Towards aeolian microbial landscapes: diversifying learning from Covid-times to support cleaning the air within more-than-human worlds.

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Introduction

The Covid-19 pandemic has increased our attention to the air. When the crisis begun public health leaders did not begin with thinking about the air, as suggested to the geography discipline by aerographers Jackson and Fannin (2011). Instead they begun with raising anxieties about what we touched – advising an increase in hand-washing in Feb 2020. Indeed, that is where we had begun in developing our expertise and interest in infection prevention and microbial aesthetics, and this still seemed valuable as we put our research proposal together in July 2020 for the Covid-19 emergency call. However, it became quickly apparent that the science was suggesting we had reasons to be anxious about the air we breathed, the air could be infectious, and to manage Covid infection required air management.

Brown et al in 2020 as their paper went through final revision before publication added a section that describes how air had come to matter to the pandemic response, in a publication on Air Care and the management of cystic fibrosis sufferers in the journal Sociology of health and illness:

> 'Breaking the global chain of Covid-19 transmission has come to depend on a new biopolitical spatiality of the body, of all bodies. For most people, these are entirely new etiquettes of spacing, of imagining the invisible, of envisioning aerosolised dangers, of picturing airborne threats encircling the bodies of oneself and others. The profound state of emergency once inhabited by the very few, has now come to enfold the entire world. ' (Brown et al 2020)

Writers on aerography (Irigary, Jackson and Fannin 2011) emphasise how it is a perspective that reverses the privileging of visible solids. Brown et al's study was on the specific experiences of living with cystic fibrosis, which they say 'has increasingly come to depend upon a hygienic regime of spatial and atmospheric segregation, ritualized etiquettes of social distancing and a keen acuity to infection risks carried on the air' (2020 p.973). Cystic

Fibrosis sufferers and those helping to manage their condition have never been able to forget air. They have not had that privilege. I will return to what privileging can do later.

Air Care
First, to think with Brown et al about air care in hospitals and how air care was translated in the pandemic to everyday spaces, thinking particularly about the bus space. Brown et al discuss how pre-antibiotics architecture was the answer for ventilating healthcare spaces to separate the bodies of the sick into divided atmospheres. Whereas the age of antibiotics led to fundamental changes in the configuration of clinical space, 'reflected in a movement of disease from the environmental to the internal and pathogen-centric' (974). We see the same in the Covid-19 pandemic on the bus. Pre-vaccinations physical distancing was mandated on the bus – seats were taken out of use, passenger carrying-capacity reduced. The reasoning behind this action relates to the metaphor of the 'cloud body', coined by microbiology (Belani et al 1986) to designate bodies that 'shed' bacteria and viruses in great quantities. As Brown describes – the idea of

> ' 'the cloud' repositions the individual body as a transmissible bioaerosol, […] by loosely symbolising the patient as a volume of air, the cloud re-envisions the unseen, whilst itself remaining visible' (Brown et al 2020:978).

Something akin to this happened in Covid-times with infection prevention guidelines and rule-making. The 6 feet (2 metre) rule social distancing rule that is commonly practised for cystic fibrosis sufferers was co-opted as the safe rule for everyone pre-vaccine. Whereas post-vaccine normal bus capacity resumed and the attempts to architecturally manage distancing between people stopped, and face-coverings became mandatory in indoor spaces. In contrast to the hospital where in the post-antibiotic world having openable windows was seen as a threat to the technologically controlled air-managed environment, the bus industry encouraged passengers to keep windows open, to stay safe.

> I'm not sure I've seen if more windows are opened. I haven't noticed that. (Amran)

Q: Yes, yeah, so that's – they're symptoms of the coronavirus, aren't they?

A: Hmm-hmm. Hmm-hmm. But also like – like stuffy air, you can't breathe in. My sister said the air was making her nose feel itchy, so something like that would make me feel as well [laughs] there's a virus in the bus. I think science, invisible science, or some actual things I can see. (Abiir)

'Fresh Air' was added in March 2021 to the UK Governments public health guidance of 'Hands, Face, Space'. And whilst 'Natural ventilation through windows turns buildings inside out bringing the external biotic life of the environment into the internal space of the building' (ibid: p.975), which has been described as, as means of 're-wilding' indoor atmospheres, the 'fresh air' instruction was more along the lines of 'old air out, new air in' with scientists reassuring us about the power of breeze, gusts and dilution that could disperse and destroy viral particles making them ineffective. The microbiome study of the bus carried out in the course of this interdisciplinary piece of research indeed supports this

understanding of external fresh air as rewilding the bus environment. The bus microbiome is more like an outdoor environment than the indoor environment of a hospital, for example. Thus, offering scientific evidence to dismantle pre-conceptions that the bus is an indoor environment and thus risky. Taking care for Covid-19 infections has led to not forgetting, but rather envisioning the invisible air for some, embracing its intangibility. Although the passengers we spoke with didn't find it an easy message to understand and put into practice or comprehend.

Q: Yeah. And what do you think about the fresh air message?

A: Mmm, I guess it's okay but yeah, it's so confusing, to be honest.

Q: Yeah, so I mean have you thought about that in terms of how you can make yourself safer when you're around other people, to have the fresh air, you know, whether you're only meeting outdoors or things or –

A: I still don't feel comfortable even outside because I feel like you can still get some of it. (Muna)

And whilst air does not easily 'show itself' as Irigary puts it, when on a moving bus, with windows open you can feel it – a pleasant breeze in the summer, a cool chill on static passengers in the winter. Although the act of opening windows in the cold months of early 2021 was identified by the passengers we interviewed as a potential source of conflict with fellow passengers. Some bus operators installed wooden blocks to force windows to stay open in the colder months, but they complained passengers forced them off bringing the window to a close, because they could only use glue to stick them on as they can't change the integrity of the bus for bus safety standard reasons.

Moving on to think about the relationship between the infectious air and infectious surfaces, Brown et al's empirical findings about the anxiety about air as carrying infection, mirror our own findings. Does wiping down surfaces have a benefit? Does it reduce airborne transmission? Is the atmosphere full of bacteria that we breathe in, because another breathed it out? Opening windows to let a bit of air in seems a way forward with all the unknowabilities, and on the bus one can feel the air as the bus starts to move. The moving bus feels safer than the bus at a standstill. Although with doors open at a standstill there is again plenty of opportunity for air to circulate in and out, and on a cold, windy day one can feel the cold breeze.

> 'The fresh air, obviously because of – in terms of like I was having like quite a few people onto the bus in one particular time, like at one given time, so obviously like, you know, when you don't have that many people, obviously everyone's got like their own space. And that makes it, you know, in terms of like, you know, air

circulation in the bus as well, obviously the windows are usually open as well, which is, you know, quite good.' (Faisal)

So it's hands, face, space, and now fresh air as well.

A: Yeah. I'm not sure about the fresh air one, I haven't tried that yet, but the most important thing is hands, space, and face. That's what I follow every day and that's what we should be following to keep each other safe.

No. The least I can say for buses is I've never seen like windows open or anything. Maybe sometimes when it's very hot, but the majority I don't even think you can open them, some of them [laughs].   They're quite a challenge, but they should be opening the windows because when you get a lot of people in one place, the risk of transmission of disease will be very high, and the same should apply to buses when it comes to transport, trains and everything. That should apply too. Yeah, that should come forward soon. (Mohammed outdoors)

Grappling with socio-materialities of the viral and its relation to taking-up infection prevention practices.

Our research aims to contribute to studies of socio-cultural geographies of infection prevention, where guidelines often developed in clinical settings, were taken into spaces of the 'everyday' by public health professionals, delivered often by Government ministers, during the Covid-19 pandemic and then circulated variously to lay publics. However, one of the challenges in the study of these new socio-cultural geographies is how to grapple conceptually with the tensions between the human imagination, knowledge and multi-sensual affective encounters with viruses, potentially infectious human bodies and other microbial life. Viruses/microbes as we have learnt are too often imperceptible on surfaces but associated with visible macro-phenomena as indicators of their potential presence – for example litter, spit, droplets from sneezes or coughs, runny noses, mucus, soil, leaf-litter, or smells. But infection in the air is even less knowable. The socio-materialities of microbial – viral worlds are complex to study, and this can be seen in how many social scientific contributions of the Pandemic have rarely tried to engage with the dynamic material agency of the virus, focusing instead on how the world changed (schooling - Duncan and Bradbury 2022), home life (Allison Blunt et al 2022), care institutions (Tischler et al 2022), but this work has not sought to analyse and explore the cultures around infection prevention practices that were targeted at changing the encounter with the microbial/viral world to reduce transmission. In contrast there are countless virological and epidemiological studies that seek to determine the characteristics and behaviour of the novel SARS-COV-2 virus.
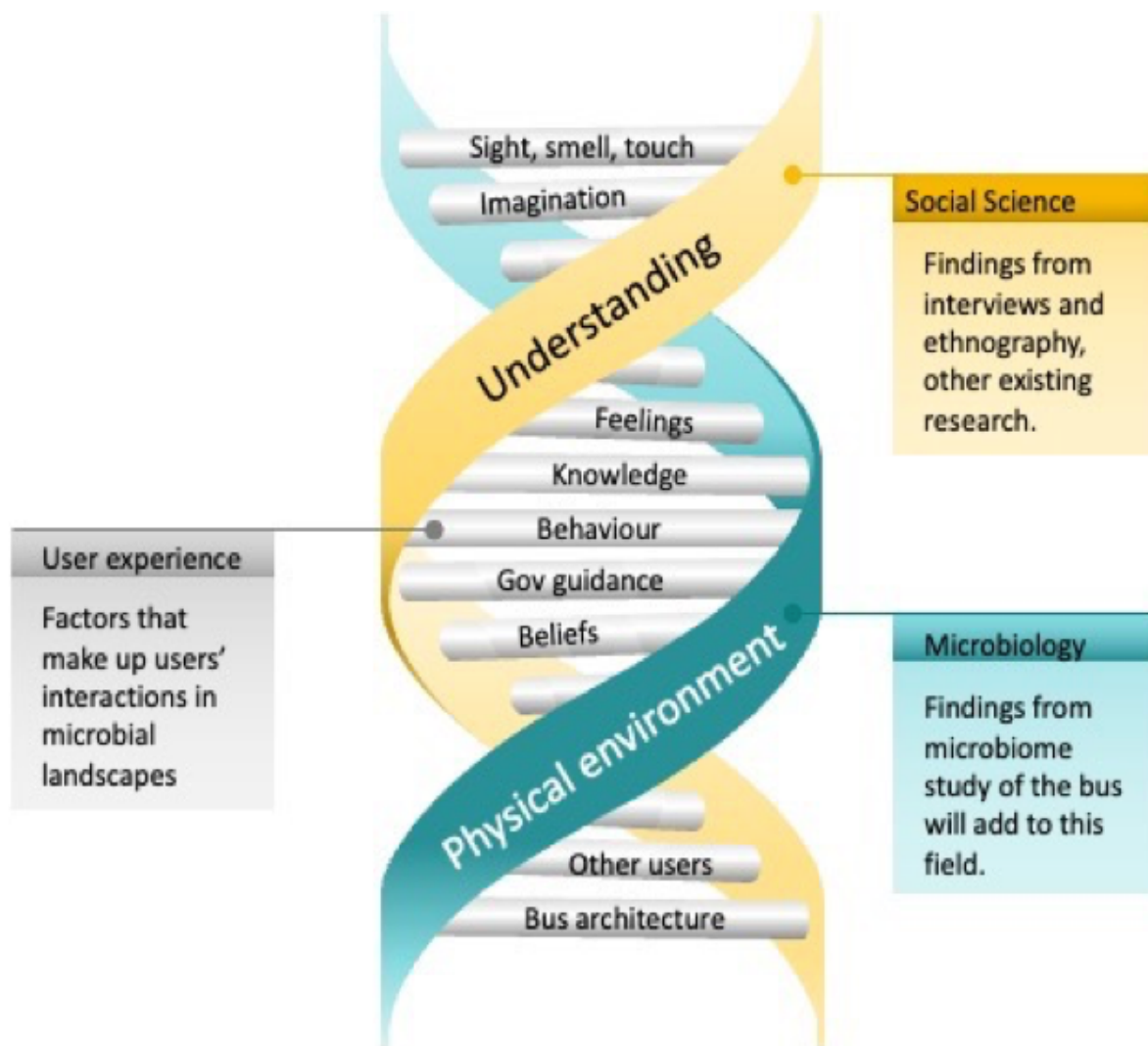
However, within these studies it is rare to find the interactions between specific human behaviors that demonstrate a 'relating to' the virus. The virus is referred to but what is not addressed is how it shapes differently the feelings, thoughts and decision-making that informs a diversity of experiences of everyday life both during the Pandemic and ongoing (which matters for future public health crises). Instead, the focus has often been on how everyday life was disrupted, sustained, or harmed by the Pandemic.

How does living with or dwelling alongside microbial life including viruses shape multicultural urban life experience?

At this point I want to turn attention to Horton and Kraftl's extraordinary paper about children's experience of poo, rats, racist ground water smearing, swarming, percolating a place where children played. They introduce the concept of 'extra-sectionalities' (2017) to 'witness how socio-materialities extend the ways in which age, class, ethnicity and religion are entangled' (p.93). For by choosing the bus as a research space, and deliberately recruiting bus passengers from a British Somali community who continued to use the bus whilst many had the option to avoid it during the Pandemic, we recognise requires additional sensitivities to the socio-economic-political harms, violence and exclusions that a more-than-human geography has often been criticized for avoiding (Hopkins and Pain 2007; O'Neill Gutierrez and Hopkins 2015).

To grapple with the sociomaterialities of the microbial we were interested in Wylie's concept of landscape as tension between self and world to think about how phenomenologically the microbial is lived in. Recognising how new cultures of infection prevention, knowledges, experiences had been made that have given a different tangibility to the microbial and more specifically the intense materiality of the bus. We initially created this schema, drawing on Wylie's reading of Merleau-Ponty's theory of reversibility to explain the relation between the science and the social science as changing the experiences of being a bus passenger. (SEE DIAGRAM).

Wylie's concept of landscape– as a tension between self and world - helps articulate how the microbial as a socio-materiality is both imagined and lived-in, and more particularly how the Pandemic brought new knowledges, thinking, about the often overlooked, often-unsaid microbial landscape that diverse human lives are embedded within in complex, biophysical, ever-processual ways.

Sight, smell, touch

Imagination

Understanding

Feelings

Knowledge

Behaviour

Gov guidance

Beliefs

Physical environment

Other users

Bus architecture

Social Science

Findings from interviews and ethnography, other existing research.

User experience

Factors that make up users' interactions in microbial landscapes

Microbiology

Findings from microbiome study of the bus will add to this field.

However, what we lacked in this framework was the nuance of addressing who are passengers were (British Somali) and how their experience of being a bus passenger was therefore different from ours – the white researchers/ethnographers. We found this literature and ideas helpful to gain new critical understanding about our privilege as white researchers on the bus. and we conclude by returning to understandings of the aerography, the aeolian microbial landscapes with a different perspective.

The Bus as intense materiality
The bus has been described as a space of intense materiality and a unique urban setting because of how it *places* bodies (Wilson 211).

> 'The space is continuously (re)negotiated and (re) ordered through mobile and constantly shifting practices of movement, behaviour, expectation, assumption and assertion as people come and go. Differences are negotiated on the smallest of scales, individual itineraries come together – if only temporarily – and subjectivities are continuously (re)formed. (ibid:646).

From empirical accounts, prior to 2019, it is clear there existed pre-Covid a heightened awareness of others on the bus, that is a consequence of what Massey (2005) called the 'throwntogetherness' of public transport. Mobility studies literature that has studied the experience of bus passengering, within the multicultural city have often engaged with spatial restrictions to how bodies are placed and what the consequences are. Lobo 2015 describes the bodily stress of Aboriginal and migrant bodies with particular attention to how nonhuman material 'things' can shape how the event unfolds. Wilson (2011) contributes the concept of everyday propinquities and the emotion, feeling and affects that assemble and re-arrange as bodies on the bus are brought close together, then part, and change configuration. "Seat drama" is identified by Shaker (2021) in their (auto-)ethnographic study of Muslim's on the Amsterdam transport network, as the most repeated performance of othering. Seat drama refers to the experience of realising people are deliberately choosing not to sit next to you, or avoiding the seat next to you, even on a busy bus. Elsewhere Koefoed, Christensen and Simonsen (2017) describe the spatial bodily negotiation in the limited spaces of public transport as 'tactics of placement', to find the safe sitting or standing place away from the other. Purifoye (2015) in a study of black passengers on Chicago's public transport argues that 'public transport brings people together from bounded places into integrated spaces that are brokered by mobility and the physicality of the space: Seating is defined, exit/entrance doors are stable, and limited stops' (304). The consequence she describes is that this 'elicits raced responses as these conditions often shape a space of anxiety for socially distant passengers.' She targets in her analysis on the absence of avoidance techniques that can easily be applied in open spaces, within the confined space of the bus.

When reading these accounts subsequent to interviewing British Somali bus passengers during the Covid19 Pandemic and as a group of white researchers carrying out our own auto-ethnography as passengers, it is apparent that there was a repertoire of existing behaviours that the bus passengers we interviewed were familiar with. This familiarity was perhaps they had practiced them themselves but also perhaps experienced when being identified by an other as the source of anxiety, then not as an infection risk but because of a hostility/tension felt towards they, the Other. Indeed, who hasn't tried to get an empty double seat on a bus, and hope no one sits next to you to get more personal space? And also who hasn't demonstrated a preference for who they sit next to, when given a choice? It is equally the case that infection prevention measures of physical distancing (often referred to as social distancing) was a tactic that tapped into existing anxieties about being close to the other on the bus, and there were tactics that tapped into anxieties about what the touch of a stranger could leave behind on public spaces and be picked up by your own touch - hence increased hand-sanitising or using an elbow, or cuff pulled over fingers, rather than a naked finger to touch the stop button. Some bus companies installed hand-sanitisers onboard to reduce anxieties related to touch. However, public transport passengers have historically been asked to habitually accept this status-quo of sharing a space, sharing a STOP button. Prior to the Pandemic, the arrival of a body moving close could be noticed if it didn't fit in. In Ahmed's writing on the phenomenology of whiteness she brings our attention to how whitenesses invisibility, becomes visible when a non-white body, 'generates disorientation in how things are arranged (2007:163). During the pandemic the disorientation in how things were arranged on the bus, was initiated through a reminder that the virus could be deadly; and secondly, that any *body* could be a source of infection,

habits that belied racial anxieties broadened to anxieties towards anyone. The pandemic introduced the idea of all human bodies as a potential source of Covid viral transmission, and surfaces, objects. Cleaning became a process to ease infection anxiety in the hope it prevented infection. For those bodies that had prior to the Pandemic been made to feel they didn't fit in – the Pandemic offered a quiescence – mandatory seated distancing reduced witnessing stimatising the Other in practice, the wearing of face-masks made the veiled face of Muslim women wearing a Niqab normalised, they felt they fitted in.

The bus as dirty

The bus industry research participants and Bus Users UK as our collaborators brought our attention to the long-standing cultural stigma attached to the bus as a dirtier space, that has been identified and discussed elsewhere (Dobbie et al 2010) and by Lobo 2014 who described the moving space of the bus in Darwin Australia with fear, discomfort and disgust (p.716). The bus industry felt the stigma helped explain how buses were widely-perceived and labelled in the Pandemic as a place to avoid, that still lingers. There was a widely-perceived, social disadvantage associated with taking the bus during the Pandemic. It is place where both Wilson (2011) and Lobo (2014) identify bodies are read through quick judgements that focus on race, dress, gender, age, language and jewellery, factoring into this in the pandemic are face-masks, sanitising, sniffles, coughs. Naively, we had hoped our microbiome study (swabbing multiple sites on the bus over a number of months) could challenge this stigma, seen to blame for ongoing challenges of increasing public transport use to meet UN Sustainability goals and reduce carbon emissions. But the literature on race and bus passengering indicates the stigma of the bus as dirty is more complex than showing bus cleaning works to reduce microbial life. For starters there are certain sectors of society that do not see the bus as part of their lifestyle, sticking with their car and thus avoiding social interactions with strangers were quick judgements are made about whether to sit or stand close to them. Bus users (outside of the highly developed public transport infrastructure of London) are often disadvantaged (poor, female, non-White, disabled, elderly).

Conclusion

The less privileged position of the Cystic Fibrosis sufferer or the non-white passenger on the bus challenges invisibilities that work against infection prevention practices deployed on the bus. Air is forgotten and the Fresh Air message has challenges in how it can be applied. Cleaning efforts on the bus are challenged by stigma of being placed potentially close to 'dirty human bodies' in a confined space.

Social and cultural geographies of infection prevention by virtue of the intangibility of the micro and the viral instead must engage with the socio-materialities that speak to the extra-sectionalities Horton and Kraftl identify.

'to enable understandings of the co-constitution of intersecting social differences *with/*in nonhuman materialities and affects; permit an expanded conception of the kinds of materialities that should be considered in accounts of socio-political geographies of communities – particularly **accommodating those materialites that are harder to categorise, that are less obviously produced by human hands as 'markers' of exclusion or discrimination, and that are hidden-in-plain-sight**; further push calls to focus away from 'thick' urban interactions by emphasising (non-)events of encounter, in which narratives of

socio-material process are instrumental in constituting social and community otherness.'
(2017 p.945)

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