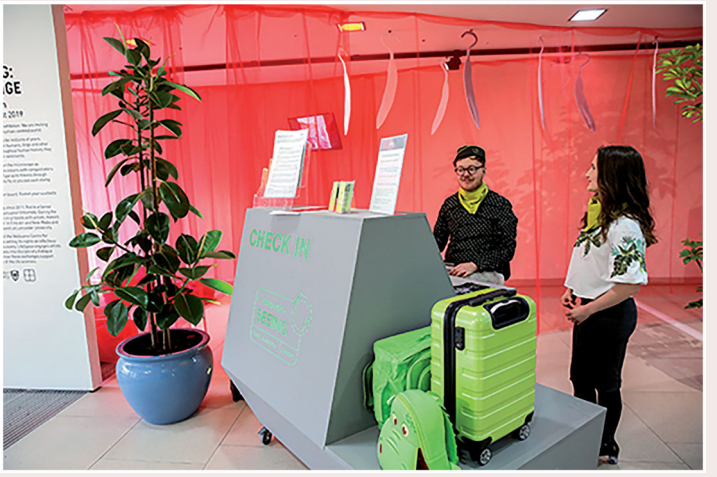
ABSTRACT

We propose that art practice as mobilities research offers alternative methods of more-than-human storytelling that expand simplistic narratives and illustrations of good and bad organisms. The article uses the authors' artwork *Para-Site-Seeing* (2018–2019) to explore how art practice can tell multi-scalar narratives of multispecies mobilities that fold in rather than leave out the social, cultural, colonial and scientific aspects of a disease. We use a fictionalised parasite's eye view to engage wide audiences in following the movement within multiple narratives of the disease. By situating *Para-Site-Seeing* in the context of the politics of care, and more-than-human art, we demonstrate the need for a more significant consideration of deadliness within the liveliness of biodiverse ecosystems.

GRAPHICAL ABSTRACT



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Introduction

In recent times, the global mobilities of disease have become a devastatingly familiar story. The invisible mobilities of microbial multiplication spread through a local population and then

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explode exponentially when the host boards a boat, a train, or a flight, and the microbes travel on scales beyond their own motility. The story of how and where disease spreads is entangled with different susceptibilities, the complexities of uneven geographies, and specific social and political responses that change over time and make or break the potential for microbial mobility and infection. COVID-19 has brought the mobilities of disease to everyone's doorstep and has attracted high levels of funding to accelerate vaccine research.

In contrast, leishmanaisis, the disease that we work with, is designated as a Neglected Tropical Disease by the World Health Organisation (WHO). It mainly affects populations in the global south, takes advantage of the disruptions of war, and disproportionately affects poorer areas. While both COVID-19 and *Leishmania* have greater impact on disadvantaged communities, *Leishmania* has been mostly invisible to the global north and is subsequently neglected in terms of treatment and research funding.

Para-Site-Seeing (Dillon and Southern 2018) and *Para-Site-Seeing: Departure Lounge* (Dillon and Southern 2019) are art-science collaborations about the mobilities of a deadly parasite called *Leishmania*. The works consider the global mobilities of *Leishmania*; the social, cultural and historical scale of its spread and scientific study of it; and the micro-mobilities of its lifecycle. In 2018, prior to COVID-19, we set out to focus on the mobilities of *Leishmania* and to make them public, not through a simplistic description but in all their complexity.

We begin by introducing the artwork, our process and research methods, and the ethical challenges we encountered. This is followed by a detailed description of how we enacted care through the eight stories that make up the art work. We then theorise this work in relation to the movement and stasis of more-than-human art works, and using a focus on the politics of care in Science and Technology Studies (STS) we reveal that care is not simply a matter of looking after the liveliness of ecosystems, but of including complex and problematic pasts, presents and futures alongside scientific research. We demonstrate that art practice as a mobilities research method can propose alternative methods of more-than-human storytelling that expand simplistic narratives and illustrations of good and bad organisms.

Taking care with art as a mobile method

Para-Site-Seeing is a collaboration between the authors, both of whom have multi-disciplinary practices: Rod Dillon is a scientist who also has a practice as an artist, and Jen Southern is an artist who also works in sociology and mobilities research. Our subject, the *Leishmania* parasite, is transmitted to humans by the phlebotomine sand fly and can also live within other mammals such as dogs and rodents. Leishmaniasis is found in 88 countries worldwide with over 12 million cases and 2 million new cases every year and about 70,000 deaths per year. In humans it causes 'irregular bouts of fever, weight loss, enlargement of the spleen and liver, and anaemia', and if untreated it is fatal in 95% of cases (World Health Organisation 2022).

Dillon's scientific research uses DNA technologies, including gene silencing (e.g. Staniek et al. 2019, Diaz-Albiter et al. 2012, Telleria et al. 2012) to research the interactions between the *Leishmania* parasite and its blood-sucking sand fly host to develop new approaches to prevent the transmission of the parasite that cause the various manifestations of leishmaniasis. His research group recently showed that *Leishmania* may help protect the sand fly host from its own diseases. Although a harmful parasite in a human host, they have found some mutual benefits to an insect host, in return for the insect providing a vehicle for the protective occupant (Sant'Anna et al. 2014). Southern's work has included GPS tracking of people, vehicles and animals, and filming with dog mounted GoPro cameras to explore more-than-human mobilities. As artists, they were co-commissioned by NEoN Digital Arts and the Wellcome Centre for Anti-Infectives Research (WCAIR) at Dundee University, who work on drug discovery to combat leishmaniasis in humans.

In the artwork, we wanted to tell the story of *Leishmania* mobilities and barriers to mobility, both within and between individual mammalian cells, within and between bodies of mammals and insects, within and between countries and between and within laboratory spaces. These relationships are complex and work on multiple sites and scales. Representing micro and macro geographical stories together is challenging, requiring dizzying zooms between scales from the bodily to the global. Representing those scales visually is difficult; it makes cuts and has priorities. The short film *Powers of Ten* (Eames and Eames 1977) by Charles and Ray Eames famously does just this, to zoom out to the scale of the limits of the known universe and to zoom in to the scale of a carbon atom within the body. The framing device for this journey is a man lying on a picnic blanket beside a lake in Chicago. The film suggests that by anchoring to one geographic point we can focus more easily on changes of scale. It is done as if the choice of a young white man in North America is unproblematic, simply an example of a 'human'.

Building on this example, Dillon uses a similar framing device in his lectures but shifts it, instead zooming out from a sand fly caught in the house of a subsistence farmer on a Google map of the outskirts of Teresina in N.E. Brazil to demonstrate the locations and situations involved in Leishmania transmissions. This is part of his orientation to scientific research that insists on the importance of studying disease as situated in specific socio-cultural, economic, and geographical locations that each have an effect on transmission and infection. Rather than simply a model organism in a laboratory, this is what Donna Haraway might describe as a companion species, one that is folded in with lives and worlds, that is lived with and through (Haraway 2008). Dillon also works closely with scientists in countries affected by the disease to exchange knowledge, and this has closely informed this project.

In *Para-Site-Seeing* our subject does not lie still as the subject in Powers of Ten does. We needed to tell a globally mobile story of difference and scale, one that is difficult to tell as a single journey. We used the framing device of a mobile parasite 'eye' view to follow the movement, and make this multiplicity into a coherent and legible narrative.

A large proportion of imagery reporting or explaining leishmaniasis depicts the suffering of unnamed black or brown people. As Austin Okigbo and Bellarmine Ezumah (Okigbo and Ezumah 2017) suggest in an article about the work of the Siphithemba Choir in Durban to shift dominant western representations of HIV/AIDS in Africa: 'Mainstream media accounts tend to present reductionist views whereby African bodies become equated with disease and helplessness' (2017, 706). While they refer mainly to news media, similar imagery also appears regularly in scientific conferences and publications. In this article we suggest that one outcome of art/science collaborations can be a process of telling wider, more complex stories that include the spread of disease associated with colonialism. Through imaginative use of a more-than-human perspective, an understanding of this parasite and the disease it causes can be made public in all its social, historical and political complexity. This perspective also contributes a set of imagery that does not rely on potentially traumatising representations of nameless dying individuals.

We approached the art commission from a mobilities perspective. Working with scientists and students from Lancaster University and scientists from WCAIR we asked participants to draw diagrams of how their research and the subject of their research, *Leishmania*, is mobile. Where possible, we asked them to imagine that a miniaturised GoPro camera was mounted on their research subject and to tell us what it would see. Narratives ranged from a mapping of historical research networks, to lab processes, parasite life cycles and historical travel. By asking what moves and how it moves, we gathered multiple narratives that are historical, geographical, colonial, organisational, biological and scientific, on a variety of spatial scales from the microscopic to the global and temporal scales from the seconds of cell division to millennia of fossilisation and evolution.

We took the mapping narratives and turned them into eight different stories from the 'parasites eye' view that were re-written as travel narratives and combined in a 'travel blogging portal' called *para-site-seeing.org* (2018), then later transformed into a physical installation called

Para-Site-Seeing: Departure Lounge (2019) (download a fully illustrated pdf of the exhibition catalogue from http://www.theportable.tv/pssDL). The transformation of the maps into narratives was done in a variety of ways, and often included being released first as a social media stream on Twitter, Instagram, YouTube or Wordpress, through accounts based on the parasite's names (e.g. @leishmania.we on Instagram and @LdBOB on Twitter), and gradually fed into the portal. To do this we translated the narratives into increasingly stylised language, and worked with students, artists and writers to craft these texts with a variety of narrative voices to imply different characters and speak to different audiences.

The anthropomorphism became increasingly extreme and embedded in the project until we were able to carry out conversations via Twitter as if the parasite was speaking to participants at a distance. Some of the media streams evolved a very playful approach to engage younger, non-science audiences. We were increasingly uneasy that it could be viewed as trivialising the effects of this deadly disease. What does it mean to promote a form of empathy with a deadly parasite? Is this ethical? How could we proceed whilst maintaining appropriate respect for those suffering from leishmaniasis and their loved ones?

Our initial approach to the work involved working with participants, one of whom suggested the title *Para-Site-Seeing*, which we adopted for a number of reasons that are indicative of the care we wanted to take with the work. Firstly, the work is about the deadly parasite *Leishmania*, which causes the human disease leishmanaisis. Within the work we anthropomorphise the parasite and imagine its own point of view as 'parasite-seeing'.

Secondly, following anthropologist George Marcus (2000), the research is conceived as a 'para-site', a mode of research done through conversations that think with participants and within a situation rather than through criticism from an external perspective. As such our work was 'para-site seeing', a collaboration and conversation between art, science, public engagement and mobilities research.

Thirdly, we approach the parasite itself as a para-site, an attempt to think alongside and within the parasites lives in order to understand how histories, geographies and laboratories are part of a wider more-than-human entanglement of 'para-site-seeing'. Finally, we allude to leisure and sightseeing as we develop travel narratives from the parasite's perspective. In this article, we expand on how we took care of these para-site-seeing relationships through focusing on mobilities and develop an argument for their importance.

We take care to see the research as a productive dialogue between disciplines rather than a critical antagonism, or informational approach to science communication. As Haraway suggests when discussing sculptor Andy Goldsworthy's work, 'Art and Engineering are natural sibling practices for engaging companion species' (Haraway 2003, 22), 'in which co-constitution, finitude, impurity, historicity, and complexity' (Haraway 2003, 16) enable us to tell difficult 'natureculture' stories.

We also draw on Michel Serres (2007) framing of the parasite as at once an actual parasite, a host/guest relationship and noise as interference in a clear signal. This framing helps us to move away from simply thinking about the parasite as a deadly adversary and enables us to think of parasitical relationships between hosts and guests in travel and tourism, how one system might become noise that productively interferes with another and thus how wider contextualisation of the disease interferes with the clear signal of a singular scientific narrative.

The mobilities of *Para-Site-Seeing*

In *Para-Site-Seeing* we took on the perspective of the parasite, making an online travel portal for stories of its global travel, both in its normal lifecycle within the body, but also historically in colonial travel and into scientific labs. This narrative enabled us to tell a complex story in a way that could be encountered at the level of collecting simple passport stamps throughout the

Figure 1. Exhibition visitors stamp a passport in the *Para-Site-Seeing: Departure Lounge*. ©Erika Stevenson 2019.

immersive 'airport lounge' installation, to in-depth engagement with the scientific and historical detail (Figure 1).

In this section we will tell eight stories and use colour to distinguish two different threads of care in *Para-Site-Seeing*, initially conceived as two dominant narratives: blood red representing the Leishmania parasite 'in the wild' within the blood and its visceral effects on the human body, and the blue neon stain used to highlight parasites in the clinical environment of the laboratory. We then go beyond that dualism to demonstrate the many ways the two situations filter into each other. The attempt to think through the parasite 'eye' view, what it would be 'seeing' at different points on the journey, enables us to think about this changing series of environments.

Leishmania in the wild

We begin by following the blood. The *Leishmania* parasite is 2–4 microns (μm) in diameter, and within mammalian blood (for instance, a human or a dog) it travels within macrophages (white blood cells), chemically disguising itself, so it is not attacked by these cells that usually destroy pathogens. Within the macrophage, in its roughly spherical amastigote form, they multiply by division and go on to infect other cells.

When a sand fly bites a dog, or human host, amastigotes travel through the mouthparts of the insect, still within the blood cell, and into the gut of the sand fly. There, as the blood meal is digested, they transform into their promastigote form, with flagella that are used to move inside the gut and to implant into the gut wall. Promastigotes that are implanted stay in the gut rather than being excreted with waste blood elements, and then continue to multiply into thousands of cells by division.

They travel back up toward the mouthparts (termed 'forward migration') and cooperatively produce a thick gel like substance, the valve in the mouthparts is thus damaged allowing them to travel back out into the blood stream of another mammal (for instance, a human) next time the sand fly feeds. No longer needing the flagella to move, they transform back into their amastigote form and enter again into macrophages. This is travel on a microscopic level between insects and mammals, and the *Leishmania* has evolved to make astounding transformations of itself between different bodies and temperatures, to embed and then travel against the progression of the digestive system, to break open an otherwise one-way valve, and to cross into a

Figure 2. Visitor unhooking a cut-out *Leishmania* shape from the ceiling in *Para-Site-Seeing: Departure Lounge*. ©Erika Stevenson 2019.

macrophage without being detected and attacked. This blood-red narrative is the parasite's journey through their usual life cycles and habitats.

In *Para-Site-Seeing* this story was initially told through an Instagram account for 'Leishmania.we', with posts written by Dillon and translated into a more dramatic storytelling voice, as is often found on social media, by Yasmine Kumordzi (a young Ghanaian researcher working with *Leishmania*). Images for this story were from earlier scientific research by Dillon, or produced by the Dundee Imaging Facility and include a variety of scientific imaging methods alongside mobile video to suggest sand fly flight and to document sand fly breeding grounds in Brazil.

In *Para-Site-Seeing: Departure Lounge* this narrative was installed inside a large red net enclosure in the shape of a sand fly gut, and positioned as if it was the aeroplane being boarded by the audience. The departure gate was where the flies mouthparts would be, denoting a point of transition. Inside the gut were red beanbags to suggest blood cells and provide a social space for visitors, an inflight movie shows the Instagram posts, and cut out *Leishmania* parasites that could be detached and reattached to the ceiling of the gut, mimicking the microscopic embedding of the parasite (Figure 2).

This part of the work is one of the most anthropomorphic, with posts using emoji's, hashtags and a first-person perspective to tell the story e.g. 'I live in a lovely house. A house with lots of bedrooms #macrophages and lots of siblings. We love it here! But things changed, it all began with Sandy the #sandfly … ' The familiar tone of the texts and the playful nature of the interactions has drawn people to congregate here, its playful feel encouraging participation with how the parasite lives within the sand fly, in a way that is usually difficult to translate for a general audience. This part of the narrative on Instagram, however, ends with both the human and the parasites dying as they continue to multiply in the blood, liver and spleen to a point where organ failure occurs.

Figure 3. The 'Unleished' newspaper including historical stories of *Leishmania* in *Para-Site-Seeing: Departure Lounge*. ©Erika Stevenson 2019.

This travel 'in the wild' takes advantage of the movements of the dog, the fly and the human. The *Leishmania* move between bodies, and at the same time travel within a local area, and if the dog, fly or human has boarded a boat, a train or a flight, could be travelling across the world. The nested vehicles of blood cell, insect or mammal, and machine, extend the scale of travel that the microscopic parasite is otherwise capable of. Situated in a simulated airport departure lounge participants are encouraged to think about the way that parasites usually travel smoothly through national boundaries as long as they are hidden within human or animal bodies, not subjected to the insecticidal sprays that police borders for insects, or the nationalised regulation of travel encountered by humans. For disease, the borders are controlled more chemically with sprays for insects, and vaccinations or preventative treatments for human consumption.

The second story is told through another Instagram account called 'Elektra_Dominica', which included images of a sand fly encased in resin and photographed for us by the Dundee Imaging Facility. It references the *Leishmania* found in the mouthparts of sand flies encased in Dominican amber, over 20 million years old (Poinar 2008). The posts show close-up fragments of the sand fly, its wings, hairs, legs and body encased in a yellowy light. It was probably a predecessor of the reptile form of the parasite and suggested the idea that *Leishmania* infected dinosaurs. In the departure lounge, one of these images was mounted on a lightbox as a part of the airport decor and was the first stop for participants to stamp their passports.

The third story was called 'Unleished'. It was inspired by the journeys of 'two intrepid ladies' who were commissioned by a Victorian era newspaper in Dundee to travel the world and bring back stories of how people lived (Keracher 2012). Our newspaper narrates *Leishmania's* colonial histories of the spread of disease (Figure 3). There is DNA evidence proving that a particularly deadly strain arrived in South America at the same time as Portuguese invaders, possibly in the blood of their war dogs (Leblois et al. 2011); dogs that were not only infected with parasites, but that also inflicted brutal deaths on the local population. *Leishmania* also travelled with the

railways built under British colonial rule in India facilitating wider spread of the disease (Desowitz 1991), and continues in the present day to multiply in areas such as Syria where war and poverty allow sand flies to proliferate and humans lack the resources to avoid being bitten (Al-Salem et al. 2016). These stories were printed in a newspaper and placed on a stand in the 'departure lounge', where participants could sit and read the paper or take it away. The drawings for the newspaper were made by Leonie Robertshaw, a Fine Art student from Lancaster University who's own art practice engages with science.

A fourth narrative called 'Visceral Media' brings the travel narrative up to date by presenting a diverse range of contemporary news stories and educational videos from countries affected by *Leishmania*, demonstrating the current spread and impact of the disease and is experienced on the *para-site-seeing.org* website. These four stories use *Leishmania* in the bloodstream to traverse the global and temporal scales of the parasites' mobility that have been going on for millions of years. Even in our 'in the wild' stories *Leishmania* is never alone, always an unwanted guest in a host, or an interference into other histories.

Leishmania in the lab

Next, we will follow the blue of Leishman stain, a story initially narrated within the 'Unleished' newspaper that describes a shift in how we see the disease. Imagine the day in 1900 when Scottish scientist Dr. William Boog Leishman took a sample of spleen tissue from the autopsy of an Irish British soldier (Desowitz 1991), and using a stain that dyed the nucleus red and the cytoplasm blue (Cox 2010) made the *Leishmania* parasite clearly visible under the microscope. Suddenly *Leishmania* were bathed in a different coloured light, an 'out of body' experience for the first time in their history, made visible in a blood sample by what became known as 'Leishman Stain'. From this point on the parasite enters into different kind of relationship with humans from '*in vivo*' to '*in vitro*'. We follow these new relationships through four more narratives.

Our fifth narrative, 'Freezr_Cat3', was made in the Dundee laboratories with scientists Lesley-Ann Pearson and Lorna MacLean, by filming with a mobile phone inside equipment used in their research. Although much of the footage was not made in the category 3 secure lab because of safety concerns, the films follow *Leishmania* in a flask of pink liquid, from cryogenic suspension in a freezer and into the labs where they do bulk testing against thousands of compounds to find a cure for leishmaniasis. The videos viewpoint travels through and with the labware and its processes, and were shared on a YouTube channel.

'Sand_Flyer' is an Instagram account that follows the work in Dillon's lab as he researches how *Leishmania* inhabit the sand fly gut. Films produced in research are interspersed with films and photographs in the lab. The perspective often looks back up the microscope at the scientist as if returning his gaze. Both this part of the narrative and 'Freezr_Cat3' are shown on monitors in the waiting area of the Departure Lounge installation. Flight announcements can be heard, made for us by Michelle Catunda who works in communication of science in Brazil.

The 'LdBOB' narrative follows the history of a specific strain of the parasite, called LdBOB, bred for use in labs and is told as a 'meet your ancestors' story on Twitter. The research was traced through academic papers by Dillon and given a younger more conversational voice for social media by Yasmine Kumordzi. The story gradually reveals that this parasite that does not occur in the UK or Canada is named *Leishmania donovani* after two British doctors, Leishman and Donovan, and Bob after a Canadian scientist called Bob Olafson. The original cells of this strain, however, were from a blood sample taken from an unnamed person in a village in Sudan in 1962, the process of scientific naming erasing this origin.

Figure 4. Interaction with 'LdBOB' in *Para-Site-Seeing: Departure Lounge*. ©Erika Stevenson 2019.

We used this Twitter stream to engage a public audience, and encourage contributions from a wider audience of scientists with whom Dillon had built relationships in countries affected by leishmaniasis, and continued to tweet from @LdBOB72 throughout both exhibitions, with at the time of writing 189 followers. Within the exhibition this area included a monitor with a Twitter wall displaying past messages, a pin board with the invitation to 'leave a message for LdBOB' and a projection of a world map showing the countries that are affected by Leishmaniasis. The message board was filled with messages, including those from the scientist who first brought LdBOB to the Dundee labs, young people asking LdBOB to keep away, and students pleading with him to help them finish their PhDs (Figure 4). Feedback for the exhibition demonstrated a wide range of views and demographics and the ability to engage both scientists with a specialism in studying *Leishmania* and young people who had never encountered the parasite or the disease.

The final narrative is 'Ghost-horde', which tells an assassin's story from the perspective of the drugs developed in the lab in Dundee, as they seek out their target in the human body. Written by Kevin Read from WCAIR and turned into the spy narrative by artist Stuart Nolan, it was originally tweeted line-by-line. In the exhibition, it took the form of a fluorescent poster next to a 'final exit' sign.

These narratives, using not only the Leishman stain, but also green florescent protein expression and fluorescence microscopy, allow us to focus on different practices of care. We can broadly say that when the parasite is in the blood, we care about the human host and its history; when it is isolated from the body, we start to also care for the parasite itself and look after it so that it survives in the lab. Within that separation, we highlight the ongoing borders and boundary crossings made by *Leishmania* and evoke a comparison and entanglement with human travel through the metaphor of the airport.

Animal points of view in art and mobilities

Para-Site-Seeing follows a rich history of taking on more-than-human perspectives in art and literature. Kafka's *The Metamorphosis* (1915), for instance, is well known for the human to insect transformation of its protagonist Gregor Samsa, and there has been a recent proliferation of artworks engaging with more-than-human themes, including exhibitions such as *And say the animal responded* (FACT 2020).

Movement and stasis have often been the focus of these works. For instance, *In the Eyes of the Animal* by artists collaboration Marshmallow Laser Feast (2015) uses VR and 360-degree immersive technologies to produce 'an artistic interpretation of the sensory perspectives of three species that inhabit British forests'. The resulting experience 'enables audiences to traverse the animated, real-world, landscape, and "see" through the eyes of these different species, on a journey through the food chain' (Abandon Normal Devices 2016). The work had a popular international tour and has encouraged a wide audience to engage with the visual and audio perspectives and movements of a mosquito, a dragonfly, a frog and an owl through an immersive cinematic experience. The artists worked with scientists to explore how perception works for those animals, producing a flow of sensory experiences, including a vibration in the backpack participants wear, indicating the beat of their dragonfly wings.

The artists suggest that the work encourages empathy and compassion through shifting visual and auditory perspectives beyond the human (Boyacioglu and Han Ersin 2017). The work acknowledges a deadliness of natural systems as each animal is eaten by the next. The work ends when a human shoots the owl, a finality that hints at a critique of human intervention in animal lives.

Two early works by artist Marcus Coates use the artists' actions within a performance to focus on movement and stasis in human-animal relations. In *Goshawk (Self Portrait)* (1999) the artist was secured high up in a Scots pine tree to put himself into the position of a bird of prey surveying the ground. In *Stoat* (1999), he built a pair of precarious shoes, described as:

> The stilts, replicating the stoat's paw print dimensions and spacing, create a physical limitation on his body which inadvertently makes his walk not dissimilar to that of a bounding stoat. The stilts are an unconscious mechanism for him to 'become' stoat and move from humanness. (Workplace Gallery website as of 22 September 2021)

The work is grounded in performative and ritualistic approaches rather than scientific research, but it develops more complex relationships to the unknowable:

> From his attempts to become animal to his vicarious experiences on behalf of individuals, he seeks to uncover degrees of understanding and knowing, testing our definitions and boundaries of autonomy. Coates devises processes to explore the pragmatism and insight that empathetic perspectives and imagined realities can offer, explicitly addressing a need to create functional and inclusive languages where conventional strategies of understanding and rationalisation prove inadequate. (Workplace Gallery Overview of Marcus Coates work as of 22 September 2021)

His exploration of animal perspectives has continued for the past 20 years and developed a sophisticated dialogue with human-animal relations. Empathy and imagination are promoted through performative and sometimes ritualistic practices in order to create a deeper understanding that is social, cultural and historical as well as 'animal', and at the same time sometimes deeply awkward and unsettling.

Para-Site-Seeing is similarly serious in its attempt to understand the more-than-human world of the *Leishmania*, while acknowledging that there was never the slightest hope of knowing the perspective of the parasite, with no eyes, no nervous system, no real sense of an individual, and reproduction by division that does away with notions of gender. These fictionalised points of view are in many ways in sympathy with the life forms they mimic. The audience is encouraged to reflect on the impact of human action on natural environments and organisms. In *Para-Site-Seeing*

the anthropomorphism is more problematic, engaging an audience in a mostly sympathetic journey from the perspective of a deadly human parasite, and we will return to this later in the article.

Another aspect of *Para-Site-Seeing* was to conceive of a perspective from a plural subject. The *Leishmania* is always 'we', impossible to refer to as 'I' because its constant replication of genetically identical multiples. Australian artist Perdita Phillips' poem *Quorum Sensing* is similarly written from the microscopic-perspective of a thrombolite, an ancient microbial community. 'The messages are received only as we congregate together. But our community is made up of many different we' (Phillips 2019), she writes in this evocative experiment in inhabiting multiple perspectives. She describes her work as ecoaesthetics for post-sustainable worlds (Phillips 2015), and calls for 'an aesthetics of action in the face of the inevitable uncertainties inherent in an ecological worldview' (ibid: 55). By taking on the multiple voice of microbes she suggests a complex world of communication and collective movement, through three related sections that describe solar, human and microbe-to-microbe connections.

If the trees spoke … (2019) by artist-geographer Candice Boyd also uses a multiple voice for a more-than-human perspective. The City of Melbourne had given individual trees email addresses with the intention that people would inform them of any maintenance needs; instead, they sent messages to the trees about memories, experiences and feelings about them. The project *Plantcities* by researchers Catherine Phillips and Jennifer Atchison analyses these responses and what they might say about how people feel, value and engage with trees. The sound work *If the trees spoke …* (Boyd 2019) vocalises sections of the emails, alongside field recordings and imagined responses of the trees. 'Beauty. Memory. They matter to us but in a very different way. There is no I, there is no me, there is only us. We, are all connected', the trees whisper back.

The more-than-human perspective has been used here as metaphor (Kafka 1915), broad environmental awareness and enjoyment (Boyacioglu and Han Ersin 2017), as approaches to understanding the unknowable (Coates 1999), and as a way of giving voice to complex, entangled and lively worlds (Phillips 2019). Despite, or perhaps because of, the seriousness of the motivation behind these works the artists never suggest that they can actually know what it is like to see from the animals perspective.

However, there is a serious intention to make connections with fragile environments, and to do this in sympathy with natural life forms and environments, and to engage audiences in different ways of seeing the world that are often drawn from scientific research into animal or plant life, including microscopic phenomena such as quorum sensing (where microbes communicate through chemical changes), or the connectedness of trees (through microbial networks perhaps), suggesting ways of trying to understand other life forms as social, cultural, historical as well as biological entities. A number of microbiologists and evolutionary biologists frame their evolutionary theory in terms of the social lives of microbes (West et al. 2007), they talk in terms of public goods, kin discrimination and enforcement of cooperation. These terms have been useful in developing concepts of the evolution of microbial communities.

In contrast with works that focus on the liveliness of other life forms the transdisciplinary art-science works of Anna Dimitriu engage directly with the deadliness of microbial life, and through which she has developed the concept of the bacterial sublime (Dimitriu 2012, 2013). Dimitriu works with deadly pathogens in laboratories, and their impact is made visible:

> Performance and participation are used in order to engage the audience with a visceral sense of the vast, complex, unseen communications networks that surround us, both in the biological and digital realms, in an attempt to engender within them a sense of the sublime (Dimitriu 2013, 43).

Dimitriu's (Dimitriu 2012) work often charts a course between the nuances and definitions of the sublime, the combination of awe and terror, building on the philosophical definitions by both Burke and Kant. She works with the world-changing deadliness of a range of pathogenic DNA ranging from the *Plague* to *MRSA* in research laboratories as part of the process of producing her work. By developing an intimacy with the beauty of their forms and processes as well as

their devastating impacts, she makes public the tensions between social, cultural and scientific understandings of disease.

Most recently, Tsing et al. (2021) have made a complex online mapping project engaging audiences in multispecies storytelling that acknowledges danger while encouraging responses to environmental challenges:

> Feral Atlas invites you to explore the ecological worlds created when nonhuman entities become tangled up with human infrastructure projects. Seventy-nine field reports from scientists, humanists, and artists show you how to recognise 'feral' ecologies, that is, ecologies that have been encouraged by human-built infrastructures, but which have developed and spread beyond human control. These infrastructural effects, Feral Atlas argues, are the Anthropocene. https://feralatlas.org/.

Their work uses specific situations to investigate multi-scalar environmental problems, and the complexity of more-than-human ecologies, with many themes that focus on pests and pathogens such as Dutch Elm Disease, Coronavirus and Yellow Fever Virus that arise through more-than-human intra-actions. In this context of artworks that engage with entangled more-than-human subjects we argue that a mobilities focus, that is evident in both *Feral Atlas* and *Para-Site-Seeing* enables us to explore the ethical relations between a respect for both disappearing environments and lifeforms and for a deadly parasite that has evolved over millennia alongside and within humans. Following Dimitriu, we could perhaps call this the parasitic sublime.

Ethics of care

Many of these artworks have been produced alongside a wider concern with extinctions on a planetary scale that cautions us to consider mobile multispecies relations more carefully, including those with microscopic life forms, as expressed here by Anna Tsing:

> … just to describe the world the way it is now, it seems to me we really need to know both human and the nonhuman dynamics, revising our ideas about social relations into a much broader sense of the term. It's about time, I guess, that we all started thinking about our situation in a way that includes plants, animals, microbes, and more, before we destroy them all. (Tsing and Haraway 2018, 14)

Within Feminist Science and Technology Studies (FSTS) there is a growing body of literature on the politics of care. Aryn Martin, Natasha Myers and Ana Viseu (Martin, Myers and Viseu 2015) describe a range of sites of care such as child care, health care, and ageing as well as the care taken in the roles of researchers in relation to their subjects, and in relation to topics as diverse as garbage dumps, war zones and courtrooms, and, of particular interest to our case, more-than-human worlds. As they suggest, care is configured differently in each case, and they foreground the way in which 'Practices of care are always shot through with asymmetrical power relations' (2015, 627).

Within *Para-Site-Seeing* care in scientific research became evident in multiple ways. Astrid Schrader's distinction between caring for and caring about something or someone and the necessity of action is useful in exploring the sometimes contradictory car for both the parasite and its hosts/victims:

> caring for somebody in need is surely possible without caring about somebody. That is, caring practices do not necessarily imply affection, sympathy, or compassion. Caring about someone does not have to issue from a specific 'need', nor must it translate into a specific action. (Schrader 2015, 668).

The form of care involved in the scientific work in relation to *Leishmania* at both Lancaster and Dundee is clear: scientists, students and researchers care about the millions of people who contract visceral leishmaniasis and care is enacted through research into new ways of preventing and curing this deadly disease. The power relations of care are demonstrated in the conflict that the scientist feels when they hear that there is a large increase in cases of leishmaniasis amongst Syrian refugees, for instance; this is at once horrifying but also fascinating from a research

perspective and there may even be an element of personal gain through the indirect suffering of others through access to more grant funding.

It is apparent that scientists also care for, and indeed have real affection for, the *Leishmania* parasite as they look after it as an experimental subject. Some PhD students may regard their parasite culture as a 'pet', almost Tamagotchi-like to be kept alive and fed at regular intervals or they will die. Furthermore, there is a strong ambivalence here, being fascinated by and spending thousands of hours with, and caring for, a life form that ultimately their research intends to eradicate. As Carrie Friese (2013) suggests in her study of experimental lab rats and mice, taking good care of the subject of research produces better experimental outcomes.

However, the care of rodents is to ensure that stress and pain for the animals are reduced, which also improves the outcome of experiments. In our case, the *Leishmania* do not 'feel' stress and pain in the same way, although they do respond to their environment as they transform and move through insect and mammalian bodies. Despite their lack of pain receptors, their care is important in order to provide healthy subjects for testing drugs and procedures, as is the decision of whether to work with *Leishmania* isolated in a flask, or situated in blood cells or sand flies. Nevertheless, the relationship between care for the parasite and care for the human subject are similarly linked: 'care for animals is bound up in care for the other social actors implicated in her research (particularly human patients) who are unseen and yet very real elements in her experimental system' (Friese 2013, 137).

If caring for a colony of microscopic parasites is different to caring for laboratory mice and rats, we need to zoom in again to care for a smaller scale through Maria Puig de la Bellacasa's work on temporality and care in relation to soil exhaustion and food security. Through a detailed description of soil in geological, biological, social and historical terms, she asks how notions of future food production can co-exist with temporalities of care for the complex liveliness of soil as an ecosystem. 'Organisms are soil', she says. 'A lively soil can only exist with and through a multispecies community of biota that makes it' (Puig de la Bellacasa 2015, 701).

> [T]o properly care for the soil humans cannot be only producers or consumers in the community of soil making organisms but must work, and be, in relation to soil as a significant living world. All participants somehow embody the time of the cycle by eating or becoming food for other participants in the death and decay cycle. (2015, 706)

Here again, on a microscopic scale, care is for microbes that are seen as constructive and beneficial, in a cyclical food chain in which death and decay still eventually become liveliness. Micro-organisms, and the multiple temporalities of soil, are cared for as parts of a living world that we share, and are crucial in sustaining life in many forms. In this case, care is not for the individual microbe or human, but the whole ecosystem within which it plays a part.

In death there is also life, and this is also true for *Leishmania*. Dillon has hypothesised that the parasite must provide a benefit to the sand fly host and it does seem that there are intermittent benefits to carrying *Leishmania* for the fly. However, these benefits are only evident if experiments are designed to find them, and in the past scientific funders were not sympathetic to this line of enquiry, with one reviewer describing it as 'very odd'. In reality, the social lives of microbes reflect human relationships; a pathogen may also be beneficial or mutualistic in some phases of their development, and it is this complex interrelation of liveliness and deadliness that we suggest is part of the complexity of care.

Margaret McFall Ngai (McFall-Ngai 2017) is also concerned that in the Anthropocene we are witnessing the destruction of complex microbial worlds that make nearly all life possible. Following Robert Koch she suggests that 'from the nineteenth century onward, bacteria have been seen primarily as pathogens' (2015, 64) and that, counter to that, recent genomics research is demonstrating how lifeforms are multiple:

> We are now beginning to realise that 'individuals' aren't particularly individual at all. The organisms of developmental biology, along with Darwin's species, all turn out to be complex assemblages, typically made up of more cells of others than of their 'own'. (McFall-Ngai 2017, 52)

> Today, biologists face the conceptual challenge of rethinking bacteria as partners in health. Human bodies can no longer be seen as fortresses to defend against microbial onslaught but must be re-envisioned as nested ecosystems. (McFall-Ngai 2017, 64)

She concludes with a call for practices of noticing microbial worlds in more detail, especially when invasive species also bring with them microbial symbionts.

> When an invasive species colonises a new region, it is likely to bring a new host of microorganisms with it. What effects might these new microbes be having on endemic ones – and how might those effects matter to all entwined with microbial life? (McFall-Ngai 2017, 66)

We must notice and account for microbial worlds with care, to differentiate perhaps between those that are beneficial to liveliness, and those that are not. Where to draw this line is difficult, and despite the need to find ways to prevent the spread of visceral leishmaniasis, like our lively companion species *Leishmania* has evolved with human life and is part of a wider ecosystem.

Why and how then should we care for the deadliness of our companion microbe *Leishmania*? Within *Para-Site-Seeing* we are interested in the multiple temporal and spatial mobilities of *Leishmania*, but our interest is not in maintaining conditions for its continued existence in the future, the power relations are more deadly on both sides. Care is not simply a matter of looking after the liveliness of ecosystems, but of including complex and problematic pasts, presents and futures. We must 'stay with the trouble' of multispecies assemblages and more-than-human storytelling that 'entangles myriad temporalities and spatialities' through what Haraway calls speculative fabulation:

> Staying with the trouble requires learning to be truly present, not as a vanishing pivot between awful or Edenic pasts and apocalyptic or salvific futures, but as mortal critters entwined in myriad unfinished configurations of places, times, matters, meanings. (Haraway et al. 2016, 1)

The uneven and differential nature of mobilities also need 'a deeper historicising of mobility research in terms of colonial histories, global geographies and neo-imperialism' (Sheller 2016, 16).

The term 'Plantationocene' (Haraway et al. 2016; Tsing and Haraway 2018) is a version of the Anthropocene that acknowledges the differential nature of human impact, by focussing on the inequalities of the plantation and its histories of slavery, dispossession from land, ecological simplification to single species crops, and use of pesticides. It offers a vocabulary with which to think through uneven power differentials in bodies and landscapes.

Anna Tsing uses the term 'contaminated diversity' to describe difficult relational stories in which histories of war, colonialism and greed are wrapped up in the survival or proliferation of other non-human species. In her case the species is the Matsutake mushroom, a life form that feeds on dead plant matter, and in turn nourishes humans and other creatures. Entangled with it are complex histories of corporate logging, displaced people, and aggressors in war that produce and now pick the mushroom. She uses the term 'contaminated diversity' to describe diversity that 'implicates survivors in histories of greed, violence, and environmental destruction' (2015, 33). She suggests that simple moral judgements are not possible, and that we must tell complex stories that include those histories:

> … we have a problem with scale. A rush of stories cannot be neatly summed up. Its scales do not nest neatly; they draw attention to interrupting geographies and tempos. These interruptions elicit more stories. (Tsing 2015, 37)

We argue that by caring for the complexity of both the biological ecosystem of the *Leishmania* parasite and the geographical, historical, temporal and colonial mobilities of *Leishmania* we can tell richer stories that communicate more about the disease and scientific research and do justice to wider communities who experience life with the deadliness of the disease. We do this by following

the movement. The initial travel blogging website was added to with a physical installation that transformed the narratives into an airport departure lounge. Through this metaphor, we emphasised the biological boundaries and border crossings involved in the mobilities of the *Leishmania* parasite on a microscopic scale, alongside the national and personal boundaries and borders of international travel that produce differential and uneven mobilities.

Conclusions

In this article, we demonstrate that art practice as a mobilities research method can propose alternative methods of more-than-human storytelling that expand simplistic narratives and illustrations of good and bad organisms. By telling multiple stories, tied together by the central conceit of a parasite's eye view, we were able to expand scientific narratives to be inclusive of difficult complexities. As Anna Tsing suggests:

> If a rush of troubled stories is the best way to tell about contaminated diversity, then it's time to make that rush part of our knowledge practices. Perhaps, like the war survivors themselves, we need to tell and tell until all our stories of death and near-death and gratuitous life are standing with us to face the challenges of the present. It is in listening to that cacophony of troubled stories that we might encounter our best hopes for precarious survival. (Tsing 2015, 34)

Leishmania donovani is part of an assemblage of relations within its own contaminated diversity, and it is this assembled quality that we articulate in *Para-Site-Seeing*. The neon-stained *Leishmania*, in controlled conditions, are isolated not only out of bodies but cut off from their troubled relational histories. Perhaps, as Tsing suggests, they are isolated into 'self-contained units' which are less complex to deal with, which enables the research lab to do mass testing to try to meet a need for drugs to treat a neglected tropical disease. In the wild, however, within blood cells and bodies, *Leishmania* exist alongside co-infections (particularly HIV) that changes *Leishmania* infection, and when transmitted by a sand fly, or passed between drug users on needles, there is evidence that infection is different (Paredes et al. 2003).

By telling a rush of stories about the multiplicity of *Leishmania* mobilities we make visible the contaminated diversity of the parasite by telling stories of the messy, relational mobilities of a disease as it is situated in the world. To care in this context is to acknowledge that human, and most notably European, colonial histories are part and parcel of the disease and its human impact, and the local conditions and politics matter in how the parasites are able to spread. Throughout the work we sought to include participants' voices, particularly from those in countries who are susceptible to the disease, in a variety of ways. Future work would benefit from finding and working with participants who are closer to the impact of the parasites as collaborators from the start.

Through approaching the parasite and art/science collaborations as para-sites, spaces for conversations rather than conflict, this art work aimed to explore the multiplicity involved in producing the science, and to provide a coherent framing for those stories that would be accessible to non-specialist audiences. We have argued that through a combination of art and mobilities research, the parasite's eye view, instead of trivialising deadliness, is a method of approaching *Leishmania* with care for multiplicity over the omissions of a single narrative of finding a cure.

By telling a rush of stories that look head-on at the problematic histories of disease, we can entangle scientific knowledge with multi-scalar social and political mobilities and make them available for public understanding. We suggest that artists, curators, scientists and practitioners of public understanding of science would benefit from using a mobilities perspective to draw together complexities in this way. It is by caring both for and about the mobilities of *Leishmania* in detail that we argue that it should be studied and represented in all its contaminated diversity in the blood red of the wild and the world as well as the neon stains of the lab.

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References

Abandon Normal Devices. 2016. "Festival Website." https://www.andfestival.org.uk/events/in-the-eyes-of-the-animal-marshmallow-laser-feast/.

Al-Salem, Waleed S., David M. Pigott, Krishanthi Subramaniam, Lee Rafuse Haines, Louise Kelly-Hope, David H. Molyneux, Simon I. Hay, and Alvaro Acosta-Serrano. 2016. "Cutaneous Leishmaniasis and Conflict in Syria." *Emerging Infectious Diseases* 22 (5): 931–933. doi:10.3201/eid2205.160042.

Boyacioglu, Beyza, and Ersin Han Ersin. 2017. "Interview with Marshmallow Laser Feast." MIT Open Documentary Lab. https://docubase.mit.edu/lab/interviews/interview-with-marshmallow-laser-feast/

Boyd, Candice. 2019. "If the Trees Spoke … ," Plantcities. https://www.plantcities.com/soundscape.

Coates, Marcus. 1999. *Goshawk*. Cumbria, UK: Grizedale Arts.

Coates, Marcus. 1999. *Stoat*. Cumbria, UK: Grizedale Arts.

Cox, Francis E. G. 2010. "History of the Discovery of the Malaria Parasites and Their Vectors." *Parasites & Vectors* 3 (1): 5. doi:10.1186/1756-3305-3-5.

Desowitz, Robert S. 1991. *The Malaria Capers: Tales of Parasites and People*. New York: Norton.

Diaz-Albiter, Hector, Mauricio R. V. Sant'Anna, Fernando A. Genta, and Rod J. Dillon. 2012. "Reactive Oxygen Species-Mediated Immunity against *Leishmania mexicana* and *Serratia marcescens* in the Phlebotomine Sand Fly Lutzomyia Longipalpis." *The Journal of Biological Chemistry* 287 (28): 23995–24003. doi:10.1074/jbc.M112.376095.

Dillon, Rod, and Jen Southern. 2018. *Para-Site-Seeing*. Dundee: NEoN Digital Art and Wellcome Centre for Anti-Infectives Research.

Dillon, Rod, and Jen Southern. 2019. *Para-Site-Seeing: Departure Lounge*. Dundee: LifeSpace.

Dimintriu, Anna. 2012. "The Bacterial Sublime." Anna Dimitrui *Website*. Accessed 22 September 2021. https://anna-dumitriu.co.uk/portfolio/the-bacterial-sublime/.

Dimitriu, Anna. 2013. "Cybernetic Bacteria 2.0: Investigating the Sublime in Bacterial and Digital Communication." *Technoetic Arts* 11 (1): 27–46. doi:10.1386/tear.11.1.27_1.

Eames, Charles, and Ray Eames, dir. 1977. *Powers of ten.* Santa Monica: Pyramid Films.

FACT. 2020. And Say the Animal Responded. Exhibition at FACT, Liverpool, UK.

Friese, Carrie. 2013. "Realizing Potential in Translational Medicine: The Uncanny Emergence of Care as Science." *Current Anthropology* 54 (S7): S129–S138. doi:10.1086/670805.

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

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

Haraway, Donna, N. Ishikawa, Scott F. Gilbert, K. Olwig, A. L. Tsing, and N. Bubandt. 2016. "Anthropologists Are Talking – About the Anthropocene." *Ethnos* 81 (3): 535–564. doi:10.1080/00141844.2015.1105838.

Kafka, Franz. 1915. *The Metamorphosis*. Translated by Stanley Corngold, 2013 ed. New York: Modern Library

Keracher, Susan. 2012. *Dundee's Two Intrepid Ladies: A Tour Round the World by D. C. Thomson's Female Journalists in 1894*. Dundee: Abertay Historical Society Publications.

Laser Feast, Marshmallow. 2015. *In the Eyes of the Animal*. Grizedale, Cumbria, UK: Abandon Normal Devices Festival.

Leblois, Raphaël, Katrin Kuhls, Olivier François, Gabriele Schönian, and Thierry Wirth. 2011. "Guns, Germs and Dogs: On the Origin of Leishmania Chagasi." *Infection, Genetics and Evolution* 11 (5): 1091–1095. doi:10.1016/j.meegid.2011.04.004.

Marcus, George. 2000. *Para-Sites: A Casebook against Cynical Reason*. Chicago: The University of Chicago Press.

Martin, Aryn, Natasha Myers, and Ana Viseu. 2015. "The Politics of Care in Technoscience." *Social Studies of Science* 45 (5): 625–641. doi:10.1177/0306312715602073.

McFall-Ngai, Margaret. 2017. "Noticing Microbial Worlds: The Postmodern Synthesis in Biology." In *Arts of Living on a Damaged Planet*, edited by Tsing. London: University of Minnesota Press.

Okigbo, Austin C., and Bellarmine A. Ezumah. 2017. "Media Health Images of Africa and the Politics of Representation: A South African AIDS Choir Counter-Narrative." *Journal of Asian and African Studies* 52 (5): 705–721. doi:10.1177/0021909615608208.

Paredes, R., J. Munoz, I. Diaz, P. Domingo, M. Gurgui, and B. Clotet. 2003. "Leishmaniasis in HIV Infection." *Journal of Postgraduate Medicine* 49 (1): 39–49. doi:10.4103/0022-3859.929.

Poinar, George. 2008. "Lutzomyia Adiketis sp. n. (Diptera: Phlebotomidae), a Vector of *Paleoleishmania Neotropicum* sp. n. (Kinetoplastida: Trypanosomatidae) in Dominican Amber." *Parasites & Vectors* 1 (1): 22. doi:10.1186/1756-3305-1-22.

Phillips, Perdita. 2015. "Artistic Practices and Ecoaesthetics in Post-Sustainable Worlds." In *An Introduction to Sustainability and Aesthetics: The Arts and Design for the Environment*, edited by C. Crouch, N. Kaye, and J. Crouch, 55–68. Boca Raton, Florida: Brown Walker Press.

Phillips, Perdita 2019. *Fossil (III)*. Hobart: A Published Event.

Puig de la Bellacasa, Maria. 2015. "Making Time for Soil: Technoscientific Futurity and the Pace of Care." *Social Studies of Science* 45 (5): 691–716. doi:10.1177/0306312715599851.

Sant'Anna, Mauricio R. V., Hector Diaz-Albiter, Kelsilândia Aguiar-Martins, Waleed S. Al Salem, Reginaldo R. Cavalcante, Viv M. Dillon, Paul A. Bates, Fernando A. Genta, and Rod J. Dillon. 2014. "Colonisation Resistance in the Sand Fly Gut: Leishmania Protects Lutzomyia Longipalpis from Bacterial Infection." *Parasites & Vectors* 7: 329. doi:10.1186/1756-3305-7-329.

Schrader, Astrid. 2015. "Abyssal Intimacies and Temporalities of Care: How (Not) to Care about Deformed Leaf Bugs in the Aftermath of Chernobyl." *Social Studies of Science* 45 (5): 665–690. doi:10.1177/0306312715603249.

Serres, Michel 2007. *The Parasite*. Minnesota: University of Minnesota Press.

Sheller, Mimi. 2016. "Uneven Mobility Futures: A Foucauldian Approach." *Mobilities* 11 (1): 15–31. doi:10.1080/17450101.2015.1097038.

Staniek, Monica E., Luigi Sedda, Tim D. Gibson, Cristian F. de Souza, Erika M. Costa, Rod J. Dillon, and James G. C. Hamilton. 2019. "eNose Analysis of Volatile Chemicals from Dogs Naturally Infected with *Leishmania infantum* in Brazil." *Plos Neglected Tropical Diseases* 13 (8): e0007599. doi:10.1371/journal.pntd.0007599.

Telleria, Erich L., Mauricio R. V. Sant'Anna, João R. Ortigão-Farias, André N. Pitaluga, Viv M. Dillon, Paul A. Bates, Yara M. Traub-Csekö, and Rod J. Dillon. 2012. "Caspar-like Gene Depletion Reduces Leishmania Infection in Sand Fly Host *Lutzomyia Longipalpis*." *The Journal of Biological Chemistry* 287 (16): 12985–12993. doi:10.1074/jbc.M111.331561.

Tsing, Anna 2015. *The Mushroom at the End of the World: On the Possibility of Life in Capitalist Ruins*. Princeton: Princeton University Press.

Tsing, Anna, Jennifer Deger, Alder Keleman Sazena, and Feifei Zhou. 2021. *Feral Atlas.: The More-Than-Human Anthropocene*. Stanford: Stanford University Press.

Tsing, Anna, and Donna Haraway. 2018. "Audio Recording from 'Reflections on the Plantationocene: A Conversation with Donna Haraway and Anna Tsing, moderated by Gregg Mitman.'" EdgeEffects Magazine. Accessed 22 September 2021. https://edgeeffects.net/haraway-tsing-plantationocene/.

West, Stuart A., Stephen P. Diggle, Angus Buckling, Andy Gardner, and Ashleigh S. Griffin. 2007. "The Social Lives of Microbes." *Annual Review of Ecology, Evolution, and Systematics* 38 (1): 53–77. doi:10.1146/annurev.ecolsys.38.091206.095740.

World Health Organisation. 2022. "'Leishmaniasis.'" WHO website. Accessed 12 July 2022. https://www.who.int/news-room/fact-sheets/detail/leishmaniasis.