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The Biosocial Event: Responding to Innovation in the Life Sciences

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Abstract

Innovation in the life sciences calls for reflection on how sociologies separate and relate life processes and social processes. To this end we introduce the concept of the 'biosocial event'. Some life processes and social processes have more mutual relevance than others. Some of these relationships are more negotiable than others. We show that levels of relevance and negotiability are not static but can change within existing relationships. Such changes, or biosocial events, lie at the heart of much unplanned biosocial novelty and much deliberate innovation. We illustrate and explore the concept through two examples; meningitis infection and epidemic, and the use of sonic 'teen deterrents' in urban settings. We then consider its value in developing sociological practice oriented to critically constructive engagement with innovation in the life sciences.

Key words: biosocial, climate change, epidemic, event, innovation, life sciences, meningitis, Mosquito teen deterrent, sustainability, untimely

Many of the risks and opportunities that currently inform the strategies of states and other political organisations (Giddens 2009), that attract the attention of investors (Harvey 2010), and that generate public debate, emerge from sites of biosocial relation where life processes and social processes, in all their variety, meet. Such sites include synthetic life (Regis 2008), human enhancement (Harris 2007), genetic and epigenetic aspects of human and animal behaviour and wellbeing, the resilience of crops to drought, pest and disease, and global climate change (Stern 2007). At such sites, the lifestyles and consumption patterns of human populations, processes of investment and capital accumulation and governmental concerns for securities of resource and health are bound up with organic processes of growth, change and reproduction in complex and shifting patterns.

In what follows we develop a perspective that understands biosocial relations as diverse in character and as constituted through continuous change. Describing a number of pairings of specific life processes and specific social processes, we argue that, as diverse as they are, biosocial relations can be characterised in terms of three common variables; the degree of relevance each pair member has for the other; the degree of negotiability within their relationship; and, the degree of novelty of that relationship. We deploy a heuristic distinction between life processes and social processes throughout our presentation. This does not, however, commit us to a static, dualistic account of the biosocial. Instead, the concept 'biosocial event' allows us to capture points of inflection at which levels of relevance, negotiability and novelty within a given relationship change significantly. The concept affords analytic purchase on the many diverse and dynamic scenes of interaction that comprise the

biosocial. We develop our case through two examples - meningitis infections and epidemics and the use of sonic devices in attempts to control young people's movements in the UK.

Life Processes and Social Processes: The Uses of Distinction

Sociological practices that distinguish between and relate life processes and social processes need careful consideration (Latour 1993, 2004). Such practices help sociologists to define their remit and to clarify the place of their discipline amongst others, even as they remain controversial (Law and Mol 2011, Barad 2007). The study of biosocial relations therefore demands a sophisticated response to the distinction between and relations amongst life processes and social processes.

Quite how to address biosocial relationships has been a key concern of sociological thought since Marx drew on species-being in his critique of alienation (Foster 2000) and Durkheim asserted the autonomy of social processes (Durkheim 1982). More recently, a common way to innovate in sociological practice has been to distinguish between life processes and social processes within a given field. This has successfully established childhood (Corsaro 2004), gender (Wharton 2004) and disability (Thomas 2007) as fields of sociological enquiry with a dual emphasis on redrawing social/biological boundaries and critically examining representations of life processes. For some, however, recent waves of biosocial innovation and discovery are setting a limit to the utility of this approach by calling the discriminability of life processes and social processes into question (Haraway 2003, Latour 2004, Rose 2007). Nevertheless, simply to abandon any distinction between life processes and social processes would risk diminishing sociological articulacy (Newton 2007).

For Rabinow (1992), life processes are increasingly being ordered according to social imperatives. On his view this trend is driven by the development of new technical capabilities. He speculates that the increasing artificiality and cultured character of life processes, especially those that contribute to human identity, could diminish the cultural authority of the life sciences. In this spirit he offers the term 'biosociality' as a root metaphor to emphasise the significance of the social in competition with the term 'sociobiology' (Wilson 1975). We recognise the importance of struggles over disciplinary cultural authority to comment on human identity. Our agenda however is neither predicated on increases in human technical competence, nor restricted to those biosocial sites at which human identity is at issue. Our approach is closer to that underlying the concept of 'local biologies' (Lock and Kaufert 2001, Lock and Vinh-Kim 2010). Lock's observation that not only the experience of but also the bodily manifestation of menopause varies by culture led her to the view that, in different locales, life processes and social processes come together in different ways to create a diversity of menopauses. This approach does not advance a view of general trends in biosocial relations or human technical capacities. Instead it notes that interactions between life and social processes are local, open-ended and often take place outwith human intention generating novelty and diversity. We have found that process philosophy (Whitehead 1978) and Deleuze's (1969, 1990) concept of 'event' in particular, provide a useful analytic backdrop for further developing this core insight.

Deleuze introduces the concept of 'event' to generate a degree of analytic purchase on diverse and dynamic processes of emergence. Focusing on events means adopting a specific analytic register within which the concern is to examine the relations of forces that constitute emergent phenomena. We follow Deleuze in this, and focus in particular on the meetings of forces that are often understood as belonging to separate realms of the biological and the social. For Deleuze, the concept of event (or 'actual occasion' (Whitehead 1978)) captures the dynamism of forces at work at the exact moment at which something happens, the very moment in which one object or state of affairs becomes another. Here the term 'event' does not denote a disruption of some otherwise continuous state of affairs (e.g. some extraordinary occurrence a newspaper would report), but focussing on event involves seeing any state, however banal or dramatic, consequential or otherwise, as always already constituted by continuous events insisting within the state. Accordingly, to focus on 'event' is not to mark something out as extraordinary, but to adopt a perspective that focuses on the dynamic forces that continuously constitute states of affairs as ongoing transformations and to open these up to analysis (Motzkau 2009, 2011). Biosocial events are of particular interest as, in our view, productive analysis of the changes in relation between specific processes that they involve is often hampered by biosocial dualisms that pose obstacles to the conceptual articulation of life processes and social processes.

Theoretical debates about the relationship between life processes and social processes are often rooted in the question of the relative speed of change of life processes and of social processes. The idea that social processes are quicker to change than life processes has been used to support attempts both to defend sociology's intellectual autonomy (Newton 2007) and to account for social phenomena like gender and hierarchy in terms of human evolution (Buss 2008). We take a different tack, aiming to create a sensitising concept for sociological practice rather than offering grounds for disciplinary divisions. In our view, biosocial novelty and innovation are underpinned by events that are governed neither by 'social' nor by 'natural' temporalities. Biosocial events are, in this sense, 'untimely' (Deleuze 1990, Grosz 2004). We argue that, whether or not there is a rate of change typical of life processes or of social processes, the points at which specific processes meet and relate have their own characteristics and pace.

One dominant style of response to biosocial novelty and innovation seeks to establish clear accounts of causal and moral responsibility around them. For example, whether or not climate change is caused by human activity is a central issue of global debate (Giddens 2009). This style of 'biosocial imagination', as we would call it, focusses on producing retrospective causal narratives in attempts to draw biosocial events back into more familiar and predictable rates of change. In doing so, it tends to underestimate the complexity, variability and very novelty of such emergent phenomena (Porter Abbott 2008). The utility of this style in devising responses to novelty and innovation has recently come into question (Hulme 2009). We hope, therefore, that our approach establishes some distance from this dominant style and will aid attempts to shape alternative forms of practical biosocial imagination (Lee 2012, Lee and Motzkau forthcoming).

Biosocial Events: Relevance, Negotiability and Novelty

If one begins to count the human life processes that are closely implicated in social processes starting out with, say, the peculiar growth of bone and muscle that affords human opposable thumbs and pointing fingers (Tallis 2010), passing by way of the autonomic control of appetite and its clever capacity to adjust to food availability (Winick 1988) and reaching higher order cognitive skills like memory, it quickly becomes apparent that the biosocial is a vast and complex field, even when restricted to issues of individual human embodiment and setting aside other dense clusters of biosocial relation such as agriculture, urbanisation, sustainable development and biodiversity. Some order can be placed on this field nonetheless. Considered as relationships between specific life processes and specific social processes, biosocial relationships vary in the mutual relevance of these processes, the degree of negotiability between them and in their degree of novelty.

First, there are differences in whether a particular life process and a particular social process affect one another at all. Some pairings have a clear effect on and relevance for one another, others less so. For example, though food cultures vary widely (Germov and Williams 2008), the life processes involved in the digestion of proteins are, broadly speaking, the same for all humans. On the other hand, societal variations in alcohol consumption certainly do produce different profiles of liver function amongst different populations (Dalton et al 2010). Likewise, toenail growth is generally irrelevant to the formation of social hierarchies, while children's maturation is the explicit focus of health and educational institutions (Turmel 2008).

Second, there are differences in the negotiability of relationships between life processes and social processes. There are some instances in which life processes present a non-negotiable issue for social processes. Ageing and death, for example, have drawn responses from hominid societies for millennia (Finlayson 2009). Notwithstanding the forecasts of some gerontologists (De Grey and Rae 2008), this is likely to continue. There are other instances, however, where negotiability is relatively high and similar outcomes can be pursued by different means. In human history, for example, the limited ability of the human body to maintain its core temperature has been supplemented by a wide range of foods and clothing, dwelling and heating technologies.

Third, there are differences in the novelty of relationships between life processes and social processes. Recent developments in the fields of biotechnology and climatology show that the novelty of relationships between life processes and social processes varies widely. Craig Venter's claims to have created artificial life (Regis 2008) may be overblown, but his work bears out the arguments Rose (2007) makes concerning the increasing politicisation of life processes at the molecular scale. If the majority of climate scientists are correct (Schneider and Rosencrantz 2010), then over the last 300 years or so new connections have been established between human lifestyles, especially those typical in the global north, and the means by which relative concentrations of atmospheric gases are regulated by earth systems.

In recent years, a good deal of sociological attention has focussed on relations between embodied characteristics and the distribution of social goods and life chances. Within this focus the examination of relevance and negotiability gave sociologists a clear role, allowing for the articulation of progressive values against attempts to naturalize inequality. Thus, much theoretical and empirical work on

biosocial relations has been devoted to minimising the sense that life processes are or should be relevant for social processes and maximising the sense that there is room for negotiation in biosocial relations. Less attention, however, has been given to the sense in which biosocial relations can be novel. It is not clear why this is the case. It may simply reflect a relatively slow rate of biosocial innovation and discovery prior to the twenty-first century. It may reflect a Western cultural tendency to think of 'Nature' as stable and 'Society' as the exclusive locus of change. It is becoming clear, however, that while a monolithic 'Nature' has often featured in ideological depictions of the human condition and responses to human diversity, biosocial sites are often sites of change and innovation. Both life processes and social processes can change, can do so at diverse speeds and sometimes do so in close interaction with each other (Serres 1995). For example, recent reports (Buroker et al 2010) indicate that processes of natural selection have, in 2,700 years since a major migration that split the populations, differentiated Tibetan and Han Chinese ability to cope with the low available oxygen on the high Tibetan plateau. Today's Han immigrants to Tibet suffer lower birth rates and higher infant mortality than their Tibetan neighbours as a result. Likewise Gessert (2010) gives a compelling account of the changing global distribution and genetic diversity of flowering plants as some species have been domesticated within human cultures in the course of thousands of years. Further, both global climate change and the emergence and spread of infectious disease mean that slow and rapid changes in biosocial processes now have pervasive impact on human communities and societies.

These examples highlight the intimacy and complexity of relations between life processes and social processes and the innovation and novelty that emerge as patterns of relation shift and change. They suggest that the relative autonomy of life and social processes and their relative degrees of stability are context specific. Crucially for our argument, they also suggest that no matter what relative speeds of change are *proper to* a given life process or to a given social process, change in the relationship *between* processes is not governed by them and can take place at an independent pace. In our terms, such instances of change in the quality of relationships between life processes and social processes, expressed in terms of relevance and negotiability, define the moments when a given biosocial site becomes a nexus of novelty and/or innovation. We use the term 'biosocial event' to identify such points of inflection and to open them up to an analysis that is sensitive to the intersecting forces at work. Sometimes, as in the case of Pasteurisation (Latour 1988) innovation is, in part, the intended outcome of human activity. On other occasions, biosocial novelty takes humans almost entirely by surprise: Who, apart from Arrhenius (1896), would have imagined 100 years ago that fossil fuel based industrialisation could change the composition of the atmosphere and global average temperatures?

Neisseria Meningitidis and Biosocial Novelty

So far we have outlined our perspective on biosocial events and sketched some of their implications. In this section, we further develop our account through a discussion of shifting patterns of relation between the bacterial species *Neisseria Meningitidis*, human life processes and human collectivities.

Neisseria Meningitidis (NM) is associated with the conditions of meningitis - inflammation of membranes around the brain and spinal cord - and septicaemia or blood

poisoning. Meningitis, evidenced by such symptoms as stiff neck, fever, confusion, photophobia and a characteristic rash, is considered a medical emergency because if not successfully treated it can result in severe brain damage and is potentially fatal. NM is also associated with meningitis epidemics.

Given the central role of NM in bringing these individual and collective disease conditions about it may seem odd that we have not characterised NM as 'causing' meningitis. We have instead described an 'association' between NM and disease. Since the early twentieth century it has been recognised that pathogenicity is not a stable, intrinsic characteristic of most of the microbes that are associated with disease (Casadevall and Pirofski 2000). In the case of NM, for example, Henrici (1934) observed that even in a meningitis epidemic only a small proportion of individuals became ill, that others 'carried' the bacterium without becoming ill and that the majority were neither ill nor carriers. Given this, pathogenicity can be characterised as a state that results from interactions between bacteria and their hosts. Over the last hundred years a range of discrete microbe/host interaction states has been identified. Terms such as 'carrier' (Smith 1995), 'subinfection' (Kolmer 1924), 'colonization' (Osterholm et al 2000) and 'opportunistic' (Poindexter and Washington 1974) each name a state of microbe/host interaction from which transition to the state of 'infectious disease' is more or less probable given a range of conditions. Each term blurs the boundary between pathogen and non-pathogen, whilst refocussing attention on changes in the state of relations between microbe and host.

Estimates are that 10-30% of US adolescents and young adults are asymptomatic, transient carriers of NM (Schaffner et al 2004). NM bacteria in this state do not passively rest within human noses and throats but interact with human tissues and other copresent species on a constant basis. Recent research indicates, for example, that serotype B NM has, through such interactions, evolved a surface structure that mimics human cells thus reducing human immune response to it (Schneider et al 2009). Further, research is ongoing into relations between NM, its relative *Neisseria Lactamica* (NL) and human immune response. There is evidence that the presence of NL conditions these relations in such a way as to reduce the likelihood of NM leading to infectious disease (Evans et al 2011).

Most often, these complex life processes are of little relevance to the social processes that involve whole human individuals. Thus, where humans are asymptomatic carriers of NM, in our terms biosocial relevance is low and negotiability is high. As long as microscopic biological phenomena and macroscopic social phenomena have little relevance for one another, and as long as their relations are characterised by high negotiability, life processes involving NM and the social processes that compose daily life can be considered in autonomy from one another. But under certain conditions the carrier state can switch into a disease state within an individual. Considering this as a 'biosocial event' allows us to view and examine this phenomenon as a change in the pattern of relations that connects life and social processes in locally novel ways.

Mechanisms involved in the switch from an NM carrier state to a state of infection and disease are not well understood (Parkhill et al 2000). However, if NM bacteria enter the bloodstream they can also reach other tissues such as the meninges – membranes that surround the brain – causing inflammation and the symptoms of meningitis. Where NM provokes disease in an individual, bacterial and human cells

continue in busy commerce, but the results are such that their interaction makes a difference at the level of the individual human organism. Conversion to a disease state is registered *both* in the changing biological functionality of the individual (raised body temperature, tissue inflammation, reduced responsiveness to external cues and stimuli) *and* in the mobilisation of varying cultural distinctions between health and illness (Thomas 2007) along with other social resources ranging from family ties to neighbourhood social networks to professional medicine, depending on circumstances. The change of state from carrier to infection involves the forging of a new connection between specific life processes and specific social processes that take place both within and beyond an individual's body. This is a 'local biology' (Lock and Kaufert 2001) in the sense that it is the emergence of a locale in which a specific state of biosocial relations pertains. In a strict sense, many episodes of infectious disease are novel biosocial events that are specific to the locale of an individual human and their social networks. Some biosocial novelties establish greater locales than others however, and therefore merit greater attention.

The first recorded meningitis epidemic was in Geneva in 1805 (Crawford 2007). Just as the individual case of sickness has a history that is marked by a locally novel biosocial event, so does the class of meningitis epidemics. Although individual cases existed before 1805, this was the first point at which life processes and social processes became linked on the scale of a whole city. When an epidemic takes hold, biosocial events that are local to individual bodies are not the only novel events to consider. Individual cases of meningitis involve a shift to disease conditions in individual bodies; epidemics involve a shift from a more or less steady level of endemic communicable disease within a population to a rapid spread of infection (Bonita et al 2006). Thus, there are additional changes in relevance, negotiability and novelty amongst specific biosocial relations to be taken into account, changes that register at the level of populations and of urban areas and whole regions.

By the mid-twentieth century, meningitis epidemics had become particularly common in a so-called 'meningitis belt' that covers the Savannah region of sub-Saharan Africa, stretching from Senegal in the west to Ethiopia in the east. Here, epidemics tend to occur in cycles of between 8 and 14 years (Moore 1992). This has allowed the identification of a range of conditions that may, together, bring these cycles into being. Globally, NM bacteria occur in 13 variants or 'serogroups' (Bonita et al 2006). Bacteria in each serogroup share a characteristic surface structure. Human immune response to NM depends on recognition of this pattern. As bacteria reproduce, their surface structure can change. It seems that changes within serogroup A pose particular challenges for human immune systems. One possible factor in meningitis belt epidemics, then, is the emergence of variants of serogroup A NM bacteria. Another is 'herd immunity' (LaForce et al 2009). Individuals who are not themselves immune to a given NM variant are often afforded protection by being surrounded by those who are, since the higher the proportion of those who are immune, the less likely it is that those who are not immune will meet an infectious individual. Thus, when a new serogroup A variant appears, this can infect individuals who have so far been immune to NM serogroup A, and also thereby degrade herd immunity. Further, many meningitis belt epidemics occur in the dry season between December and June. Dusty wind and cold nights can damage the nasopharyngeal lining increasing the likelihood of NM infection. Individual immunity can also be suppressed by poor diet, endemic parasites and upper respiratory tract infections. Social cycles in population

movements for regular pilgrimages and traditional markets may also contribute to the phased spread of NM bacteria. Finally, high population density makes rapid spread of infection more likely (Moore 1992).

In the local novelty of an epidemic, specific life processes – those that determine herd and individual immunity and allow new NM variants to appear - and specific social processes – those that produce poverty, high population density and large population movements - come into high relevance for each other. Outwith epidemic conditions, the emergence of a new NM variant and attendance at a seasonal market can take place, to all intents and purposes, in autonomy from one another. As it is not the individual ‘status’ of factors that changes, but their relations and the import of those relations, their new linkage can be described as a biosocial event, in the same way as the formation of a link between the presence of NM and a parent’s care for their child. Individual and epidemic meningitis events certainly differ in the scale and duration of the locale they produce. They also differ in the level of negotiability that obtains within them. Individual sickness raises the mutual relevance of specific life and social processes. Where a sick individual’s wellbeing is valued and desired, this lowers the negotiability that obtains in those relationships. Certain steps must be taken to try to preserve their life and health. In the epidemic conditions typical of the meningitis belt however, even though relevance between specific life and social processes is raised, negotiability remains relatively high since none of factors listed above is in itself essential for an epidemic to occur.

Diversifying Biosocial Imaginations with the Event Perspective

Whether the locale established by the event is on the scale of an individual, a city or a geographical region, each involves the drawing together and reordering of a range of forces that, together, enact a distribution of effects. Though there is no single cause behind this, and contributing factors vary in the degree to which they can be understood as lying within human control, biosocial events are often narrated retrospectively in terms of causal and moral responsibility. Such narratives are not simply attempts to represent the state of affairs more or less accurately. They also play an important role in conceiving, selecting and developing responses to events like epidemics. In other words, they are expressions of practical imagination. Indeed, when biosocial novelty emerges to reorder the relations that compose daily life, establishing a clear account of what has caused it and who is obliged to respond often seems to be the most pressing task. Where such a causally oriented practical imagination about biosocial relations is too closely tied to the production of retrospective accounts, however, the results can be less than desirable.

The pharmaceutical manufacturer Pfizer recently concluded a decade-long legal dispute with the Nigerian Kano State Government by making a £50,000,000 out-of-court settlement. The case arose as follows: In 1996 there was an epidemic of meningococcal meningitis in a slum in the city of Kano, Nigeria, that lies within the meningitis belt. More than 11,000 people eventually died. Many children were seriously ill. A Pfizer team arrived to set up an operation near a medical station run by the aid organization Médecins Sans Frontières (MSF). MSF were distributing an established antibiotic treatment ‘Rocephin’ (Annas 2009). The Pfizer team selected 200 sick children to be subjects in an active comparator study for a new treatment

called 'Trovan'. Half were given injections of Rocephin and half were given pills containing Trovan (Annas 2009). Eleven of these 200 children eventually died. According to Pfizer, five died despite taking Trovan pills and six died despite being injected with Rocephin (Pfizer 2010). Some parents complained that they had not given informed consent to their children's involvement. Pfizer maintains to this date that they had taken appropriate steps to gain parents' informed consent.

The alarming pace of a meningitis epidemic provides just the conditions that seem to demand a clear narrative of causal and moral responsibility so as to establish what processes require intervention and who is in the right position to respond. In our view, even though epidemic is a collective biosocial phenomenon, it can be reasonable to cut through that complexity by, for example, blaming NM and it can be responsible to use biomedical expertise to kill NM bacteria. After all, once NM infection takes hold of an individual, no poverty reduction programme can hope to outpace it. Nevertheless, an existing treatment was already being administered by MSF, so on what account could Pfizer's rapid arrangement of an active comparator study be understood as a responsible course of action? It could be argued that testing Trovan in the midst of an epidemic was responsible in the light of potential benefits to children in future epidemics of having a wider range of available treatments. However, this appeal to future cases makes it quite clear that the range of approaches open to Pfizer as a responsible biomedical provider were not limited to the immediate circumstances of the epidemic. Even if non-biomedical responses, such as poverty reduction, fall outside Pfizer's remit, ways could be found to develop treatments for NM infection in less urgent circumstances. This would, no doubt, involve working to decrease the mistrust of pharmaceutical corporations that local populations have developed over years of experience (Annas 2009), but it is certainly not impossible. Hope's (2008) analysis of the obstacles that intellectual property law creates for life science researchers in the developing world charts some possibilities.

Seeing relations between humans and NM through the 'event' perspective establishes a critical space between the description of biosocial locales and attempts to narrate them in terms of causal and moral responsibility. This points to the possibility of alternative styles and timings of response to biosocial novelty. In this, the event perspective promises to supplement the existing forms of biosocial imagination that currently inform bids to render biosocial events tractable.

The 'Mosquito Teen Deterrent' and Biosocial Innovation

Our previous examples focussed on the event-ness of phenomena that are easily understood as taking place at some distance from human intention. Neither the emergence of new NM variants, weather conditions nor seasonal travel can rightly be said to aim at precipitating epidemics. In this section we use a further example to show that, despite its conceptually a-humanist character (Lee 2008), our approach has a contribution to make in cases where change is so freighted with human intention that the term 'innovation' is merited.

Since 2006 the UK company 'Compound Security Systems' has marketed a range of high frequency sonic devices under the brand name 'Mosquito'. These devices can be wall-mounted such that a chosen area can be filled with an unpleasant high-pitched sound. The Mosquito is marketed as an 'anti-loitering' device promising to deter

vandalism and petty crime (CSS 2010). From the point of view of biosocial innovation, its key feature is that it is capable of emitting sound at such a high frequency (17Khz) that individuals over 25 are very unlikely to be able to hear it. The device uses a peculiar feature of the maturation of human hearing selectively to target this unpleasant sound on young people so as to influence their movements without troubling their elders.

Within the inner ear, a coiled organ called the 'cochlea' contains numerous 'hair cells' that project from the surface of a membrane into a fluid. The stiffness of the membrane, and thus its resonant frequency, decreases along its coiled length. When the assembly of eardrum and inner ear bones transmit sound vibrations to the cochlea, the membrane resonates with these vibrations. This moves the hair cells with respect to the fluid, creating an electrical potential within the body of the cell. Collected and processed, these potentials enable hearing. Hair cells that respond to very high frequencies begin to die in late childhood, with the result that very few individuals over 25 can hear sounds above 16 KHz.

In all likelihood, older and younger people have differed in their ability to perceive sound at 17KHz throughout human history. Where age distinction has been key to social processes however, visual cues and identity documents have often been used to make that link (Turmel 2008) but susceptibility to high frequency sound has not. As a biosocial innovation, then, the Mosquito makes high frequency hearing newly relevant for processes of young people's movement and rest within urban space. One factor in these processes is young people's desire to find spaces of autonomy from adult control. A Mosquito activated by a motion sensor or a relatively distant human operator would tend to deny such a space to the young. The degree of negotiability within the newly formed biosocial relation is quite clear. The young can try to tolerate the noise so as to maintain their position, or they can adapt their patterns of movement and rest to take the new sonic obstacle into account.

The production of a device that emits high frequency sound is no technical revolution, but the pairing of a life process with the social processes involved in the contested use of urban space as in the production, marketing and deployment of the Mosquito is a clear example of a biosocial innovation. It takes its place in a context that is already replete with intergenerational conflict (Lee and Motzkau 2011). Its fresh contribution is to create locales in which 'drowning out' speech between young people is a near certainty. In doing so it offers property owners, and other authorities, an alternative to verbal requests to 'move on', one that conditions intergenerational communication in a very basic way; the device denies the replies that a verbal request might elicit.

Considered as a biosocial event, we can see how this phenomenon is based not on changing existing states or factors as such (i.e. cochleas, young people, locations remain unchanged), but on momentarily establishing new relations between those factors/forces. Such untimely meetings of age-related cochlear functioning and the contestation of public space that the device fosters also bring uncertainties however. Since its launch, vigorous media and legal campaigns aimed at banning the device have sought leverage in those uncertainties (Lee and Motzkau 2011). The device discriminates between old and young but does not discriminate within the set of those capable of hearing it. Thus, an infant or child who has no intention of vandalism, loitering or behaving 'anti-socially' will be affected so long as they are in range of an

active device, which, in some urban areas, is likely. Campaigns against the Mosquito have emphasised this discriminatory indiscriminate targeting that potentially targets all young people. The claim is that device should be banned because it compromises rights to free assembly and movement (Lee and Motzkau 2011).

This illustrates an interesting limitation of the forms of biosocial imagination that are often brought to bear on such innovation. Once a locale is established distributing forces and effects, the practical possibilities for those who would challenge it are constrained. As in the CSS case, critical attention is forced to focus not on the apparent 'problem' the innovation was designed to address (loitering) but on contesting retrospective narratives of causal and moral responsibility. The case against CSS hinges on whether they are responsible for specific deployments of the device and, more specifically, whether they are responsible for effects that they did not intend (Walsh 2008). Thus far, CSS have won this argument and Mosquito devices continue to be used. In this case a form of biosocial imagination that is concerned solely with identifying loci of cause and responsibility has helped an innovator to seize and maintain the initiative. Shifting to the perspective of event however, we can see that if the key biosocial event here is establishing new relations between age-related cochlear functioning and intergenerational communication, CSS and its customers clearly have no monopoly on its use to distribute and determine effects. Inspired by the Mosquito, 17Khz mobile phone ringtones are now available. Anecdotal reports indicate that these enable pupils surreptitiously to send and receive texts in classrooms where mobile phone use is prohibited and even a vibration alert could be heard.

The Sociological Value of the Focus on Biosocial Events

We suggest that NM epidemics and Mosquito events are fair analogies for novelty and innovation at many other sites. 'Sustainable development' depends on attaining increased economic activity across the majority world whilst minimising or even repairing damage to existing ecosystems (Foster 2008). Innovation promoting some biosocial events and preventing others will be at issue here. Renewed biosocial imaginations sensitive to such events and their untimely character could have a role not only in criticising existing solutions, but also in devising new ones. Recent attempts to promote biosocial innovation so as to link contemporary modes of capital accumulation with the carbon cycle through 'carbon trading' have had disappointing outcomes (Giddens 2009). Yet some such articulation would appear to be necessary. Diversified biosocial imaginations could provide a practical corrective to the tendency of purely economic analysis to obscure material relations, not only as a critical voice but also as a participant in the development of alternative techniques of analysis and intervention. It seems that antibiotic responses to bacterial infection have a limited future as resistant strains appear, and as 'plasmids' that confer resistance are exchanged between bacterial species (Hawkey and Jones 2009). When antibiotic resistomes are mobile between species and across human designed environments (Wright 2010), simply targetting infectious species thought to be responsible for disease is no longer an adequate response. Patterns of associations amongst bacterial species, resistomes, sewage systems and international travel (Crawford 2007) and the biosocial events therein are now shaping the evolution of antibiotic resistance and require more sophisticated forms of biosocial imagination in response.

Conceptual work alone cannot provide all the answers (Shove 2010). If, as we propose, the practice of Sociology is in future to involve not just the study of but also participation in biosocial innovation, new professional skills and attributes will need to be developed. Ethical consideration of which projects to contribute to will be needed. We note however that the disciplines of Bioethics and Economics each benefit from the availability of distinct ‘travelling concepts’ (Bal and Marx-MacDonald 2002). The ‘ethical dilemma’ and ‘price’ respectively offer them purchase on a wide range of issues. Our hope is that the concept ‘biosocial event’, and the analytic sensitivities opened up by it, are useful in easing sociologists’ formation of new relationships between their existing strengths and those of other academic disciplines and new partnerships with relevant actors in public, private and third sectors.

Conclusion

As disciplinary landscapes change, as life sciences become a major depository of excess capital (Harvey 2010), and as biosocial innovation is variously demanded and deplored, sociologists encounter new opportunities. In sketching our response we were not concerned with producing a general statement about relations between Nature and Society. Instead, taking the view that neither are unitary phenomena, we set out to examine life processes and social processes in the specificity of their ongoing relations. We argued that the life process and social process in any given biosocial pairing have a degree of relevance to each other. Unless relevance is such that one partner is entirely dependent on the other, there is also a degree of negotiability. From our perspective such relations are in continuous transformation, and degrees of relevance and negotiability within a given biosocial relationship can change. Our approach draws attention to such points of inflection in biosocial relationships and allows for their analysis by strategically suspending any decision between theoretical alternatives of ‘anti-dualism’ and ‘dualism’ (Newton 2007). The key benefit is that it opens novelty and innovation within biosocial relations to analysis such that mutability of relations between specific life processes and social processes can become a guiding concern of sociological practice. Our hope is that this will aid in the development and diversification of biosocial imaginations both within and beyond Sociology.

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