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Estranged companions: Bed bugs, biologies, and affective histories

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Abstract

In recent decades, bed bugs have swept across wealthy industrialized nations. After near extirpation in North America and Northern Europe, the return of these insects has led to a significant level of public anxiety and cultural notoriety. Here, we undertake an analysis of human-bed bug relations in order to both better understand this contemporary resurgence and critically examine the concept of "companion species." We argue for conceiving of bed bugs as "estranged companions," and foreground the need to understand contemporary encounters between humans and the insects through distinct histories that have been shaped by the opening and closing of spaces between classed and racialized bodies and that have been dependent upon the development and deployment of particular technologies such as Dichlorodiphenyltrichloroethane (DDT). Further, we argue that "estrangement" has wider conceptual purchase and contributes to a body of research that has countered a strain of scientism in theory that decenters "the human" by interrogating the relations between companion species, (bio)political interventions, and colonial histories. Estrangement contributes to this task by, first, foregrounding that relationships with all companion species are imbricated in situated histories and biopolitical regimes and, second, drawing attention to the differential ethico-political implications of these regimes.

Keywords

Companion species, estrangement, DDT, insects, more-than-human geography

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> The bed bug is currently is an estranged creature to many people, a fact that seems to hinder rational approaches to their control

– Conrad Seidel and Klaus Reinhardt, "Bugging forecast: unknown, disliked, occasionally intimate. Bed bugs in Germany meet unprepared people," *PloS one* 8, no. 1 (2013): e51083.

> Please bear with me. I need *to* do *this*. Fuck you, you fucking motherfucker! You have been sucking my blood and irritating my skin for fucking months now! I fucking hate you! You crawl into my bed, into my shirt, up my pants, and fucking *bite* me! . . . Prepare to meet your maker, motherfucker! The Exterminator is finally coming, oh yes, he is coming!

– Laura Perciasepe quoted in Mark Singer, "Night Visitors", *The New Yorker*, 4 April 2005. Italics in original.

Introduction

The most frequently asked question on the Reddit forum r/bedbugs is simple: "is this a bed bug?" Often the answer is "no": it is another form of beetle, an ant, or in one memorable post, a piece of bark. There appear to be several reasons for this frequent mis-identification of bed bugs. First, the insect's appearance is reasonably nondescript: about the size and shape of an apple seed (Lockwood, 2013: 179), the ectoparasitic common bed bug (*Cimex lectularis*), which feeds more-or-less exclusively on humans, is part of the order Cimicidae, a "small family of flat-bodied wingless bloodsucking bugs".[1] These insects look, superficially at least, similar to many other creatures.

Second, bed bugs are hard to spot. They appear mostly at night when they crawl into beds, and, like "pigs at a trough," (Borel, 2015: 3) feed upon their sleeping victims, leaving only a tell-tale line of small, itchy, welts (Krause-Parello and Sciscione, 2009: 128). Indeed, despite sharing the most "intimate of space[s]" with their hosts (Lynch, 2019: 370), bed bugs are referred to as "cryptic" creatures (Hinson et al., 2014: 97) or "the bug nobody knows" (Potter, 2006: 103) within the professional literature. This nomenclature developed both because the insects are perceived to be an embarrassment (Potter, 2006: 103), but also because they are hard to find. As Clive Boase writes in *Pesticide Outlook*, bed bugs spend:

> . . . almost all their time concealed in harbourages, such as around the seams of mattresses, in bed-frames, behind headboards, behind skirting boards, in furniture, inside electrical fittings, behind pictures and coving, in curtains, under fitted carpets and in wall voids. Only very rarely are they found on clothing or on the person. (Boase, 2001: 159)

Third, bed bugs appear to be frequently misidentified because they were once nearly extirpated from North America and Western Europe and, thus, many people in these regions have limited experience of them. Thanks in significant part to the efficacy and widespread use of pesticides, these regions have, since the latter half of the twentieth century, been largely spared the anxiety, the itching, and the nightly bug hunts associated with bed bug infestation.

The fact that the question "is this a bed bug" is asked with such frequency, however, demonstrates one final thing: Several decades after the commencement of environmental warfare upon the insects, bed bugs are back with a bang. Since the mid-1990s, there has been a resurgence in bed bug numbers throughout the minority world. In the United States, bed

bugs have been reported in all 50 states with New York, Chicago, and Cincinnati noted as particular hot spots (Doggett et al., 2012: 165), while resurgent insect populations are also widely reported across Europe and Australia (Doggett et al., 2012: 164–165; Kilpinen et al., 2008; Levy Bencheton et al., 2011).

The re-emergence of bed bugs has been attributed to a "perfect storm" of diverse factors including a rise in international travel, increased exchange of second-hand furniture, the banning of pesticides such as Dichlorodiphenyltrichloroethane (DDT) in response to environmental concerns, a reluctance to use those pesticides which remain available as liberally within the home, and finally but certainly significantly, chemical resistance on the part of the bugs themselves. This perfect storm makes the possibility of eradicating bed bugs slim and entomologist Michael Potter has said that while "other household insects will take their toll . . . bed bugs will transform the way people live, sleep, and travel, especially in developed areas of the world" (Potter, 2006: 102).

The toll taken by the insects' dramatic return has included a staggering level of public anxiety and cultural notoriety. Since 2010, the year *CBS* suggested be named "the year of the bed bug,"[2] these anxieties have been reflected in colorful articles in the *New Yorker*, comic strips in *Doonesbury*, episodes of *30 Rock* and *The Simpsons*, numerous pieces in *The Onion*, public artworks, off-Broadway shows, and comic books (Borel, 2015; Minora, 2010; Reinhardt, 2018). Furthermore, and while not known to be disease vectors, bed bugs have been implicated in a range of significant mental health problems, ranging from insomnia, anxiety, and depression, through to occasional cases of reported post-traumatic stress syndrome and delusory parasitosis or Ekbom Syndrome (Goddard and De Shazo, 2012; Reinhardt, 2018: 56; Rieder et al., 2012).

It is the central argument of this paper that these phenomena—the recent estrangement from bed bugs and the contemporary terror evoked by their return—are inextricably entangled. The two quotations with which we open are, we suggest, talking directly to one another. Just as significantly, we argue that the insects' position as a biological, social, and cultural phenomenon, is conceptually significant and offers provocations for a body of theoretical work that has explored how, in Donna Haraway's terms, humans can develop "arts for living on a damaged planet" (Haraway, 2016: 67; see also: Tsing et al., 2017). In particular, the estranged relationship between humans and bed bugs offers an important contribution to work across more-than-human geographies, animal studies, the environmental humanities, and cultural theory more broadly, that has emphasized the ethics of companion species, encounters, and entanglements.

In this paper, we flesh out an account of bed bugs as "estranged companions." The relationship between estrangement and encounter in the case of bed bugs means that the insects are not just evocative figures to add to a menagerie of creatures who do not relate as easily to humans as valued domestic companions: from nuisance "trash animals" (Nagy and Johnson II, 2013) and "incompanionate" pests (Livingston and Puar, 2011), to creatures who are dangerous, awkward (Ginn et al., 2014), or uncharismatic (Clark, 2015). In figuring bed bugs as estranged within the minority world we aim not only to deepen understanding of contemporary human-bed bug encounters but also to reconceptualize how encounters between species are understood more broadly.

We begin by revisiting the concept of companion species, engaging with a set of critiques regarding the way that narratives of entanglement between species are increasingly undergirded via the straightforward deployment of scientific studies. We then outline an alternative body of work that has adopted a reparative, yet situated, engagement with scientific knowledges, framing companion species as "biocultural" phenomena (Rose et al., 2017: 2) while resisting uncritical scientism. The main body of the article complements this research

by conceptualizing bed bugs as "estranged companions," through presenting an history of human-bug encounters across the Global North. This situated history details how shifting relations with class, racism, and xenophobia, alongside particular technological developments, are essential to understanding why contemporary fears around bed bugs take the form that they do. We conclude by underlining the value of "estrangement" in conceptual terms, insisting on the ethico-political dimensions of companion species and foregrounding the constitutive role of particular cultural histories in shaping interactions and affective engagements between species.

Companion species and biocultural entanglements

Although not an archetypal domestic animal—due to the obvious asymmetry of benefit that structures human-bed bug encounters—bed bugs nonetheless speak to the tenets of Haraway's conception of companion species. The notion of companion species has played a distinct role in broader attempts to conceive of environments as more-than-human (Whatmore, 2006) and consider the liveliness, agency, and creativity of entities that were formerly treated as a backdrop to human action, either as inert matter or, at best, life that is "poor in world" (Bennett, 2010; Braidotti, 2013; Dolphijn and van der Tuin, 2012; Latour, 2005). Initially popularized in Haraway's *Companion Species Manifesto*, and more fully fleshed out in *When Species Meet*, the rendering of species as "companions" points to the co-constitutive entanglements between humans and actors who are more-, other-, or non-human (Haraway, 2003, 2008). For Haraway this understanding of companion species is a matter of ethico-onto-epistemological significance (Barad, 2007), simultaneously making a claim about the composition of the world and how it can, or should, be conceived. A companion species perspective thus has clear ethical implications, drawing attention to the ways in which human agency is contingent on the relationships between humans and a myriad of other actors. This emphasis upon relationality marks a move designed to both unsettle human exceptionalism and underline human obligations towards more-than-human worlds (Alaimo, 2016; Giraud et al., 2019; Puig de la Bellacasa, 2017).

Despite their significant influence, theories that have sought to decenter the human through more-than-human, new materialist and posthuman approaches have elicited a number of critiques. Research seeking to decenter the human has increasingly sought to evidence the entanglement of humans and other species through drawing on resources from the natural sciences and, as a result, it has been suggested that some work may "veer towards universalizing metaphysical claims about the nature of 'matter' as such and also, at times, take scientific truth claims about the world at face value" (Paxson and Helmreich, 2014: 169). Bruce Braun has identified this matter as a "persistent problem in the literature with what we might call 'scientism'," and notes, in particular, a trend that "takes 'science' to speak in one voice, or in what often amounts to the same thing, draws selectively from the natural sciences in order to find the ideas and concepts it needs, ignoring science's heterogeneity and side-stepping vibrant internal debate over models and paradigms" (2015: 3–4). Braun is here allied with who have critiqued the "strange borrowings" from scientific research within related work in affect theory. Stan Papoulias and Felicity Callard, for example, note a reliance upon a small number of science popularizers; the elision of differences between those popularizers' perspectives; and a frequent lack of acknowledgment of "significant debate and contestation" within the scientific fields in question (Papoulias and Callard, 2010: 33).

Relatedly, it has been argued that uncritical appeals to the natural sciences have specific political implications. Angela Willey suggests that a key characteristic of earlier work in feminist science studies—which has heavily influenced contemporary more-than-human theories—was its commitment to feminist and postcolonial standpoint politics (Willey, 2016). The purpose of bringing scientific knowledges into dialogue with cultural theory was to unsettle, challenge, and queer assumptions held by each body of work. In contrast, Willey argues that more recent research often straightforwardly deploys findings from the natural sciences, taking an additive approach to knowledge, where diverse perspectives from within different epistemic communities are brought together "like beads on a string" without addressing how such approaches might undercut, complicate, or diffract through one another (Kwek, 2018: 26). This move, it has been suggested, can radically undermine the postcolonial commitments of earlier work (see, e.g., Sundberg, 2014; TallBear, 2017; Todd, 2016), and perpetuate a "risky intimacy" between posthumanism, exoticism, and orientalism (Ahuja, 2016: xv).

Given the above critiques, a counter-vailing trend has been to explicitly re-theorize the space that constitutes the "encounter" between species (Johnson, 2015) by engaging, broadly speaking, with the "political." Such approaches seek to recognize that any particular meeting between species is radically shaped by historically constituted biopolitical regimes and assemblages (e.g., Ahuja, 2016; Giraud et al., 2019; Guthman, 2019). For example, Hannah Brown and Ann Kelly (2014) develop the analytic of the "hotspot" in order to think through the spread of Viral Hemorrhagic Fevers (VHFs) such as Ebola. Rather than a focus upon a restrictive, localized encounter between a particular human body and a particular strain of virus, through the concept of the "hotspot" Brown and Kelly seek to:

> . . . draw attention to sudden, ephemeral, and material concurrences between humans, animals, non-humans, institutions, and pasts that occasion contagion . . . [and explore] viral movement by attending to the multiple material, historical, and social forms of connection brought about through closeness, contiguity, and propinquity. (Brown and Kelly, 2014: 292)

Such theorizing de-essentializes the forms of relation between species—be they marked by pathogen and dysbiosis, as in the case of VHFs, or conviviality and symbiosis, as in the case of Haraway's dogs—by arguing that forms of life can only be understood by taking into account the diverse scales, sites, and histories that constitute a particular "situation" (Hinchliffe et al., 2016). Jamie Lorimer's recent work (e.g., 2017, 2019) examining modes of relation between humans and hookworms is exemplary in this regard, arguing that hookworms may not be essentially good or bad for human health, but become so within particular "disease situations" which are given their contours by existing and profound socio-economic disparities.

This article complements the aforementioned moves away from straight-forward naturalization, moves that have brought theorizations of the more-than-human world into engagement with conceptual frameworks related to biopolitics (Ahuja, 2016), neoliberalism (Braun, 2015), and colonialism (Jackson, 2020). By reflecting on the socio-cultural histories of human-bed bug encounters, we here explore how different bodies of knowledge can be drawn together in conceptualizing the affective and material relationships between humans and other beings: not by lining these knowledges up, but asking how they can complicate one another in ways that generate more expansive narratives. Revisiting the opening characterization of bed bugs as "estranged creatures" offers a route into approaching this task.

Estranged companions

It is possible to tell a straightforward story about bed bugs in which popular discourse, evolutionary biology and psychology, and cultural theory neatly "line up" (Kwek, 2018) without troubling one another's assumptions. In popular culture, parasitism and vampirism are frequently suggested as defining qualities which make insects such as bed bugs *extra* scary; the novelist Teju Cole, for instance, states that his protagonist's concerns over bed bugs "... were primeval: the magical power of blood, the hours given over to dreams, the sanctity of the home, cannibalism, the fear of being attacked by the unseen" (cited in Borel, 2015: 118–119). This framing neatly aligns with cultural theory, rendering bed bugs "an *unheimlich* intrusion of nature" (Campkin, 2010: 36); matter out of place traversing boundaries of not only the home but also the body (Douglas, 2001).[3] In turn, these narratives speak to work in the life sciences that has hinted at the deep evolutionary roots of responses to bed bugs and a possibility that: "... a fear of small, light brown, flat objects—resembling lice, bedbugs and fleas, but not so much ticks—is imprinted biologically, perhaps even in our genes" (Reinhardt, 2018: 143).

Together, the lining up of these knowledges renders affective responses to bed bugs the product of long histories of co-evolution, wherein the extreme levels of anxiety surrounding the insects are an in-born psychological proclivity on the part of humans. Yet, although co-evolutionary narratives might seem persuasive, framing affective responses to the insects as the decontextualized product of biology or psychology runs the risk of undercutting more expansive—and ongoing—social and cultural relationships that shape multispecies encounters.

Following cultural theorists (e.g., Fitzgerald, 2017; Rees, 2016) who understand the concepts developed by scientists as holding utility for social scientific analysis, we here we draw upon Seidel and Reinhard's figuring of bed bugs as "estranged creatures," introduced in the epigraph, to articulate a more expansive narrative about bed bugs. Rather than simply aligning their concept of estrangement with cultural research examining human-bug encounters, however, we instead diffract "estrangement" through theorizations of the term in social and cultural theory as a means of furthering both bodies of thought.

While estrangement is used in a descriptive sense within the scientific literature—pointing to the re-emergence of bed bugs after a period of absence—reading the term against cultural theory opens up richer implications. The most obvious point of reference is Marx's analysis of the way that the worker is not only alienated from their labour but, in the process, estranged from all that makes them human "acting freely only in his animal functions – eating, drinking, and procreating ..." (Chen, 2012: 45). While bed bugs' role in constituting new pest control industries can certainly be read in line with recent re-articulations of Marxist theory in the context of more-than-human encounters (e.g., Barua, 2016), Sara Ahmed (1999) offers a slightly different understanding that focuses on the sensory reconfigurations fostered by processes of estrangement. Ahmed understands estrangement as the movement from one space to another, which marks a: "... spatial reconfiguration of an embodied self: a transformation in the very skin through which the body is embodied" (Ahmed, 1999: 342).

This conception of estrangement, then, underlines that affective engagements with the material world can never be disentangled from socio-historical contexts and events. As Ahmed continues:

> The word estrangement has the same roots as the word 'strange'. And yet, it suggests something quite different. It indicates a process of transition, a movement from one register to another.

> To become estranged from each other, for example, is to move from being friends to strangers, from familiarity to strangeness. The term is suggestive precisely because it names the process of moving from one to the other, rather than referring to different states of being. (Ahmed, 1999: 344)

We suggest Ahmed's understanding of estrangement foregrounds what is conceptually productive in developing the concept of estranged companions. It might be a conceptual stretch to cast bed bugs as friends—though, it should be noted, more complex parasitic relations have been framed in these terms, as with Lorimer's reference to hookworms as "old friends" whose loss has resulted in autoimmune problems in humans (Lorimer, 2017, 2019). Ahmed's emphasis on the relationship between affective experience and socio-cultural change does, however, remain productive. Here the term estrangement points not to a fixed sensory state, but—in Ahmed's terms—is evocative precisely because it is processual, a means of evoking the affective marks left by lived experience. Read against Siedel and Reinhardt's more descriptive use of the term, the notion of estrangement-as-process can be extended: one cannot understand such encounters without an awareness of collective history.

As we trace throughout this paper, estrangement in the context of more-than-human encounters is useful not just in evoking shifting sensory experiences on the part of individuals, but can be used to evoke wider socio-historical processes that leave their marks on collective affective experiences, in part, due to their entanglement with specific biopolitical regimes and interventions. The term estrangement, therefore, offers a reminder that affective relationships with companion species should always be situated in longer cultural histories and biopolitical arrangements.

Narrating bed bugs' stories

From everyday nuisance to fear: Bed bugs and the distancing of the "low"

Bed bugs appear to have lived alongside humans for millennia. Archaeological evidence places them in Ancient Egypt and numerous records exist of their presence in the classical era (Panagiotakopulu and Buckland, 1999). Scientific research, meanwhile, currently suggests that bugs—living, over a quarter of a million years ago, with bats in a hypothetical "ancestral" or "primordial" cave in the Mediterranean region—started to feed upon early hominins sheltering there and began to genetically diverge from insects adapted to bats (Balvín et al., 2012; Reinhardt, 2018: 23). Nonetheless, there is a "continuing and direct relationship" (Campkin, 2009: 268) between the presence and density of bed bugs and modes of human habitation (Campkin, 2010: 36) and a slow march into northern Europe was aided by the warmth of domestic dwellings and fires (Potter, 2008: 14). This northward journey continued unabated over the centuries with reports from Italy (first century), Germany (eleventh century), and France (thirteenth century) (Usinger, 1966: 3). Bed bugs were first observed in the United Kingdom in 1593 although they took a good deal longer to become established in the United States, becoming plentiful only from the eighteenth century (Potter, 2008: 14).

Lisa Sarasohn has argued that, prior to the eighteenth century, bed bugs had no particular place of significance in the English imagination; there was no consistent nomenclature and night-time invasion seems to be have been, at least on occasion, a cause for amusement (Sarasohn, 2013: 513). It is certainly clear that there was a professionalization of bed bug control in the eighteenth century quite unlike anything that had come before. Sixteen-ninety saw the founding of Tiffin and Sons, "bug destroyers to her majesty and the royal family"

(Usinger, 1966: 43) while 1730 saw John Southall publish *A Treatise of Buggs* (1730), generally assumed to be the first scientific text to consider bed bugs and a focal point for a new class of experts in pest control.

The emergence of "bed bug professionals" like Southall and the Tiffins appears to have been intimately related to a growing fear of bed bugs within the United Kingdom. Sarasohn argues that, after causing barely a murmur a hundred years earlier, in the eighteenth century bed bugs were the "most threatening of all attackers on the body . . . Being bitten by a bedbug was repulsive, humiliating and nauseating" (Sarasohn, 2013: 514). For those who could not afford professional remedies—which were themselves of dubious efficacy and safety—"bug hunts" became a routine part of life and bugs, along with lice and fleas, became a matter of considerable concern (Ekirch, 2005: 269–270).

Changing responses to bed bugs in the eighteenth and early nineteenth centuries were linked to a peculiar interplay of proximities and distances. In terms of distancing, an increasing amount of space was being inserted between various animal and human bodies. Prior to industrialization it was common for animals such as cows, pigs, and sheep to be brought inside dwellings at night; the protection and warmth offered by and to these animals apparently outweighing the excrement, smells, and parasites they brought with them (Ekirch, 2005: 279). Similarly, farm animals were a common sight in the city with large markets and slaughterhouses in the center of certain towns and cities (Philo, 1995; Shukin, 2009).

This situation changed radically in the eighteenth century with animals increasingly deemed "matter out of place" (Douglas, 2001) in both the home and the civilized, industrialized space of the city. Urban animals, as Stephen Eisenman describes, were increasingly associated with disorder and even criminality:

> The spectacle of bulls, goaded by ruffians, running rampant down Oxford Street or the Strand, destroying property, and tossing pedestrians was the veritable image of social chaos—the world upside down—feared by anti-Jacobin Tory and Whig alike. (Eisenman, 2016: 352)

Other scholars have similarly foregrounded the growing belief that there was "something deeply wrong, both distasteful and ludicrous, in allowing livestock animals to violate human space," which led to these animals—along with attendant insects and human laborers—being "expelled" into the countryside (Philo, 1995: 666–667). This geographic expulsion was intimately bound to a larger problematization and distancing of "the low" in which bourgeois society was "enclosing itself, indeed often defining itself, by suppression of the 'base' languages of the carnival" (Stallybrass and White, 1986: 181). Animality, thus stuck to and bled "back onto the textures of humanness" (Chen, 2012: 89) as understood within an emerging class consciousness.

To use Ahmed's turn of phrase (2013: 8), grasping the "sticky" associations between class, race, and fear is essential to understanding this emerging "disease situation" (Hinchliffe et al., 2016; Lorimer, 2017) that was constituted in relation to bed bugs in the eighteenth and nineteenth centuries. Among bourgeois classes, foreigners, imported timber, and increased international trade were immediately blamed for rising numbers of infestations (Boynton, 1965: 17), ensuring a narrative that linked "the bodies, domestic interiors and furnishings of Londoners to the global politics of colonialism" (Campkin, 2011: 140). There was also a consistent fear that servants would bring bed bugs into the home (Boynton, 1965: 20), perhaps even weaponize the insects in a war against their employers (Sarasohn, 2013: 518).[4] A bed bug infestation appeared devastating for well off households during the "age of the bed" where up to a third of domestic assets could be invested in "elevated bedsteads with canopies, feather mattresses, and heavy curtains" (Ekirch, 2005: 274).

These beds, often filled with mattresses full of dirty feathers (Boynton, 1965: 19), were both important symbolically and a prime breeding ground for hard-to-find bed bugs.

And yet, more than a simple threat of contamination, the working classes were actually seen to resemble bed bugs. At a time when bourgeois classes were increasingly conscious of miasmas, smell both in general (Corbin, 1986) and in relation to animals (Philo, 1995: 672), was being increasingly problematized. Bed bugs notoriously stink and, in this regard, the insects were seen to resemble the "odiferous and filthy lower classes" (Sarasohn, 2013: 516–517). The fear of bed bugs may, then, have been in part a "primeval" fear of blood and intrusion but it was also tied to a contemporary biopolitical regime (Ahuja, 2016) and a distinctly modern transgression of class boundaries that was intertwined with a particular, politicized, public mood.

Exterminism and the beginnings of estrangement: Chemical warfare on bugs

Despite the aforementioned attempts at control during the 1700s, bed bugs continued to flourish throughout the late nineteenth and into the early twentieth century. In "... 1887 it was decided that a rent reduction was not justified because bedbugs should not be a surprise to anyone renting an apartment in New York" (Reinhardt, 2018: 35). By 1938, around half of all tenants moving into Chicago Housing Authority projects had lived with bed bugs in their old place of residence (Biehler, 2013: 13). In Europe, and during the late 1930s, it was found that around 50% of removal vans in Sweden were infested with bed bugs (Potter, 2008: 17). A ministry of health report from 1933 argued that, in the UK, "in many areas all the houses are to a greater or lesser degree infested with bedbugs" (Boase, 2001: 160). Most likely sparked by fears that bed bugs may be disease vectors (Biehler, 2013: 56), in 1929 The London School of Hygiene and Tropical Medicine identified the insects as one of eight key medically important pests along with fleas, flies, lice, mosquitoes, rats, snakes, and ticks (Borel, 2015: 166). Ben Campkin, moreover, has shown how bed bugs were part of a "propaganda machine" put together by "socially concerned professionals and philanthropists" (2009: 266) who aimed to "raise awareness of housing issues, provoke debate, and lobby for improved state housing" for those who lived in London's "slumland" (2009: 263). Thus, bed bugs were simultaneously rendered as material problem and semiotic metaphor in efforts to intervene in class-based philanthropic efforts.[5]

As Campkin's discussion of the relations between bed bugs and the architecture of urban poverty may suggest, alongside disease, fear of bed bugs during this "hot spot" (Brown and Kelly, 2014) of the early twentieth century owes much to a confluence of factors. Just as domestic fires facilitated the spread of bed bugs across Europe in previous centuries, in the twentieth century central heating systems allowed them to multiply and thrive all year (Potter, 2008: 17). Similarly, bed bugs are at their most prevalent when human populations are both dense and moving frequently (Reinhardt and Siva-Jothy, 2007: 361). Urbanization, therefore, provided an ideal habitat.

We have already described how, in the eighteenth century, bourgeois classes saw a kinship between the poor and the insect; the smell and dirt of the bed bug demonstrating an affinity with the lower classes and a need to police both. In the twentieth century, associations with bugs "bled" (Chen, 2012: 89) even more readily onto both the poor and often racialized migrant populations.[6] As explored by Dawn Biehler, the increasing economic and racial segregation which occurred in the US during the early twentieth century (Massey and Denton, 1993: 17) meant that middle and upper-class households could physically distance themselves from urban centers in which infestations were most likely (Biehler, 2013: 61). Furthermore, those with financial means now had novel methods to control bed bug

populations. Immediately post-World War 1, gases that were developed in the context of trench warfare were "domesticated" and made available for widespread commercial use (Feigenbaum, 2017). By the 1920s, gases such as hydrogen cyanide (HCN) were being used for pest control purposes (Biehler, 2013: 66).

HCN gas, however, is extremely dangerous and there were numerous incidents of accidental deaths associated with insect fumigation.[7] Accordingly, pest control needed to be carried out by highly trained—and extremely expensive—experts (Biehler, 2013: 70). Where previous generations had been united in nightly "bug hunts" and seen bugs labeled as a necessary evil (Biehler, 2013: 59) to be lived with (Seidel and Reinhardt, 2013: 1), the rich could now effectively distance themselves from both insects and the poor. With this distancing, those human and non-human actors left behind became ever more tightly bound in cultural imaginations. Bed bugs became an increasing symbol of shame and stigma with the mere presence of bugs marking "both homes and neighbourhoods as unclean" (Biehler, 2013: 62).

Lewis Mumford christened the period after the Second World War the "Age of Wreckers and Exterminators," a time when a "Pasteurian" mentality (Lorimer, 2017) ensured that an "ideology" of "...eradication captured the imaginations of people and institutions far and wide" (Kinkela, 2011: 98). Chemicals, and chemical warfare, played a central role in this ideology. Indeed, Sloterdijk has argued that the "20th century will be remembered as the period whose decisive idea consisted in targeting not the body of the enemy, but his environment" through the use of chemical weapons (Sloterdijk, 2009: 43). Human-bed bug relations were significantly implicated in this novel biopolitical regime that adheres to a particular mode of what Neel Ahuja calls "dread life;" an affective state at the juncture of fear, anxiety, and hope wherein there is a "racialized channeling of the fear of infectious disease into optimism regarding the remaking of life through technical intervention" (Ahuja, 2016: 6).

As noted above, the ecologized war on bed bugs began in the 1920s with the use of gases such as HCN. This mode of "atmospheric policing" (Feigenbaum, 2017) worked well for middle and upper-class households, who lived in stand-alone properties, and yet HCN was an inefficient chemical for use in large housing projects.[8] HCN worked so well because it behaved like a bed bug; they both had the "ability to get into every single nook and cranny" (Biehler, 2013: 67). This made both bug and chemical dangerous in high density living environments for they could move from dwelling to dwelling, infesting (in the case of bugs), or potentially killing (in the case of HCN) unsuspecting neighbors. Effective removal of bed bugs via the use of HCN in housing projects, therefore, required both expensive experts and necessitated a coordinated, community response. While attempts were made at such social solutions, in the US, logistical problems, underfunding, and a preference for individual, responsible citizens to find their own solutions ensured these solutions were never fully effective (Biehler, 2013: 79).

DDT, first synthesized in the nineteenth century but recognized as an effective pesticide only in 1939 (Kinkela, 2011), offered the "the perfect answer" (Usinger, 1966: 46) to this problem. While, like HCN, DDT dispersed through an atmosphere into the nooks and crannies where bed bugs were to be found, the chemical appeared far less dangerous to humans. Individual householders could, therefore, use DDT without fear of poisoning their neighbors. Accordingly, DDT was made available for individuals, and women in particular were encouraged to use the chemical liberally within their own homes. Chemical treatment with DDT was thus significantly cheaper than HCN, which required expert administration, and this made the chemical affordable to all but the very poorest in society (Biehler, 2013: 92).

There were other innovations important to the eradication of bed bugs and this significantly evolving disease situation: vacuum cleaners (Krause-Parello and Sciscione, 2009: 127), washing machines (Biehler, 2013: 90), and newly designed bed frames (Potter, 2008: 148) have all been important in widening the gap between humans and the insects. Nonetheless, and while its primacy has not been established (Reinhardt, 2018: 125), DDT was used extensively on bed bugs and eradication efforts were hugely successful: by the mid-1950s, bed bug infestations were exceptionally rare in the Global North (Doggett et al., 2012: 164; Seidel and Reinhardt, 2013: 1). As with other "pests" such as hookworms (Lorimer, 2019) or the plant pathogen *Verticillium dahliae* that leads to the wilting of economically valuable species like strawberries (Guthman, 2019), during this time an enormous gulf between bed bugs and humans opened. Indeed, this gulf opened to the extent that most of those living in the North had not encountered the insects nor could they identify them when seen (Seidel and Reinhardt, 2013). It was, thus, during the mid-twentieth century that bed bugs became estranged from their human companions.

The return

As stated in the introduction, the situation has changed radically since the mid-1990s with resurging bed bug numbers across the Global North leading to a new "hot spot". Even if we take figures pertaining to the US as indicative rather than definitive they remain startling: a 100-fold increase in bed bug infestations (Kane, 2016) and a 9-fold increase in both patent applications and treatment call outs (Borel, 2015: 151). These increases have been accompanied by numerous claims for damages (Lockwood, 2013: 184) that have left hotel chains and landlords particularly fearful (Doggett et al., 2012: 177) and have, in turn, prompted legislative action (Borel, 2015: 151).

The current bed bug hot spot is almost certainly due to a myriad of factors; increased international travel and exchange in second-hand furniture provide the conditions of mobility necessary for a rapid spread. Many chemicals, most obviously DDT, used to control bed bugs have now been banned as a response to longstanding concerns about their environmental impact (Kinkela, 2011). Furthermore, worries about toxic exposure (Biehler, 2013: 211; Lynch, 2019) mean that there is also a distinct reluctance to use chemicals within the home. Importantly, many chemicals that are used are now significantly less effective; resistance to DDT in bed bugs was first noted in 1947 (Usinger, 1966: 47) but is now exceptionally common (Zhu et al., 2010)—an apparent example of what Julie Guthman calls an "iatrogenic harm" wherein the cure ultimately causes the illness (Guthman, 2019: 10). There has also been a widespread de-skilling in relation to bed bugs with householders losing skills required to identify and then eliminate the insects in the home (Biehler, 2013: 213; Campkin, 2009). Scientific research on bed bugs, meanwhile, ground to a halt in the latter half of the twentieth century meaning that knowledge about the insects, their habits, and capacities is not what might be expected (Borel, 2015: 61).

Importantly, then, understanding any particular encounter with bed bugs in the present moment necessarily requires a consideration of the histories that are materially and inextricably bound up with it. We noted previously a reported range of cultural (articles, art works, cartoons, television skits) and psychological (depression, anxiety, PTSD, delusionary parasitosis) responses to the bed bug epidemic that are—even given negative responses to bed bugs in early modernity—unprecedented in their negativity, an argument made repeatedly in the entomological and pest control literature (e.g., Potter, 2006: 102; Seidel and Reinhardt, 2013: 1). As Elizabeth Johnson argues, "The present – or the encounter – is much more than the elements found within it," and care must be taken when using

particular instances of relation to ground larger epistemological claims or ethical understandings (Johnson, 2015: 307). Bed bugs elucidate the stakes of this point, illustrating the danger not just of essentializing encounters but of reifying the types of knowledge through which encounters can be known and understood.

Radiation and xenophobia: Estrangement in the twenty-first century

It is a central claim in this essay that understanding the cause of contemporary anxieties over bed bugs is not just of social or ecological but also theoretical importance. We have noted popular narratives pointing towards evolutionary explanations revolving around blood, night-time and alterity when explaining reactions to insects (Borel, 2015: 122). The history of human responses to bed bugs, however, suggests that such a fixity of inter-species encounter cannot be assumed.

It is important to note, for example, that bed bugs re-emerge into a different world than that which they left behind. Joseph Masco, for instance, argues that the age of the atom bomb—and in particular the years between 1945 and 1962, during which there was significant above-ground nuclear testing—"produces not only new understandings of self, nature and society but also . . . initiates a profound mutation in each of these terms" (Masco, 2006: 298). For Masco, changing representations of insects (such as the giant irradiated ants in the film *Them!*) offer a way into understanding these "mutated" natures. Similarly, Catherine Cassel in her work *Bugs After The Bomb* suggests that mid-twentieth century depictions of insects embody "cultural anxieties about postatomic life in 20th century North American . . . culture . . . [becoming] a powerful register for expressing fear for the future of an environmentally damaged . . . planet" (Cassel, 2016: xi). Cassel also notes a more recent shift in imagery wherein there is a move from the irradiated insect typical of films like *Them!* (1954) and *Tarantula* (1955) towards an image of the racialized, insect-like alien (in *District 9* (2009), for example) reflecting a fear of immigration and increased levels of xenophobia.

The once-chlorinated and now chemical-resistant bed bug fits well with a post-atomic fear, while it has been a re-occurring theme throughout this paper that the insects are entangled with conceptions of migrancy and vagrancy. At a time of increased xenophobia, therefore, it is unsurprising to see the bed bug emerge as a figure of particular dread. With regards to this point, there are remarkable pieces of work which pin the current bed bug re-emergence upon poor quality Soviet architecture and the subsequent fall of the Berlin Wall (Naylor et al., 2018: 59–65). It also remains the case more broadly that migrants, the poor, and the socially excluded are consistently held accountable for infestations: From Roma, to drug addicts, to communists (Borel, 2015: 192–193; Lynch, 2019: 368; Reinhardt, 2018: chap. 8).

A particular contemporary fear that pervades anxieties about bed bugs is an inability to escape classed and racialized groups who have become associated with the insects in cultural imaginaries. Through HCN, pest control, and suburbanization, the early twentieth century saw overwhelmingly white affluent classes able to leave bed bugs behind. For all the reasons discussed above, this has become increasingly hard to do.[9] Bed bugs have become a "social equaliser" that "cut the wealthy down to size" (Biehler, 2013: 206) and it is, in significant part, the fact that affluent classes are being bound to *both* bed bugs *and* particular groups of people that means that, following a 60-year estrangement, bugs are "*increasingly* viewed as intolerable" and "*all the more* unsettling" (Seidel and Reinhardt, 2013: 1 emphasis added).

The cultural situatedness of affective encounters with bed bugs, and the intimate relationship between historical estrangement and contemporary terror, is evident in Heather Lynch's work. Resonating with the shifting affective responses described above,

Lynch found that it was not the parasitism or anatomical characteristics of bed bugs that was the primary source of anxiety for interviewees living in a part of Glasgow that was at the epicenter of a bed bug infestation. Instead, participants treated the insects as an everyday nuisance. It was formally *identifying* the insects as bed bugs that "transform[ed] benign relations into horrific encounters" (2019: 371). Identifying the insects not only intensified a sense of them as a "threat to bodily integrity," but, more significantly, this threat had implications relating to gender, class, and ethnicity. As one interviewee noted:

> Maybe it's that I should be more of a housewife, I'm not clean enough, I'm not working hard enough to get my house into shape. For me, it's just I always see myself being criticized by this bedbug. It's all about, you know, these posh women see this Eastern European with bedbugs in her house . . . (Lynch, 2019: 370)

Thus, interviewees were concerned that the bugs were a cultural marker of uncleanliness that reflected unfavorably upon their own social position (see also Reinhardt, 2018: 148). Such findings chime with Campkin's warning that:

> . . . the neoliberal approach to pest control raises similar issues to discourses about the Victorian city, where infestations were attributed to alien individuals rather than understood as the consequence of wider structures or conditions. (Campkin, 2009: 268)

Turning to bed bugs, therefore, reiterates the need to situate affective encounters with nonhumans in relation to their constitutive cultural histories. Inadvertently undercutting these histories by appealing to studies that straightforwardly naturalize companion species narratives can make it difficult to imagine mutually dangerous or damaging relations differently. In the conclusion, we develop these arguments further by drawing out the value of figuring bed bugs as estranged companions.

Conclusion

In this paper, through turning attention to human-bed bug encounters, we have sought to do three things. First, we have contributed to theoretical debates about the relationship between more-than-human theories and "the political." A growing body of research is working at the nexus of more-than-human theories, biopolitics, and postcolonial critique, in order to push back against a homogenization of how relations between the "human" and "nonhuman" are conceived (Ahuja, 2016; Jackson, 2020). A key challenge faced by scholarship at this nexus is how to recognize the irreducibly "biocultural" relations between humans and other beings (Rose et al., 2017: 2), while negotiating some of the pitfalls created by theories that have uncritically undergirded a decentering of the human by using studies from the natural sciences (Braun, 2015; Paxson and Helmreich, 2014). These scholars have highlighted that just as, in Haraway's terms, it "matters what stories tell stories" (2016: 35), it also matters how sciences are used to ground these stories.

The position we have taken here reaffirms longstanding approaches in feminist science studies that are grounded in ethical commitment to situated knowledges (Willey, 2016) and diffractive methods that are attentive to the entanglement of ethics, epistemology, and ontology (Barad, 2007). These commitments are enacted through our development of the concept of "estranged companions." Rather than "lining up" (Kwek, 2018) pest control literatures and cultural theory, we have diffractively read different conceptions of estrangement against one another, drawing attention to the evocativeness of the concept more

broadly as well as the specific value of figuring bed bugs as estranged companions. For Ahmed (1999: 134), estrangement does not refer to a "state of being" but a process; a transition, change, or movement that profoundly shapes subsequent affective experiences. Entomologists Seidel and Reinhardt (2013: e51083), in contrast, offer a more literal description of the institutions and biopolitical arrangements that enact estrangement from other species on a large-scale. Read against one another, these works situate estrangement as a process that holds sharp affective consequences, while foregrounding the wider forces and structures that inform such processes. Conceiving of bed bugs as 'estranged companions' in the Global North, then, offers a reminder of the complex histories, violences, and exclusions that constitute affective states in the present, histories that cannot be captured through recourse to straight-forwardly naturalized explanations or primeval fears of parasitism. Instead, more expansive narratives are needed that pay careful attention to the insects' classed and racialized associations—with squalor, poverty, and dirt—that have differentially been transferred to those whose households harbor (or perceived to harbor) the insects.

The concept of estranged companions thus, thirdly, has a decisive political aim; through placing an emphasis on the processes through which companion species emerge, estrangement also draws attention to the politics of these processes. In order to account for—and, crucially, unsettle—the imbrication of bed bugs with racialized and classed relations, responses to the insects need to be understood in the context of their distinct social and cultural histories. Figuring bed bugs as estranged companions is a means of drawing attention to the failed technofixes that have impacted on encounters in the present, while also tracing the specific histories of stigma that are entangled with present-day encounters with the bugs. Indeed, the only way of grasping contemporary affective responses to bed bugs is to understand how technological interventions and social stigma have become entwined in ways that have resulted in the opening of spaces between bodies while simultaneously shaping the contours of the affective environment that is created when these spaces are closed. In the case of these insects, moreover, this environment is intimately tied to Othering, extermination, xenophobia, and anti-Semitism. While these relations might give affective responses to creatures such as bed bugs a sense of stability, it is important to foreground that such responses are ultimately constituted by shifting cultural contexts and histories of estrangement.

Importantly, bed bugs are not the only beings who have been distanced from (certain) humans due to past interventions and whose return has been the focus of new biopolitical regimes. There are clear parallels with other forms of "Anthropocenic abundance" (Giraud et al., 2019) as reflected, for instance, in the management of diseases that affect humans (Ahuja, 2016; Brown and Kelly, 2014), farmed plants and animals (Guthman, 2019; Hinchliffe et al., 2016), and the "relational geographies" of parasitic encounters (Lorimer, 2019, 2017). Even beyond these contexts of undesirable abundance, bringing the different biopolitical assemblages that frame companion species to the fore is vital in making sense of the differential ethical implications of these relationships. As we have argued here, estrangement is an evocative term precisely because it underlines that social and historical processes *always* inform encounters in-the-present. Using this term to bring such processes to the fore, we argue, contributes to efforts to unsettle essentializing narratives and opens space to ask what sort of ethics can emerge in the future.

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Notes

1. See https://www.merriam-webster.com/medical/Cimicidae
2. CBS, "Year of the bed bug?". 21 December 2010. See https://www.cbsnews.com/video/2010-year-of-the-bed-bug/. From the report, the suggestion is that bed bugs beat stiff competition from sports related concussion, H1N1bird flu, and salmonella poisoning, among others.
3. In turn, see Campkin (2013) for an examination of how the treatment of "dirt"—including animals—within urban architecture can refigure how we conceive of "purity and danger."
4. There were, in fact, attempts made by the U.S. military to weaponize bed bugs during the conflict in Vietnam. See Borel (2015, pp. 31–32).
5. Through analysis of these slum clearance efforts, Campkin makes the important point that bed bugs, their presence, and distribution, have not only *been shaped* by particular biopolitical regimes and urban environments but have also *actively contributed to* the production of new regimes and environments.
6. These explicit links between pests and immigration were foreshadowed by the enshrinement of associations between poverty, immigration, and pestilence into law during the late nineteenth and early twentieth century. Both the first US Immigration act of 1882 and the British equivalent—the 1905 Aliens Act—explicitly linked certain diseases to Jewish migration as a justification for refusing entry to particular populations (Maglen, 2005).
7. While in this instance deaths related to fumigation were accidental there is a broader history. HCN would go on to be used in World War Two under the trade name Zyklon B. Hugh Raffles has argued that the use of Zyklon B in the camps was dependent upon an alleged affinity between certain humans and insects: "those selected for death were directed to 'delousing facilities' equipped with false-headed showers . . . To diseased humans, delousing promises remediation, a return to community, a return to life; to lice, it offers only extermination. Too late, the prisoners discover they are merely lice" (Raffles, 2010, p. 155).
8. Feigenbaum uses the term "atmospheric policing" specifically in relation to new techniques developed by police to disperse protests, techniques that first emerged in the 1920s with the development of tear gases as riot control tools, but the term is equally evocative in relation to the policing of domestic atmospheres and draws attention to the way—to put things in Douglas's terms—that the boundaries between purity and danger are often policed with force (Feigenbaum, 2017, p. 84; see also Feigenbaum and Kanngieser, 2015, pp. 80–84).
9. While there are numerous similarities, this moment illustrates a point of departure from the case of hookworms, as discussed by Lorimer (2017, 2019). Lorimer finds practitioners who continue to see a range of options for the mode of re-entanglement between hookworms and humans. Here, though, we find professional communities who doubt that such deliberative decision making is possible in the case of bed bugs.

References

Ahmed S (1999) Home and away: Narratives of migration and estrangement. *International Journal of Cultural Studies* 2: 329–347.

Ahmed S (2013) *The Cultural Politics of Emotion*. Edinburgh: Edinburgh University Press.

Ahuja N (2016) *Bioinsecurities: Disease Interventions, Empire, and the Government of Species, Anima*. Durham & London: Duke University Press.

Alaimo S (2016) *Exposed: Environmental Politics and Pleasures in Posthuman Times*. Minneapolis: University of Minnesota Press.
Balvín O, Munclinger P, Kratochvíl L, et al. (2012) Mitochondrial DNA and morphology show independent evolutionary histories of bedbug *Cimex lectularius* (Heteroptera: Cimicidae) on bats and humans. *Parasitology Research* 111: 457–469.
Barad K (2007) *Meeting the Universe Halfway: Quantum Physics and the Entanglement of Matter and Meaning*. Durham & London: Duke University Press.
Barua M (2016) Lively commodities and encounter value. *Environment and Planning D: Society and Space* 34: 725–744.
Bennett J (2010) *Vibrant Matter: A Political Ecology of Things*. Durham: Duke University Press.
Biehler DD (2013) *Pests in the City: Flies, Bedbugs, Cockroaches, & Rats*. Seattle & Washington: University of Washington Press.
Boase C (2001) Bedbugs – Back from the brink. *Pesticide Outlook* 12: 159–162.
Borel B (2015) *Infested: How the Bed Bug Infiltrated Our Bedrooms and Took over the World*. Chicago: University of Chicago Press.
Boynton L (1965) The bed-bug and the "age of elegance". *Furniture History* 1: 15–31.
Braidotti R (2013) *The Posthuman*. Cambridge, UK & Malden, MA: Polity Press.
Braun B (2015) New materialisms and neoliberal natures. *Antipode* 47: 1–14.
Brown H and Kelly AH (2014) Material proximities and hotspots: Toward an anthropology of viral hemorrhagic fevers. *Medical Anthropology Quarterly* 28: 280–303.
Campkin B (2009) The cleansing of slumland and the return of the bedbug: Pest infestations and the shaping of London. In: Naik D and Oldfield T (eds) *Critical Cities: Ideas, Knowledge and Agitation from Emerging Urbanists*. London: Myrdle Court Press, pp. 258–279.
Campkin B (2010) Bugs, bats and animal estates: The architectural territories of 'wild beasts.'. *Architectural Design* 80: 34–39.
Campkin B (2011) "Terror by night": Bedbug Infestations in London. In: Gandy M (ed.) *Urban Constellations*. Berlin: JOVIS Verlag, pp. 139–144.
Campkin B (2013) Placing "Matter Out of Place": Purity and danger as evidence for architecture and urbanism. *Architectural Theory Review* 18: 46–61.
Cassel CS (2016) Bugs after the bomb: Insect representations in postatomic American fiction and film (Doctor of Philosophy). University of Philosophy.
Chen MY (2012) *Animacies: Biopolitics, Racial Mattering, and Queer Affect*. Durham & London: Duke University Press.
Clark JL (2015) Uncharismatic invasives. *Environmental Humanities* 6: 29–52.
Corbin A (1986) *The Foul and the Fragrant: Odor and the French Social Imagination*. Hamburg and New York: Berg Publishers.
Doggett SL, Dwyer DE, Peñas PF, et al. (2012) Bed bugs: Clinical relevance and control options. *Clinical Microbiology Reviews* 25: 164–192.
Dolphijn R and van der Tuin I (2012) *New Materialism: Interviews & Cartographies*. London: Open Humanities Press.
Douglas M (2001) *Purity and Danger: An Analysis of the Concepts of Pollution and Taboo*. London: Routledge.
Eisenman SF (2016) The Real "Swinish Multitude". *Critical Inquiry* 42: 339–373.
Ekirch AR (2005) *At Day's Close: Night in Times Past*. New York & London: W.W. Norton & Company.
Feigenbaum A (2017) *Tear Gas: From the Battlefields of WWI to the Streets of Today*. London: Verso Books.
Feigenbaum A and Kanngieser A (2015) For a politics of atmospheric governance. *Dialogues in Human Geography* 5: 80–84.
Fitzgerald D (2017) Tracing autism: Uncertainty, ambiguity, and the affective labour of neuroscience. Seattle: University of Washington Press.

Ginn F, Beisel U and Barua M (2014) Living with awkward creatures: Vulnerability, togetherness, killing. *Environmental Humanities* 4: 113–123.
Giraud EH, Hadley Kershaw E, Helliwell R, et al. (2019) Abundance in the Anthropocene. *The Sociological Review* 67: 357–373.
Goddard J and De Shazo R (2012) Psychological effects of bed bug attacks (*Cimex lectularius* L.). *The American Journal of Medicine* 125: 101–103.
Guthman J (2019) *Wilted: Pathogens, Chemicals, and the Fragile Future of the Strawberry Industry*. California: University of California Press.
Haraway DJ (2003) *The Companion Species Manifesto: Dogs, People, and Significant Otherness*. Chicago: Prickly Paradigm Press.
Haraway DJ (2008) *When Species Meet*. Minneapolis: University of Minnesota Press.
Haraway DJ (2016) *Staying with the Trouble: Making Kin in the Chthulucene, Experimental Futures: Technological Lives, Scientific Arts, Anthropological Voices*. Durham & London: Duke University Press.
Hinchliffe S, Bingham N, Allen J, et al. (2016) *Pathological Lives: Disease, Space and Biopolitics*. Hoboken, NJ: John Wiley & Sons.
Hinson KR, Benson EP, Zungoli PA, et al. (2014) Assessment of natural-based products for bed bug (Hemiptera: Cimicidae) control. In: Muller G, Pospischil R and Robinson WH (eds).*Proceedings of the 8th International Conference on Urban Pets*. Zurich: Executive Committee of the International Conference on Urban Pests. pp. 97–101.
Jackson ZI (2020) *Becoming Human: Matter and Meaning in an Antiblack World, Sexual Cultures*. New York: New York University Press.
Johnson ER (2015) Of lobsters, laboratories, and war: Animal studies and the temporality of more-than-human encounters. *Environment and Planning D: Society and Space* 33: 296–313.
Kane E (2016) Beagle vs. bedbug: The hunt is on [WWW Document]. DVM360. Available at: http://veterinarynews.dvm360.com/beagle-vs-bedbug-hunt?pageID = 3 (accessed 30 June 2017).
Kilpinen O, Jensen KV and Kristensen M (2008) *Bed bug problems in Denmark, with a European Perspective. In: Robinson WH and Bajomi D (eds). Proceedings of the Sixth International Conference on Urban Pests*. Veszprém: OOK-Press, pp. 395–399.
Kinkela D (2011) *DDT and the American Century: Global Health, Environmental Politics, and the Pesticide That Changed the World*. Chapel Hill: University of North Carolina Press.
Krause-Parello CA and Sciscione P (2009) Bedbugs: An equal opportunist and cosmopolitan creature. *The Journal of School Nursing : The Official Publication of the National Association of School Nurses* 25: 126–132.
Kwek DH (2018) The importance of being useless: A cross-cultural contribution to the new materialisms from Zhuangzi. *Theory, Culture & Society* 35: 21–48.
Latour B (2005) *Reassembling the Social: An Introduction to Actor-Network Theory*. Oxford: Oxford University Press.
Levy Bencheton A, Berenger JM, Del Giudice P, et al. (2011) Resurgence of bedbugs in southern France: A local problem or the tip of the iceberg? *Journal of the European Academy of Dermatology and Venereology* 25: 599–602.
Livingston J and Puar JK (2011) Interspecies. *Social Text* 29: 3–14.
Lockwood JA (2013) *The Infested Mind: Why Humans Fear, Loathe, and Love Insects*. Oxford: Oxford University Press.
Lorimer J (2017) Parasites, ghosts and mutualists: A relational geography of microbes for global health. *Transactions of the Institute of British Geographers* 42: 544–558.
Lorimer J (2019) Hookworms make us human: The microbiome, eco-immunology, and a probiotic turn in western health care. *Medical Anthropology Quarterly* 33: 60–79.
Lynch H (2019) Esposito's affirmative biopolitics in multispecies homes. *European Journal of Social Theory* 22: 364–381.
Maglen K (2005) Importing trachoma: The introduction into Britain of American ideas of an 'immigrant disease', 1892–1906. *Immigrants & Minorities* 23: 80–99.

Masco J (2006) *The Nuclear Borderlands: The Manhattan Project in Post-Cold War New Mexico. New Edition 2020*. Princeton & Oxford: Princeton University Press.
Massey DS and Denton NA (1993) *American Apartheid: Segregation and the Making of the Underclass*. Cambridge, MA & London: Harvard University Press.
Minora L (2010) Samuel Mark, East Village Bed Bug Artist, strikes again and again (Q&A). *The Village Voice*. Available from: https://www.villagevoice.com/2010/08/03/samuel-mark-east-village-bed-bug-artist-strikes-again-and-again-qa/
Nagy K and Johnson II, PD (2013) *Trash Animals: How We Live with Nature's Filthy, Feral, Invasive, and Unwanted Species*. Minneapolis: University of Minnesota Press.
Naylor R, Balvín O, Delaunay P, et al. (2018) The bed bug resurgence in Europe and Russia. In: Doggett SL, Miller, DM and Lee C-Y (eds). *Advances in the Biology and Management of Modern Bed Bugs*. Oxford: John Wiley & Sons, pp. 59–65.
Panagiotakopulu E and Buckland PC (1999) *Cimex lectularius* L., the common bed bug from Pharaonic Egypt. *Antiquity* 73: 908–911.
Papoulias C and Callard F (2010) Biology's gift: Interrogating the turn to affect. *Body & Society* 16: 29–56.
Paxson H and Helmreich S (2014) The perils and promises of microbial abundance: Novel natures and model ecosystems, from artisanal cheese to alien seas. *Social Studies of Science* 44 (2): 165–193.
Philo C (1995) Animals, geography, and the city: Notes on inclusions and exclusions. *Environment and Planning D: Society and Space* 13: 655–681.
Potter MF (2006) The perfect storm: An extension view on bed bugs. *American Entomologist* 52: 102–104.
Potter MF (2008) The history of bed bug management. *American Entomologist* 57: 14–25.
Puig de la Bellacasa M (2017) *Matters of Care: Speculative Ethics in More than Human Worlds*. Minneapolis: University of Minnesota Press.
Raffles H (2010) *Insectopedia*. New York: Random House.
Rees T (2016) *Plastic Reason: An Anthropology of Brain Science in Embryogenetic Terms*. California: University of California Press.
Reinhardt K (2018) *Bedbug, Animal Series*. London: Reaktion Books.
Reinhardt K and Siva-Jothy MT (2007) Biology of the bed bugs (Cimicidae). *Annual Review of Entomology* 52: 351–374.
Rieder E, Hamalian G, Maloy K, et al. (2012) Psychiatric consequences of actual versus feared and perceived bed bug infestations: A case series examining the current epidemic. *Psychosomatics* 53: 85–91.
Rose DB, Van Dooren T and Chrulew M (2017) Introduction: Telling extinction stories. In: Rose DB, Van Dooren T and Chrulew M (eds). *Extinction Studies: Stories of Time, Death, and Generations*. New York: Columbia University Press, pp. 1–18.
Sarasohn LT (2013) "That nauseous venomous insect": Bedbugs in early modern England. *Eighteenth-Century Studies* 46: 513–530.
Seidel C and Reinhardt K (2013) Bugging forecast: Unknown, disliked, occasionally intimate. Bed bugs in Germany meet unprepared people. *PLoS ONE* 8: 4–9.
Shukin N (2009) *Animal Capital*. Minneapolis: University of Minnesota Press.
Sloterdijk P (2009) Airquakes. *Environment and Planning D: Society and Space* 27: 41–57.
Southall J (1730) *A Treatise on Buggs*. London.
Stallybrass P and White A (1986) *The Politics and Poetics of Transgression*. Ithaca, NY: Cornell University Press.
Sundberg J (2014) Decolonizing posthumanist geographies. *Cultural Geographies* 21: 33–47.
TallBear K (2017) Beyond the life/not life binary: A feminist-indigenous reading of cryopreservation, interspecies thinking and the new materialisms. In: Radin J and Kowal E (eds) *Cryopolitics: Frozen Life in a Melting World*. Cambridge, MA & London: The MIT Press, pp. 179–202.
Todd Z (2016) An indigenous feminist's take on the ontological turn: 'Ontology' is just another word for colonialism. *Journal of Historical Sociology* 29: 4–22.

Tsing AL, Bubandt N, Gan E, et al. (2017) *Arts of Living on a Damaged Planet: Ghosts and Monsters of the Anthropocene*. Minneapolis: University of Minnesota Press.
Usinger RL (1966) *Monograph of Cimicidae (Hemiptera-Heteroptera)*. Annapolis, MD: Entomological Society of America.
Whatmore S (2006) Materialist returns: Practising cultural geography in and for a more-than-human world. *Cultural Geographies* 13: 600–609.
Willey A (2016) A world of materialisms: Postcolonial feminist science studies and the new natural. *Science, Technology & Human Values* 41: 1–24.
Zhu F, Wigginton J, Romero A, et al. (2010) Widespread distribution of knockdown resistance mutations in the bed bug, *Cimex lectularius* (Hemiptera: Cimicidae), populations in the United States. *Archives of Insect Biochemistry and Physiology* 73: 245–257.

Author biographies

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