16 Transversal geo-politics

The violence of sound

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On a website called 'The Electronic Intifada' are a series of recordings made by Rana Baker during the 2012 Israeli attacks on Gaza. The four recordings, taken in total over 8 minutes between 8:50 p.m. and 3:50 a.m. on the 20th and 21st of November (a few days preceding the ceasefire), document deployments of missiles from Apache helicopters and live ammunition fired from the ground. The recordings themselves are low fidelity with static overlaying the relays of explosions and retorts. This static fuzz lends the recordings a peculiar stillness that suspends in tension life within the intermittent echoes of warfare woven through. This discomfort is heightened by the large absence of animal or human voices. Occasional words and squeals punctuate the drone of planes, sometimes the inquisitive piping of a child, at times in the far off distance an amplified vocal distortion or perhaps a television or radio can be discerned but the words are muddied and incomprehensible. In the recording 'Apaches and apache strikes right now in Gaza Nov 20 9.37pm' an infant's wail is syncopated sharply. Moments where the recordist brushes her hand over the microphone (or perhaps it is some kind of signal interference) recall a situated embodiment that for the large part the recordings deny. One senses for a few seconds that she is sitting there, silently, listening, allowing us bear witness to what she hears.

These recordings remind us how profoundly the sounds of a place can evoke its conditions. Most importantly for geo-politics scholars, I argue, they compel us to critically address the largely overlooked 'invisible', atmospheric forces of governance, and their role in determining everyday experiences of space and place (Feigenbaum and Kanngieser, 2015). By listening to the ambiances or atmospheres of a place we get a sense of the complex and shifting terrains that constitute it, the sudden flashes of activity, the unremarkable meanderings and stutters, the compositions of organic and inorganic matter. Listening closely allows us to hear for sonic topologies – those continuous tones and harmonics that hum throughout moments as they articulate themselves. Sound transverses events and states to bring into effect relational ecologies that reveal themselves to us in ways that require a particular sensitivity to apprehend. Through concerted listening we are able to encounter sound as a way of 'knowing', as an acoustemology. Put another way, through emphasising the temporal, active, and collective dimensions

of sound, as Jean-Paul Thibaud (2011) stresses, we are able to study and to document the unfolding of an atmosphere.

Félix Guattari's work, specifically his conceptualisation of transversality, provides a framework for unpacking the disparate territories and themes of these sonic topologies. For Guattari, the concept of transversality provided a way to "think the interactions between ecosystems, the mecanosphere, and social and individual universes of reference" (1989: 135). From its inception, his idea of the transversal was tied to investigations of power and the formation of subjects (subjectivation). Through the early experiments in psychoanalytical and political organisation, to later explorations of creativity and aesthetics, transversality signalled for Guattari a means to think about the crossing over between different identities, structures, and hierarchies. Subjectivation, for Guattari, is thus

> based on transversal practices that allow the collective emergence and entanglement of existential territories and universes of value. Transversality as a field of expression provides the milieu for a creative emergence from disparate forces. As a 'dimension to overcome two impasses,' it is not a mere connecting device but a practice for novelty to emerge.
>
> (Brunner and Rhoades, 2010: np)

Following Guattari's commitment to experimentation, this chapter uses a transversal technique to move between sites, times, machines, and nation-states and/or privatised entities – *it becomes itself an instance of transversal expression*. Transversality is used to map out an 'assemblage of vulnerabilities' – bodies and forms of life vulnerable to sonic governance. By naming these vulnerabilities, and casting light on these assemblages, it is my intention to highlight the necessity for a more concerted focus on sound within geo-political research.

Sound has several unique affordances that make it relevant to a transversal style of investigation. Firstly, the processual character of the transversal – something that cuts across scales and levels – is fundamental to the way in which sound, as a phenomenological and as a vibrational-kinetic entity, works. Transversality always affects that which it crosses through; it does not just 'connect'; it changes things; it brings into the world novel relations; it shifts paradigms and builds new formulations. These may be significant or not, temporary or not, evident or not. Second, sound as transversal subjectivates; sound is productive of place, space, and identity. (Nancy, 2007: 17). These sonic processes are not indicative of spatial or temporal permanence; they are highly contingent and eventful – sounds require space and air for their form, they "take shape on different scales of space" just as they do different temporal scales (Roads, 2001: 39). The communication of auditory trauma is thus always fraught. In the moment of its activity, sound can cause acute physical and psychological violence, which may resonate well after the vibration itself has diminished (see Revill, 2014: 3). This, however, is in excess of its possible articulation, leaving the narration of sonic assault as impartial and unseen.

Thirdly, transversality reveals the vulnerabilities that sound governance capitalises upon because it shows how bodies are asymmetrically affected within common conditions. Put another way, transversal modes let us shift between the general to the particular, while retaining a view to the collective. Sound has a tendency toward immersion: when it is not heard it still penetrates the proximate skin and bodily cavities, organs, and cells. As a tool of warfare, this asymmetry to sound exacerbated by intensity of volume or frequency, makes it unevenly harmful. Sound enacts an elementary affective force influencing how we relate to the world and the materials that comprise it (Ingold, 2011). It is highly promiscuous; it goes into space and time where bodies cannot (LaBelle, 2010) and it envelops that which it comes into contact with, creating a collective effect (though it may not be experienced in the same way throughout that collectivity). At the same time, as seen with holosonics, sound can be highly specific when directed, affecting certain kinds of bodies more intensively than others and fostering awareness of precise relations of subject and object.

Finally, sound decentres human subjects. Everything makes sound and is touched by sound, regardless of how imperceptible to human sensibilities this may be. Attending to the geographies of sound requires seeking chains of association across often incompatible and irreducible spaces and corporealities, working in a motion of propagation like sound itself. This movement reveals surprising or unconventional connections, offering a productive means for reconfiguring how we understand the interrelations between biotic and abiotic subjects. This helps us to conceive a more nuanced, and less humanistic, view of ecosystem function. In sum, transversality situates sound in an always-political dynamic delimiting how we conceive of political agency (Kanngieser, forthcoming) into a more 'cosmopolitical' (Stengers, 2005) approach. This has consequences for how we consider sound to generate knowledge of environments, the power structures that it illuminates and participates in, the intersections of state, military, and corporate interests, and so forth. Vital to this are different ways of listening or attenuating in order to become more sensitive to these structures and dynamics. In what follows, this chapter, through maintaining a transversal momentum, provides a pathway to intervention into such ways of attending to the complex and shifting interchanges of governance and subjectivation – namely by exploring how sound is weaponised across geophysical, atmospheric, and biological scales.

From the air to the earth

> In modern warfare, mechanical and metallic, the element of sight is almost zero. The sense, the significance, and the expressiveness of noise, however are infinite.
> (Russollo, 1986: 49–50)

> All one has left is a resonance chamber well on the way to forming a black hole.
> (Deleuze and Guattari, 2004: 379)

It came from above: air strikes. The sound of helicopters chopping the sky with their blades overhead, the repetitive whips undercut by cracking drones oscillating

as they moved from one location to the next, hovering then peeling away. Atmospheres of war, made in the air, etch out zones of militarisation as much vertical as horizontal. The sound of missiles, machines, infrastructural collapse are carried through the air in waves. The waveforms of sound make it almost impossible to escape as they are felt as tactile vibration as much as they are heard. Sound penetrates space and matter.

Writing on the affective force of sound, Steven Goodman explores how sound warfare impacts on the ways "populations feel – not just their individualized, subjective, personal emotions, but more their collective moods or affects" (2009: xiv). For Goodman "sound contributes to an immersive atmosphere or ambiance of fear and dread"; the vibration of sonic weapons, however, "threatens not just the traumatized emotional disposition and physiology of the population, but also the very structure of the built environment" (2009: xiv). Defined under the rubric of nonlethal or 'less-lethal' (and psy-op)[1] warfare, not intended to inflict injury or death, sound devices thoroughly destabilise the integrity of infrastructure – geological, material, social-political, – and can, and do, cause massive amounts of physical pain and damage, even death (Altmann, 2001; Arkin, 1997), depending on the parameters of their deployment.

In the 2014 report by the Who Profits Research Centre on the use of nonlethal or less-lethal weapons, a section is dedicated to a device nicknamed 'the scream'. First used in Bil'in in 2005 during a protest against the Israeli West Bank barrier, the Israeli manufactured anti-riot system 'SHOPHAR'[2] consisted of 36 horns stacked upon each other mounted onto a jeep (Businessweek, 2014). Several years later a different iteration of the scream appeared on the West Bank: an LRAD (long-range acoustic device) produced by the American Technology Corporation – a "high-intensity directional acoustic hailer designed for long-range communication and issuing powerful warning tones" with a reach of up to 3,000 metres depending on the model (LRAD nd). Used to both establish exclusionary zones, and police civil demonstrations, (Volcler, 2013)[3] reported effects included temporary loss of hearing, nausea, and dizziness (Altmann, 2008).

The past years have seen increasing use of diversionary devices such as stun grenades or 'flash bangs' in occupied were used territories, with reports particularly focusing on instances of violence against civilians. Comprising a mix of mercury and magnesium powder, and with peak sound pressure levels between 130 and 190 dB at 1.5 metres (well above safety limits), stun hand grenades such as the M84 are designed to distract noncombatant targets through the combination of pyrotechnics and sound (Department of the Army, 2009: A–11). In 2014 three incidents wherein stun grenades outside of political and religious demonstrations received coverage in English-language media – the employment of grenades in combination with tear gas against school children in al-Khalil (ISM, 2014), the firing of grenades into a wedding march in al-Issawiya (Ma'an, 2014), and the attack by Israeli police on the al-Aqsa mosque, in which grenades were detonated inside the mosque itself (Lewis, 2014). While Stun grenades are designed to be discharged within confined and enclosed spaces this is with the regulation that they do not come within 1.5 metres of human bodies. Alongside ongoing concerns around the ways in which war recasts and shapes everyday geographies into

escalating spaces of terror, such incidents demonstrate the ambiguous position that less-than-lethal sound devices hold. The disorientating effects of flash bang grenades have been widely documented – causing severe dizziness, temporary deafness and blindness; and the devices have led to acute injury and death (Bogue et al., 2014; Gurr, 1997; Wright, 2001). Nonetheless, they are designated less-than-lethal status.

The calculated use of the significant affective, emotional, psychological, and physical violence of sonic weapons is perhaps most markedly captured by the production of sonic booms through shock waves caused by jets travelling beyond the speed of sound. Shortly following the enaction of the Israeli Disengagement Plan from Gaza in 2005, it was reported that IDF jets were flying at extremely high speed and low altitude over the densely populated Strip, creating what were described as "sound bombs" or thunderclaps over residential areas several times a night. Felt as "a wall of air, painful on the ears", sonic booms give the effect of aerial bombardment; the force of the boom cracked edifices, blew doors off buildings, and shattered glass (McGreal, 2005). This intense sonic physicality was accompanied by further physical and psychological including nose-bleeds, hearing loss, symptoms of anxiety and hypertension, exhaustion, and, according to the Palestinian health ministry, increased miscarriages and heart problems, with the most severe impacts on children and infants. Medical human rights groups argued that, given the ubiquity of the sonic reverberation making it impossible to shield from, the tactic amounted to "collective penalties" defined as illegal by customary international humanitarian law and the Geneva Conventions (International Committee of the Red Cross, 2014).

As from the air, sonic technologies constrain and control life beneath the soils of Gaza. Taken from Naval methods for finding oil, and used to guard prisons, security installations, sea ports, government facilities, airports, and banks, microphones are placed 1.5 metres within the ground to measure low frequency and infrasonic energy travelling through the Earth's layers. This information is processed by "intrusion recognition algorithms" to help ascertain the type of activity causing the sound – be it walking, digging, vehicular, and so forth (Elpam, 2014). Elpam Electronics who engineer these geophones claim that the system can ascertain minute movements up to 10 metres below surface level. With a plan to bury hundreds of sensors around the Gaza border, the company is working on the means to differentiate human from other subterranean sounds.

From extreme volume to below human thresholds of hearing "sonic warfare is as much about the logistics of imperceptions (unsound) as it is perception" (Goodman, 2009: 9). The affective resonances of sound are not limited to human bodies, nor to biotic bodies at all. Sound not only emanates from and impacts upon bodies but also vibrates through environments and objects; in a text on non-cochlear sound, Will Scrimshaw emphasises the nature of sonic affects and signals in excess of their human audibility or perceptibility (2013: 28). This kind of "sonic materialism" (Cox, 2011) considers sound beyond its attributed phenomenological immediacy. It is especially through the registers of infra- and ultrasound that the more-than-human targets of sonic governance are implicated.

Governing the imperceptible

The relationship of sound to the imperceptible is aporetic in that it hides and reveals phenomena. The often acousmatic character of sound – where the source is heard but unseen – is endemic to this relationship. So is the frequency range of sound. Beyond registers perceptible to human hearing are those that transmit on ultrasonic (above 20 kHz) and infrasonic (lower than 20 Hz) frequencies often used in medical and military contexts. These frequencies, while inaudible or barely audible to humans can cross sensory thresholds through their vibratory qualities – evidenced in discussions about low frequency noise (LFN) such as what has been called 'the hum'.[4] They are also discernable to animals, plants, viruses, and bacteria (see Yusoff, 2013).

Ultrasound is most commonly associated with deterrence, commercial and military detection and sensing (such as motion sensing), and biomedical procedures such as sonography. Through sonic pressure, ultrasound registers beyond the upper limits of human hearing, sending and receiving millions of pulses each second. The frequencies at which ultrasound transmits are audible to animals and insects – a vulnerability capitalised on in the development of domestic and wild animal repellents, which can generate a sonic barricade up to 600 metres around the site of broadcast. Some ultrasonic frequencies can also breach the threshold of human hearing; devices perceptible only to those below their mid-20s, such as the 'mosquito', have been used to disperse gatherings of teenagers and young people in public places (Townsend, 2010). In the biomedical industries, the use of ultrasound has been primarily directed toward cell disruption, reducing particle sizes, and vaporisation; however, it has also been shown to render inactive bacterial spores, microbes, and parasites. In part, this has been of particular interest to researchers in the USA, hoping to arrest biological warfare such as anthrax – an experiment conducted by scientists placing spores in an envelope showed a 99.9% elimination rate through the use of high-intensity focused ultrasound at a frequency of 70–200 kHz for 30 seconds. The acoustic energy generates heat, along with the mechanical effects associated with acoustic pulses, to cause cell death (Zhou, 2011); this advancement has also been deployed as a key non-invasive and extracorporeal treatment of cancer tumours.

The deterrent and lethal effects of ultrasound for detection, monitoring, and nontoxic control have been explored by artist David Dunn through his work in bioacoustic ecology. In collaboration with physicist Jim Crutchfield, Dunn has proposed the use of ultrasound to intervene in a feedback loop of beetle infestation and deforestation. According to Dunn and Crutchfield (2009) correlations can be drawn between expanding beetle habitation and the mass decimation of trees through a fungus, which the beetles carry; this decimation leads to the release of thousands of tonnes of carbon into the atmosphere, significantly altering climate. In their work, Dunn and Crutchfield studied the ways bioacoustic communication affects infestation dynamics, namely, how tree-eating beetles use ultrasound to identify trees already vulnerable due to drought, and to further communicate this within the insect colony. While entomologists have argued

that pheromones are more commonly critical to insect communication and identification of infestation sites, Dunn and Crutchfield found, through initial field research using ultrasonic signals in close range to disturb the beetles' sense, that acoustic signals were successful in breaking up or slowing down infestation. This, they argued, could help to lure insects away from damaged forests and, importantly, mitigate the further spread of insects into new territory.

From the ultrasonic to the infrasonic, acoustic technologies are used to explore, demarcate, and discipline biospheres (Hedlin et al., 2012). Increasingly, underwater drones are being used to for geo-exploration, using traditional sonar but with the added benefit of deep underwater mobility. Because of the mid to low frequency range of these pulses, and the vast underwater distances travelled by sound, a range of detrimental effects to sea life have been isolated. Physical changes in whale and dolphin populations such as tissue and organ damage and the growth of microbubbles, and behavioural changes including avoidance of sound emitting boats, cessation of singing, altered migration routes, and high levels of agitation have been noted scientists, and have directly linked mass beach strandings of sea mammals to sonar testing.

Further, offshore oil and gas exploration by geophysics companies use sonar devices, sending highly compressed air pulsing through the water and penetrating the sea floor, where sound levels, claimed to be 100,000 times that of a jet engine, are detonated every 10 seconds, 24 hours a day for weeks on end. Recent research has also shown that fish that communicate acoustically are having to produce louder sounds in order to be heard over manmade sounds – which threaten their existence (Holt and Johnston, 2014) and demand more robust regulation of anthropogenic ocean sound (Merchant et al., 2012).

Voice as biometric signature: warehouses, prisons, and borders

From ultrasound to sonic booms, buried microphones to acoustic screams, sound is used to control and monitor human movement. Surveillance and discipline through vocal technologies is a ubiquitous iteration of this. The use of voice-based biometrics to track and determine the movements of individuals has been thoroughly incorporated into varying levels of nation-state and corporate governance. This has been loosely consolidated around voice and speech capture and recognition software and hardware, which identify an individual biometric signature from the combination of vocal tract physiology and behavioural speaking aspects. From drones armed with super-sensitive microphones (under consideration by the NYPD for use in 'crime hotspots'), to 'smart' CCTV cameras able to eavesdrop on conversations (rumoured to have been used during the London 2012 Olympics), advances in voice biometrics are mapping new fields in surveillance capabilities. Such biometric technology is being deployed both in public and private spaces, perhaps most aggressively at border zones, and on the warehouse floor.

Voice biometrics have been used on asylum seekers and refugees for over a decade to impede movement outside of detention centres. Between the 2004

Asylum and Immigration (Treatment of Claimants, etc) Act and the 2006 *Immigration, Asylum and Nationality Act*, compliance with electronic tagging and monitoring moved from consensual to a conditional requirement in the UK.[5] Although electronic tracking has not been made compulsory, as this would constitute criminal abuse (though cases can be made to implement compulsory consent), compliance has been encouraged by authorities as beneficial to asylum seeker claims. This means that electronic monitoring has been assimilated into the suite of bureaucratic and technological apparatuses determining, and often severely and unjustifiably constraining the everyday mobilities of asylum seekers. Corporate service providers operating across the prison-detention spectrum, such as G4S and Serco, although are developing more accurate voice verification systems capable of accommodating multiple dialects, accent variations, and voice and condition changes.

Working in conjunction with the UK Border Agency (UKBA), such systems sit alongside security protocols designed to confirm, through accent and dialect, asylum seekers places of origin. Amidst controversy around the nature of language and accent acquisition, in 2003 the UK ratified the use of forensic linguistics in language analysis, to examine dialectological features relevant to the individual's geographical and social origin.[6] According to a 2011 report prepared for the UK Border Agency: New Asylum Model team (NAM +) by Home Office Science (2011: 5), language analysis is deployed

> to assist in establishing whether an asylum applicant is from their claimed country of nationality in cases of doubt; and to deter individuals from making fraudulent claims purely because particular countries have a perceived advantage – such as a high grant rate for asylum or humanitarian protection.

During the pilot of the programme the UKBA focused more closely on applicants from Afghanistan, Eritrea, Kuwait, Palestine, and Somalia, for whom Removal and Return Agreements were available. In 2013 claimants from Syria were added (Harper, 2013). While not compulsory, as for electronic monitoring, the refusal by an asylum seeker to participate in testing may have a detrimental effect on their asylum case. The profiling inherent to these systems of linguistic analysis confirm and intensify racial and ethnic discriminations, further illuminating the fundamentally racist and violent nature of the asylum processes.

The discrimination enacted along nation-state border zones also takes place within warehouses, already sites of precarious working conditions, labour exploitation, and biopolitical control. Over the last decade voice directed efficiency mechanisms have become ubiquitous along the logistics supply chain (Kanngieser, 2013). In warehouses and distribution centres, voice picking is used to manage the passage and pace of workers through the workplace. Voice picking is a system for supervising workers via headsets and microphones, consisting of a series of automated verbal directives issued from a company's warehouse management system, which recognises the response from the worker through speech recognition and converts it into productivity data. In a workforce that is significantly migrant and

on flexible and temporary contracts, the ability for software to accommodate diversities of speech and language is imperative. Unfortunately, as commercial voice recognition softwares have shown, this accommodation is limited at best[7]; in the logistics industries this has severe consequences for worker's pay and roster, which are contingent on workers meeting targets conditional on accurate communication with speech recognition platforms. Two kinds of recognition systems are used in warehouse operations: speaker-dependent, which require speakers to 'train' the application to identify their voice; and speaker-independent, which rely on a pre-existing archive of voice patterns from which statistical models are derived. Both are based on assumptions that may conflict with the realities of the distribution centre labour force. Speech-independent systems, while marketed as being adaptable to any voice within minutes of activation, are fundamentally restricted in their capacity to accommodate vocal or sonic 'anomalies' (including accents, dialects, speech impediments, external noise) that fall outside of software parameters. Speaker-dependent systems, while being more exact in their ability to assimilate pathologies, accents, dialects, and even multiple languages, require time for their programming and are thus incompatible with high and fast turnover rates (Klie, 2009).

The use of voice to determine geographical mobility shows how deeply embedded racism is within biometric profiling. More than fingerprinting or iris scanning, voice announces the ethnic, social, geographical and cultural characteristics of the speaker. Arguments for the impartiality of technological 'security and monitoring' apparatuses obfuscate the parameters upon which algorithms are built, leading to the applications of norms and standards that are always deficient. When these seemingly 'objective' technologies are then deployed to enact decision-making protocols, it is clear how violent these inbuilt deficiencies can be. The invisibilisation of prejudice that technologies afford are in part connected to a lack of engagement with what lies behind the interface. This disconnection breeds a ignorance of the substantial role of "computerized code in shaping the social and geographical politics of inequality" (Graham, 2005: 562)

Conclusion

The myriad techniques of sonic governance over bodies and forms of life outlined here remain predominantly disconnected from one another, under-examined, and outlier to 'visible' iterations of control – police and military formations and their armouries of weapons, drones, ships, tanks, horses, gases, dogs, robots, barricades, and bullets. Sound is largely insensible when one is not within the requisite spatial and temporal proximity. The activity of sound can thus only be relayed through traces and effects, and these bodily responses, the narratives told through words, articulations and flesh, behaviour and memory, can only ever marginally convey the trauma of sonic warfare. Perhaps it is for this reason that concerns about sound weapons often end up relegated to the speculative, conspiracy-theory, edges of public knowledge and debate.

Beyond what has been introduced within this chapter, it is critical to note that sound as a threshold-crossing war dispositif is not limited to the biotic. Sound is

becoming even more prolific within digital systems. A 2014 study on acoustic cryptanalysis demonstrated the viability of sound to break highly secure encryption algorithms. Deploying a side channel attack (a non-direct and unconventional attack line), a computer was able to listen via a microphone to the 10–150 KHz sounds the target computer made when decrypting encrypted data. Using both a high-quality parabolic microphone (at a distance of 4 metres), and a smartphone (at a distance of 30 centimetres), researchers showed how such information could be gleaned from different kinds of computing hardware at varying distances with equipment of even negligible sophistication (Genkin et al., 2014). The implications of this are enormous, especially given the ease at which such infiltrations can be undertaken in any setting to both retrieve information from, and instal information on to, personal computers. Similar in consequence has been the claim made by security researcher Dragos Ruiu to the infection of his lab computers by 'badBIOS' system-to-system malware carried by sound waves from computer microphones to speakers (Marks, 2013). What sound deployed in the sphere of the digital shows is just how ubiquitous and far-reaching its development as a means for contagion, constraint, and control may actually be, re-inscribing the perimeters of governance across spatial scales from the minute to the expansive.

This movement across different spatial and temporal scales necessarily requires a conceptual framework like Guattari's concept of transversality for its articulation, one that not only speaks to human relations and pathologies, but also the assemblages that concatenate human, animal, energetic, material, and technological phenomena. As Guattari sought to make clear, transversality is an inherently political concept, attendant to flows of power and multiple vectors of communication. It is also a concept that refuses to adhere to fixed categorical delimitations. By bringing together specific geopolitical concerns, this chapter has aimed to show how sound de- and reterritorialises geographies by looking at the bodies, objects, and infrastructures brought into new formations through it. It has traced out historical and contemporary practices of colonisation and militarisation of not only humans but of biospheres more broadly.

These sonic technologies have helped to comprise apparatuses of everyday discipline; however, they also hold the potential to, reshape and escape such administrations. In his final work *Chaosmosis* (1995), Guattari elaborated the movement of transversality as processes of subjectivation. For Guattari, ideal activities were made up of transversal lines that affectively engender "unprecedented, unforeseen and unthinkable qualities of being" (1995: 106). Sound cannot help but be transversal, and thereby be creative of new modalities and relations. These are not always connective, or substantive of cultural and social norms (as is often focused on in research on sound) – they can also be disruptive, alienating, and profoundly damaging (see Gallagher, 2013). Whatever the repercussion, sound is a commoning force, pushing proximate bodies into shared and environments to engender different ways of perceiving and apprehending the world. It is this geopolitical element of sound that makes it critical for further exploration, in terms of its development by state, military, and corporate organisations for territorial

securitisation, and for the potential it holds for building lines of evasion and solidarity.

Notes

1 The use of sound and music for psychological warfare and torture in conflict environments has already been extensively documented and theorised, most significantly by Suzanne G. Cusick (2013). See also Hill (2012) and Pieslak (2009).
2 The SHOPAR is named after the traditional ram's horn instrument blown during Jewish religious ceremonies (Rawnsley, 2011).
3 To date, the LRAD is used extensively in maritime, law enforcement, military, and commercial activity. As for military and policing, its application in commercial contexts is primarily in deflection/dispersal – notably in the use of crop protection from avian predators and in logistics, ocean travel, and piracy.
4 Low frequency noise, and its effects, has had a contentious history, with individual experiences conflicting with results from scientific and audiological testing. "While only a relatively small number of people are affected, those who are tend to suffer severe distress . . . and they may suffer various symptoms such as depression or even feel suicidal. In some cases a source of LFN is found and can be dealt with. However, in many cases . . . no environmental sound that could account for the sufferer's reaction can be found, and the cause of the disturbance remains a mystery" (Moorhouse et al., 2011: 2). This conflict emphasises the importance of acknowledging not only the limitations of current testing parameters for low frequency sound, but also the strong affective and emotional responses sound as physical and psychological entity generates.
5 The Thirteenth Report (2004) of the Joint Committee of Human Rights states: "1.134 We accept that clause 22 does not strictly speaking authorise compulsory electronic monitoring against an individual's will, and that to this extent there is no risk of interferences with Article 8 rights arising from compulsory monitoring as such. However, an individual's agreement to co-operate with electronic monitoring can under this clause be made a condition of their admission to the country or release from detention. Consent to monitoring in those circumstances cannot be said to be freely given, and the imposition of such a condition therefore amounts to an interference with Article 8 rights which requires justification in each case".
6 From its inception, the use of language testing by border agencies has been duly criticised by human rights lawyers and linguists, who argue that "the assumption that language can be equated to nationality is problematic and assumes an essentialized model of nationality. Languages and dialects have permeable borders, they change over generations and people who grow up over several areas often have mixed accents or lose their 'mother tongue'. Language tests also depend heavily upon the expertise of the translator" (Griffiths, 2013: 290). See also Diana Eades' (2005) exemplary criticisms of language analysis and asylum claims.
7 This was seen in the case of the Apple iPhone automated voice recognition software (Siri) not recognising particular accents and dialects, such as the Scottish accent (Wade, 2011).

References

Altmann, J. (2001) Acoustic weapons: A prospective assessment. *Science and Global Security*, 9: 165–234.

Altmann, J. (2008) *Millimetre Waves, Lasers, Acoustics for Non-Lethal Weapons? Physics Analyses and Inferences*. Osnabrück: Deutsche Stiftung Friedensforschung.

Arkin, W. (1997) Acoustic anti-personnel weapons: An inhumane future? *Medicine Conflict and Survival*, 14: 314–326.

Bloomberg Businessweek. (2014) *Company Overview of Electro-Optics Research & Development Ltd*. Available online: http://investing.businessweek.com/research/stocks/private/snapshot.asp?privcapId=46428024. Accessed 4 May 2014.

Bogue, P., Sullivan, R., Anonymous and Grandinetti, G.C. (2014) Settlements and separation in the West Bank: Future implications for health. *Medicine, Conflict and Survival*, 30(1): 4–10.

Brunner, C. and Rhoades, T. (2010) Transversal fields of experience. *INFLeXions*, 4. Available online: www.inflexions.org/n4_introhtml.html. Accessed 1 May 2014.

Cox, C. (2011) Beyond representation and signification: Toward a sonic materialism. *Journal of Visual Culture*, 10(2): 145–161.

Cusick, S.G. (2013) Acoustemology of detention in the 'global war on terror'. In: Born, G. (ed.) *Music, Sound and Space: Transformations of Public and Private Experience*. Cambridge: Cambridge University Press. pp. 275–291.

Deleuze, G. and Guattari, F. (2004) *A Thousand Plateaus*. London, New York, NY: Continuum.

Department of the Army. (2009) *Grenades and Pyrotechnic Signals Field Manual*. Washington, DC: Department of the Army.

Dunn, D. and Crutchfield, J.P. (2009) Entomogenic climate change: Insect bioacoustics and future forest ecology. *Leonardo*, 42(3): 239–244.

Eades, D. (2005) Applied linguistics and language analysis in asylum seeker cases. *Applied Linguistics*, 26(4): 503–526.

Elpam Electronics. (2014) Available online: www.elpam.com/products/tunnels-disclosure/. Accessed 1 October 2014.

Feigenbaum, A. and Kanngieser, A. (2015) Response to 'Air Affinities'. *Dialogues in Human Geography*, 5(1): 80–84.

Gallagher, M. (2013) Listening, meaning and power. In Carlyle, A. and Lane, C. (eds.) *On Listening*. Devon: Uniformbooks. pp. 41–44.

Genkin, D., Shamir, A. and Tromer, E. (2014) RSA key extraction via low-bandwidth acoustic cryptanalysis. *Crypto*, 1: 444–461.

Goodman, S. (2009) *Sonic Warfare: Sound, Affect and the Ecology of Fear*. Cambridge, MA: The MIT Press.

Graham, S. (2005) Software-sorted geographies. *Progress in Human Geography*, 29(5): 562–580.

Griffiths, M. (2013) 'Establishing your true identity': Immigration detention and contemporary identification debates. In About, I., Brown, J. and Lonergan, G. (eds.) *Identification and Registration Practices in Transnational Perspective: People, Papers and Practices*. London: Palgrave Macmillan. pp. 281–302.

Guattari, F. (1989) The three ecologies trans Turner, C. *New Formations*, 8: 131–147.

Guattari, F. (1995) *Chaosmosis: An Ethico-Aesthetic Paradigm* (trans. P. Bains and J. Pefanis). Sydney: Power Publications.

Gurr, N.J. (1997) Non-lethal weapons: Lifting the lid on the issue of human rights. *The International Journal of Human Rights*, 1(4): 1–17.

Harper, M. (2013) *Equality (Language Analysis – Palestinian, Syrian & Kuwaiti Testing) Authorisation 2013 – WMS*. Available online: www.publications.parliament.uk/pa/cm201213/cmhansrd/cm130214/wmstext/130214m0001.htm. Accessed 1 May 2014.

Hedlin, M.A.H., Walker, K., Drob, D.P. and de Groot-Hedlin, C.D. (2012) Infrasound: Connecting the solid earth, oceans, and atmosphere. *Annual Review of Earth and Planetary Sciences*, 40: 327–354.

Hill, I. (2012) Not quite bleeding from the ears: Amplifying sonic torture. *Western Journal of Communication*, 76(3): 217–235.

Holt, D.E. and Johnston, C.E. (2014) Evidence of the Lombard effect in fishes. *Behavioral Ecology*, 25(4): 819–826.

Home Office Science: Migration and Border Analysis. (2011) *Language Analysis Testing of Asylum Applicants: Impacts and Economic Costs and Benefits September 2011. A Report Prepared for the UK Border Agency: New Asylum Model Team (NAM +)*. Available online: www.gov.uk/government/uploads/system/uploads/attachment_data/file/257177/language-analysis.pdf. Accessed 1 May 2014.

Ingold, T. (2011) *Being Alive: Essays on Movement, Knowledge, and Description*. London: Routledge.

International Committee of the Red Cross. (2014) Available online: www.icrc.org/customary-ihl/eng/docs/v1_rul_rule103. Accessed 1 October 2014.

International Solidarity Movement. (2014) Video: 15 tear gas grenades and 5 stun grenades fired at school children. *International Solidarity Movement*. Available online: http://palsolidarity.org/2014/08/video-15-tear-gas-grenades-and-5-stun-grenades-fired-at-schoolchildren/. Accessed 28 December 2014.

Joint Committee on Human Rights. (2004) *Thirteenth Report*. Available online: www.publications.parliament.uk/pa/jt200304/jtselect/jtrights/102/10204.htm.

Kanngieser, A. (2013) Tracking and tracing: Geographies of logistical governance and labouring bodies. *Environment and Planning D: Society and Space*, 31(4): 594–610.

Kanngieser, A. (forthcoming) Listening to the anthropocene: Sounding the 'natural' world. In Maitland, P. (ed.) *Object Emotions*. Cambridge: Harvard University Press.

Klie, L. (2009) Speech declares its independence. *Speech Technology*, 14(8): 28–33.

LaBelle, B. (2010) *Acoustic Territories: Sound Culture and Everyday Life*. London: Continuum.

Lewis, O. (2014) Top Palestinian cleric says Israel threw stun grenades into al Aqsa; Israel denies. *Reuters*. Available online: http://uk.reuters.com/article/2014/04/20/uk-palestinian-israel-violence-idUKBREA3J0MQ20140420. Accessed 5 May 2014.

LRAD. (nd) Available online: www.lradx.com/site/content/view/15/110/. Accessed 4 May 2014.

Ma'an News Agency. (2014) Israeli forces fire stun grenades at Palestinian wedding. *Albawaba News*. Available online: www.albawaba.com/news/palestinian-wedding-attacked-581836. Accessed 28 December 2014.

Marks, P. (2013) Can a computer virus communicate via your speakers? *New Scientist*. Available online: www.newscientist.com/article/dn24582-can-a-computer-virus-communicate-via-your-speakers.html#.VOSDIbCsXpA. Accessed 1 May 2014.

McGreal, C. (2005) Palestinians hit by sonic boom air raids. *The Guardian*. Available online: www.theguardian.com/world/2005/nov/03/israel. Accessed 4 May 2014.

Merchant, N.D., Blondel, P., Dakin, D.T. and Dorocicz, J. (2012) Averaging underwater noise levels for environmental assessment of shipping. *Journal of the Acoustical Society of America*, 132(4), EL343–EL349.

Moorhouse, A., Waddington, D. and Adams, M. (2011) *Procedure for the Assessment of Low Frequency Noise Complaints*. Manchester: University of Salford.

Nancy, J.L. (2007) *Listening* (trans. C. Mandell). NewYork: Fordham University Press.

Pieslak, J. (2009) *Sound Targets: American Soldiers and Music in the Iraq War*. Bloomington, IN: Indiana University Press.

Rawnsley, A. (2011) 'The Scream': Israel blasts protesters with sonic gun. *Wired*. Available online: http://goo.gl/EfI6De. Accessed 4 May 2014.

Revill, G. (2014) El tren fantasma: Arcs of sound and the acoustic spaces of landscape. *Transactions of the Institute of British Geographers*, 39(3): 333–344.

Roads, C. (2001) *Microsound*. Cambridge, MA: The MIT Press.

Russollo, L. (1986) *The Art of Noises*. New York, NY: Pendragon Press.

Scrimshaw, W. (2013) Non-cochlear sound: On affect and exteriority. In Thompson, M. and Biddle, I. (eds.) *Sound, Music, Affect: Theorizing Sonic Experience*. New York, NY: Bloomsbury, Academic. pp. 27–43.

Stengers, I. (2005) The cosmopolitical proposal. In Latour, B. and Weibel, P. (eds.) *Making Things Public: Atmospheres of Democracy*. Cambridge, MA: The MIT Press. pp. 994–1003.

Thibaud, J.P. (2011) The sensory fabric of urban ambiances. *Senses and Society*, 6(2): 203–215.

Townsend, M. (2010) Teenager-repellent 'mosquito' must be banned, says Europe. *The Guardian*. Available online: www.theguardian.com/society/2010/jun/20/teenager-repellent-mosquito-banned-europe. Accessed 1 May 2014.

Volcler, J. (2013) *Extremely Loud: Sound as a Weapon* (trans. C. Volk). New York, NY: New Press.

Wade, M. (2011) Scottish accent leaves iPhone lost for words. *The Times London*, 26 October.

Who Profits Research Centre. (2014) *Proven effective: Crowd control weapons in the occupied Palestinian territories*. Available online: http://whoprofits.org/content/proven-effective-crowd-control-weapons-occupied-palestinian-territories. Accessed 28 December 2014.

Wright, S. (2001) The role of sub-lethal weapons in human rights abuse. *Medicine, Conflict and Survival*, 17(3): 221–233.

Yusoff, K. (2013) Insensible worlds: Postrelational ethics, indeterminacy and the (k)nots of relating. *Environment and Planning D: Society and Space*, 31(2): 208–226.

Zhou, Y.F. (2011) High intensity focused ultrasound in clinical tumor ablation. *World Journal of Clinical Oncology*, 2(1): 8–27.