Postprint

This is an Accepted Manuscript of an article published in *Critical Public Health* on 25 Sept 2013, available online: http://www.tandfonline.com/doi/abs/10.1080/09581596.2013.827325

Toward stronger theory in critical public health: Insights from debates surrounding posthumanism

Melanie J. Rock, **Chris Degeling**, **Gwendolyn Blue**, 2013

Keywords: Social Sciences, Humanities, Technology, Animals, Public Health

Acknowledgements: The writing process was supported by a New Investigator Award from the Canadian Institutes of Health Research, an Alberta Innovates – Population Health Investigator Award (funded by the Alberta Heritage Foundation for Medical Research Endowment), and Visiting Scholar Awards from the Canadian Institutes of Health Research – Institute for Population and Public Health (to MR). We gratefully acknowledge the insights of two anonymous reviewers for *Critical Public Health*, the patience demonstrated by Judith Green, Editor-in-Chief, and the guidance of the Kirsten Bell, Associate Editor.

ABSTRACT

The "posthumanist turn" in critical theory comprises efforts to recognize and analyze the interdependence of human existence with non-human entities, including other animals, spaces, and technologies. Scholarship aligned to and debating posthumanism pertains to public health, but has yet to be clearly articulated for a public health audience. This commentary and an appended glossary illustrate the relevance of these ideas for enhancing critical theory in public health.

Public health activities change with changing technologies and social values, but the goals remain the same: to reduce the amount of disease, premature death, and disease-produced discomfort in the population (Last 2001).

INTRODUCTION

The "posthumanist turn" in critical theory foregrounds the importance of nonhuman entities for the complexity of human existence. This development in the social sciences and humanities is highly relevant to public health, yet has yet to be articulated or interpreted for a public health audience. The purpose of this article is two-fold. First, we wish to assist researchers and learners aligned to critical public health in finding and interpreting scholarship that is relevant to their interests and concerns. Second, we seek to encourage more scholarship in public health that draws upon, interrogates, and advances debates in critical theory about non-human constituents, including other animals, spaces, and technologies. Ultimately, we aim to contribute to how public health researchers think about the history and politics of the field, and about the prospects for meaningful and sustainable improvements in health indicators and subjective well-being.

HUMANIST VALUES in a MORE-THAN-HUMAN WORLD

Public health has been authoritatively defined as "[t]he science and art of preventing disease, prolonging life, and promoting health through organized efforts of society" (Last 2001), and public health has been equated with human health. Yet public health researchers and practitioners continually grapple with complex problems that are not entirely human in composition or nature.

The nonhuman dimension of problems in public health is particularly evident with infectious diseases. Infectious pathogens are, quite literally, nonhuman and provoke disease by infiltrating bodies. Yet the significance of nonhuman pathogens should not be reduced to a chain-of-causation way of conceptualizing disease onset. Rather, systemic relationships drive the incidence of infectious diseases, including zoonoses (Green 2012, Hinchliffe *et al.* 2012, Mendelsohn 1998). Furthermore, institutionalized ways of thinking about and acting upon pathogens reflect systems of thought and their historical development (Lakoff 2008, Weir and Mykhalovskiy 2010). For example, the sharp demarcation between people and animals in Western thought has meant that human diseases tend to be treated and monitored separately from diseases in non-human animals (Hardy 2003). Nevertheless, the majority of infectious diseases in people are defined as zoonoses because they have been traced to nonhuman animals, as carriers or reservoirs (Jones *et al.* 2008).

In regard to the above, it is increasingly clear that due to the properties of complex systems, the health of human populations is integrally linked to animal populations (Rock *et al.* 2009, Zinsstag *et al.* 2011). Consequently, diseases in plants and animals may serve as sentinels

for threats to human health. Nevertheless, responses are all too often are narrowly interpreted from the outset, to the extent of glossing over the meaning and implications of the problems at hand (Blue and Rock 2011; Hinchliffe *et al*. 2012). One example of how public health responses to animal disease are construed is their adverse mental health implications for people, as occurred during the foot-and-mouth epidemic in the UK (Mort *et al.* 2005). Litter from dog feces in cities represents another example of focusing on the biological dimensions of non-humans entities. The tendency in public health has been to conflate this problem with measurable contamination and infection control. Whereas, when this everyday nuisance has been considered or studied at all, a prominent finding is that the presence of dog waste in public spaces can symbolize feeling poor and neglected (Derges *et al.* 2012, McCormack *et al.* 2010)

Indeed, the ubiquity of dogs and other animals kept as pets should disrupt any lingering presumption that the systems in which people live and the relationships that they value are purely human. About half of all households in Western countries include pet animals (McNicholas *et al.* 2005), and pet-keeping is growing in popularity in many non-Western countries (Headey *et al.* 2007, Oka and Shibata 2009) The potential implications of pet populations for human health include a negative impact on zoonotic infections, a positive impact on physical activity in the form of dog-walking, and both positive and negative influences on mental health via human-animal bonds and pet-related interactions between people (Cutt *et al.* 2007, McNicholas *et al.* 2005, Toohey and Rock 2011).

The nonhuman world includes more than plants, microbes and other animals. Additional non-human entities with implications for public health include toxins, addictions to psychoactive substances, people's environments, and technologies. Carcinogens, such as those found in cigarettes, have considerable influence on everyday life and on patterns of death. It is not an exaggeration to suggest that such nonhuman entities possess a kind of agency, for by coupling with people's bodies, they channel and constrain the capacity for change (Dennis 2011, Jain 2003). Meanwhile, the "built environment" has become a prominent topic of discussion in research on physical activity, particularly as regards landscapes that have been modified or selectively preserved in the course of urbanization (e.g., McCormack and Shiell 2011, Sallis *et al.* 2012). The socio-ecological model, which is rooted in psychology, certainly acknowledges the potential for places to exert influence on people's behaviour (McLaren and Hawe 2005, Sallis *et al.* 2012), yet recent developments in social science disciplines such as geography, sociology and anthropology challenge the convention in the public health literature of distinguishing sharply between "physical" and "social" environments (Cummins *et al.* 2007). These developments point to the pertinence for public health of Donna Haraway's (2008) contention that humans are continually "becoming with" microbes, other animals, technologies, and spaces.

DEBATES about POSTHUMANISM and CRITICAL PUBLIC HEALTH

As a philosophical and moral tradition, humanism posits an intrinsic value for human life, a universal capacity among people for rational thought and for morality, and a commitment to seeking truth through human means in support of human interests. In affirming

the dignity and worth of all people along with the desirability of rational decision-making, the development of public health since the nineteenth century can be interpreted as a humanist achievement. Yet in the contemporary period, humanist impulses and arguments no longer seem so central to events and trends. This decentering of the humanist worldview has been attributed to our increasing "imbrication in technical, medical, informatics, and economic networks" (Wolfe 2010, p. xv). Below, we illustrate the relevance of debates about posthumanism to critical public health. Italicized terms appear in the appended glossary.

In drawing on while also critiquing the legacy of humanism, debates about posthumanism build on poststructuralism. While poststructuralist theories are highly diverse, central to poststructuralism is a questioning of how systems and frames of reference change over time, sometimes with rapidity, such that that the meaning of words and actions are contingent as opposed to being inherently stable. As an intellectual movement, post-structuralism has been closely associated with French theorists, including Bourdieu and Foucault.

Bourdieu (1997 [1980]) emphasized that people come to embody systemic forms of advantage and disadvantage. In doing so, Bourdieu contributed to a revitalization of humanism. Foucault (1978 [1976]), by contrast, emphasized that the very notion of a human being or being human is historically rooted. His rendition of systems of thought and the importance of technologies is foundational to posthumanist thought (Wolfe 2010). Whereas numerous investigators have taken up the Foucauldian concept of discourse in qualitative health research, less attention has been paid in public health than is warranted to Foucault's insights about populations, texts and numbers as political imbrications (Foucault 1991 [1978], Hacking 1982). Foucault's work arguably underplayed the materiality of embodied agency (Haraway 2004 [1985]), however, as well as the imprint of non-human animals in social life (Blue and Rock 2011, Haraway 2008). Since both embodied agency and non-human life pertain directly to public health, these critiques of the Foucualdian literature could assist with theorizing in public health.

As illustrated by critical research on smoking and tobacco control measures (Bell *et al.* 2010, Frohlich *et al.* 2012, Jain 2003, Poland 2000), Bourdieu's poststructuralist contributions to humanism and Foucault's poststructuralist contributions to posthumanism both provide incisive insights. In humanist terms, tobacco control interventions themselves have become part of why gender and social class are deeply implicated in where and when different groups of people smoke, what type and brands of tobacco products are consumed, and by whom. Posthumanist scholarship, meanwhile, foregrounds the materiality of cigarettes and place-based features in smoking as a social practice. As an ensemble, this body of scholarship invites greater reflexivity on public health's history, present, and future. Appeals to individual choice and rational agency, for instance, merit rethinking.

More recently, poststructuralism has given rise to ***non-representational theories***, which is "an umbrella term for diverse work that seeks to better cope with our self-evidently more-than-human, more-than-textual, multisensual worlds" (Lorimer 2005). Originally articulated in geography (Thrift 1996), ***non-representational theories*** signal a conceptual and methodological shift away from social constructivism, the dominant mode of critical analysis in the social

sciences and humanities throughout the 1980s and 1990s. ***Non-representational theories*** are characterized by three shared commitments: an approach to meaning and value as "thought-in action"; a relational-material or associative account of the social; and an attention to specific events that may bring about new ways of acting and thinking (Anderson and Harrison 2010). Central here is a concern with ontogenesis, the construction of meaning and the maintenance of relationships through developmental processes rather than pre-constituted information codes or social orders (Oyama 2000).

The social, in other words, is not reduced to the activities of humans. Instead, the conceptualization of social life is being expanded, as illustrated by the concept of ***meshwork*** and the insights of ***actor-network theory***, to include all manners and forms of contingent material relations. The simultaneous emphasis on embodiment, performance and everyday life provides new avenues for public health scholarship.

Actor-network theory developed within and has expanded the boundaries of ***science and technology studies (STS)***. Most ***STS*** scholarship starts with the presumption that "[k]nowledge and artifacts are human products, and marked by the circumstances of their production" (Sismondo 2003). This position has evolved from both empirical and historical studies that have taken on issues raised by Robert Merton's (1938) internalist account of science as an institution and Thomas Kuhn's highly influential examination of scientific progress (Kuhn 1970 [1962]). In ***STS*** scholarship, the relationships between data and theories, technology and social order, are all understood as being socially contingent, and therefore influenced by social processes. On this basis, ***STS*** scholarship sets out not only to examine the context but also the contents of science and technology in social and cultural terms. Over the last few decades, ***STS*** has become an established part of the academy and increasingly intellectually influential in shaping public policy and practice, yet this field is not yet widely known or taught in public health.

STS scholarship informed by ***actor-network theory*** confers agency on non-humans, unlike in social network theory, which focuses on the relationships that people form with one another (Hawe *et al.* 2004). Entities such as scallops (Callon 1986), pathogens (Latour 1983), or even "sleeping policemen" (Latour 1992), also known as "speed bumps," have been shown via ***actor-network theory*** to influence their surroundings, and, thereby, shape material outcomes. To provide for symmetry in the treatment of the human and nonhuman constituents, scholarship informed by ***actor-network theory*** considers both human and nonhuman entities to be "actants." Crucially, the agency of nonhuman entities is not seen as being derivative of or dependent on the actions of humans, but as a constitutive part of relations that reciprocally shape both humans and nonhumans. Consequently, acts of translation involve not only rephrasing information in a different language or idiom, but also efforts to mobilize and shape networks comprised of both humans and non-humans (Law 1999). Underlying the conceptualization of translation in ***actor-network theory*** are Foucault's (1978 [1976]) insights about problematization through categorization as well as through technologies such as statistics and maps (Latour 1990).

One application in public health of the conceptualization of translation in ***actor-network theory*** concerns bans on smoking in shared space (Young *et al.* 2010). The conceptualization of

translation in ***actor-network theory*** has also been extended in public health to partnerships with frontline as well as managerial staff (Clavier *et al.* 2012) and to rhetorical uses of diagnostic categories (Degeling and Rock 2012). By re-conceptualizing smoking bans, inter-sectorial reform, and diagnostic innovations with reference to ***actor-network theory***, these contributions all demonstrate that very small changes in systems can have significant impacts on subjective experience and health indicators. Furthermore, while scholarship informed by ***actor-network theory*** is not united by a normative posture, the conceptualization of translation in ***actor-network theory*** can assist in surfacing underlying values that shape decisions and practices that ultimately impact on people's health.

BRINGING OBJECTS and COLLECTIVITIES into CONSIDERATION

In exemplary ethnographic research on health-related knowledge, Annemarie Mol (2002) built upon ANT and on classic scholarship in philosophy, sociology, and anthropology to develop the concept of ***enactment***. This concept further departs from anthropocentric assumptions about human mastery and from an emphasis on hierarchical control over resources as the driver of innovation. It is important to emphasize that an ***enactment*** is not the same as a construction as there is no single or ultimate constructor. Rather, ***enactments*** are the product of a heterogeneous web of social and material relationships. This understanding of ***enactment*** means, for example, that entities such as disease (in all its varieties) should not be taken for granted as if they were states of nature, nor should they be regarded as artifacts of human activity alone. These things only exist for us in so much as our interactions with them rely upon specific configurations of material elements and sets of practices. Thus, as the empirical philosopher Mol notes: "If an object is real this is because it is part of a practice. It is a reality *enacted*" (Mol 2002, p. 44, emphasis in the original).

This approach hinges on the idea that entities are never stable. ***Enactments*** are mutable and liable to change when brought into being under different conditions. As a prime example, Mol's (2002) detailed examination of what is called "arteriosclerosis" found that there were many varieties and therefore many ***enactments*** of the disease depending on the setting and the interpretive community. Epidemiological ***enactments*** differ markedly from clinical ***enactments*** of arteriosclerosis, and both epidemiological and clinical enactments of this disease differ from those in pathology. Yet ultimately the various ***enactments*** do cohere, to some extent, in practice. It follows that reality is not a singular topographical space we move around in (Cummins *et al.* 2007). The upshot for public health research and practice is that "matter," or the context provided by the material world, really does matter because it enters into what we perceive to be the facts of existence.

In a witty essay written in the genre of a fable, Tim Ingold (2011 chapter 7) imagines a dialogue between Bruno Latour as the ANT of ***actor-network theory*** and himself as a SPIDER implicated in ***meshwork***. By the acronym of SPIDER, Ingold means skilled practice involves developmentally embodied responsiveness. Ingold introduces the ***meshwork*** concept by contending that being alive is rendered possible through relationships, which are forged between and among sentient organisms, and through movement, which leave traces and create trails. "Each such trail is but one strand in a tissue of trails that together comprise the

texture of the lifeworld. This texture is what I mean when I speak of organisms being constituted within a relational field. It is a field not of interconnected points but of interwoven lines; not a network but a *meshwork*" (Ingold 2011 p. 70, emphasis in the original). Agency in relation to ***meshwork*** is not a condition exclusive to human beings, yet according to Ingold (2011 p. 93), human existence is unique among organisms only insofar as people, as individuals and in groups, exhibit a "cognitive capacity to work things out in advance, in the head, prior to implementation in the world."

Ingold's concept of ***meshwork*** is indebted to ethnographic research with Wemindji Cree and their notion of life as "continuous birth" (Scott 1989). As an ecological anthropologist, Ingold does not explicitly concern himself with health, yet the medical anthropologist Naomi Adelson translates the closest Wemindji Cree term to health as the subjective experience of "being alive well." This concern with "being alive well" encompasses the wildlife and the land itself; it is not only a matter of human concern or a purely human phenomenon (Adelson 2000). Furthermore, this concern with "being alive well" resonates with the evolving concept of "one health" in veterinary medicine and public health (Green 2012, Rock *et al.* 2009, Zinsstag *et al.* 2011), as well as with Donna Haraway's (2008) revival of the term "flourishing." Haraway (2008), in fact, emphasizes that human bodies and human lives comprise multi-species encounters. For Haraway (2008), a key point is that being alive is inherently communitarian, not only because people's bodies entwine with technologies, but also because multiple species constitute what it is to be human in a given time and place.

The anthropologist Philippe Descola (2005, 2006), meanwhile, contends that relationships among human and non-human beings are primordial to social organization, and he has suggested the ***collectivity*** concept as an alternative to assuming that societies, by definition, are purely human in composition. The co-existence of human and non-human beings in a given ***collectivity*** has a material imprint as well as symbolic dimensions. Together, the material imprint and symbolic dimensions constitute a given ***collectivity*** as an ontology, or, in classic terminology, a "social fact" (Durkheim 1988 [1912]). In Western countries, humans and animals are generally recognized as being alive and sentient, while things such as trees are considered to be alive but not sentient, and things such as rocks are considered to be neither alive nor sentient. In many collectivities, however, certain rocks or trees are understood to be both alive and sentient. Such differences in worldview can pose difficulties for non-dominant groups and even contribute to inequity in health and well-being, as has been illustrated vividly by research and advocacy with an Indigenous ***collectivity*** in Australia (Povinelli 2002). For public health, there are two crucial contributions that arise from research and theory on collectivities. First, people may care just as much if not more about the lives and fates of some nonhuman beings as they do about human life and health. Second, to be ethical and effective, public health interventions should be attuned to people's emotional and biological connections with nonhuman beings.

In the years to come, we envision constructive dialogues between critical public health and the interdisciplinary field of ***anthrozoology***, which focuses attention on interactions and broader connections between people and nonhuman animals. Primatologists and other ethologists who study behavior in nonhuman species now recognize that what members of

nonhuman species are observed to do is often influenced by human behaviour, and vice-versa. In addition, sociocultural anthropologists have shown that a strict distinction between human and non-human beings, which has been foundational in Western thought, is far less salient in many non-Western settings or is absent altogether (Descola 2006, Povinelli 2001). Moreover, in Western countries, popular ideas about and patterns of interactions with nonhuman animals have changed dramatically since the mid-nineteenth century, fundamentally reshaping veterinary medicine while also permeating public health (Hardy 2003, Jones 2003). Understanding the nuances of people's connections with nonhuman animals is of immense relevance to public health because we all live with, amongst and rely upon other species of animals. It follows that nonhuman animals are relevant for ecological health and are inextricable from many spheres of human activity (e.g., dog-walking, horse-riding, bird-watching, farming). Further, their presence – or absence – can influence people's emotional health.

Ultimately, inquiries and debates surrounding posthumanism could lead to revisiting the very meaning of "public." For the field of public health, what is meant by "public" is of vital and definitional importance. Conceptually, however, the public is a "curiously obscure" term (Warner 2002). Publics typically refer to historically-situated collectives comprised of human strangers who are united through discourse, deliberations, and procedures. In stark contrast to scholarship that defines publics in discursive, deliberative and procedural terms, some recent contributions explore how publics are constituted in relation to particular technologies and other nonhuman entities (Marres 2005, Michael 2002). Rather than privilege language above all else, here the primary concern lies with how material entities and environments become politicized. In particular, Marres (2005) points out that in Dewey's (1991 [1927]) influential formulation, the public moves from an entity constituted solely by speech to one that explicitly involves material concerns and technologies, notably communication technologies. This reinterpretation opens the door to distinguishing the public sphere of discourse from the existence of publics as material entities that always include non-human constituents (Blue and Rock, In press).

Conclusions

Existing efforts within public health to adopt, adapt, and clarify terminology on complex systems have emphasized contributions from the natural sciences, economics, and social psychology (McLaren and Hawe 2005, Rickles *et al.* 2007, Shiell *et al.* 2002, Smith *et al.* 2006). Scholarly contributions from other social sciences disciplines and the humanities can assist in advancing this agenda further. In this commentary, accordingly, we have invited public health researchers to pay heed to debates surrounding posthumanism. Divergent definitions of posthumanism currently co-exist, which we view as an opportunity to examine how distinct philosophical and scientific traditions have given rise to increasing interest in how non-human entities influence social life and human experience. In this light, we hasten to clarify that that we are not advocating for critical scholars in public health to reach "beyond" the human body or humanist values. Rather, our hope is that discussion and debates surrounding the very notion of posthumanism will invigorate discussion within critical public health about conceptual

foundations, while also encouraging dialogue with critical scholars across the social sciences and humanities. This commentary could, therefore, assist public health scholars in linking their research and pedagogy more closely with current debates in critical theory. Yet we recognize that the premium placed on human life and thought is foundational to public health. The cultivation of critical thought in public health could be emboldened by efforts to reconcile this humanist ethos with due recognition of nonhuman entities, including nonhuman beings.

APPENDIX: A GLOSSARY of TERMS

Actor-network theory (ANT) is a materialist approach to describing the connections between elements in heterogeneous systems (Law 1999). Rather than being a formal theory, actor-network scholarship is grounded empirically in an expanding series of case studies. Actor-network case studies have two defining features: (a) entities are treated as effects of reciprocal relationships between actors; and (b) conventional categories and typical distributions of power are to be bracketed at the outset, as a matter of methodological principle, to allow for empirical investigations into which entities are present and to what effect.

Anthrozoology refers to the study of concrete interactions and political relationships between people and animals. Scientists and scholars from a broad range of backgrounds contribute to this interdisciplinary field, which is also known as human-animal studies.

Collectivity: The collectivity concept has been proposed to take into account the co-mingling of human and non-human beings in anything resembling a political situation or a social setting. The anthropologist Descola (2006) has used the term “collectivity” to highlight that nonhumans recognized as being alive and sentient differ in their effects from those considered to be inert and inanimate.

Enactment took on new meaning as a theoretical concept through Annemarie Mol’s ethnographic investigations in the realms of biomedicine and the natural sciences. This concept references the realization that practices bring entities into existence (Mol 2002). The emphasis is avowedly empirical and tightly focused on what things do, preclude, and allow others to do.

Meshwork is a concept introduced by Tim Ingold (2011) to foreground the permeability of bodies and continual exchange between bodies and their surroundings. The concept of meshwork stands in explicit contradistinction to the term “network,” especially as conceived in ***actor-network theory***.

Non-representational theories: Also known as NRT and as more-than-representational theories, non-representational theories refer to a diverse body of interdisciplinary post-structuralist scholarship that locates signification in ongoing, everyday interactions rather than solely in the realms of discourse, ideology or language.

Science and technology studies (STS) is an interdisciplinary field of research in which the object of study is 'science' itself. Put another way, STS focuses on describing the processes and outcomes of science and technology.

REFERENCES

Adelson, N., 2000. *'Being Alive Well': Health and the Politics of Cree Well-Being* Toronto: University of Toronto Press.

Anderson, B. & Harrison, P. eds. 2010. *Taking-Place: Non-Representational Theories and Geography.* London: Ashgate.

Bell, K., McCullough, L., Salmon, A. & Bell, J., 2010. 'Every space is claimed': smokers' experiences of tobacco denormalisation. *Sociology of Health & Illness,* 32 (6), 914-929

Blue, G. & Rock, M.J., 2011. Trans-biopolitics: Complexity in interspecies relations. *Health: an Interdisciplinary Journal for the Social Study of Health, Illness & Medicine,* 15 (4), 353-368

Blue, G. & Rock, M.J., In press. Animal publics: Accounting for heterogeneity in political life. *Society & Animals*.

Bourdieau, P., 1997 [1980]. *Outline of a Theory of Practice* Cambridge: Cambridge University Press.

Callon, M., 1986. Some elements of a sociology of translation: Domestication of the scallops and the fishermen of St. Brieuc Bay. *In* Law, J. ed. *Power, Action and Belief: A New Sociology of Knowledge?* London: Routledge and Kegan Paul.

Clavier, C., Sénéchal, Y., Vibert, S. & Potvin, L., 2012. A theory-based model of translation practices in public health participatory research. *Sociology of Health & Illness,* 34 (5), 791-805

Cummins, S., Curtis, S., Diez-Roux, A.V. & Macintyre, S., 2007. Understanding and representing 'place' in health research: a relational approach. *Social Science & Medicine,* 65 (9), 1825-1838

Cutt, H.E., Giles-Corti, B., Knuiman, M. & Burke, V., 2007. Dog ownership, health and physical activity: A critical review of the literature. *Health & Place,* 13 (1), 261-72

Degeling, C. & Rock, M., 2012. Hemoglobin A1C as a diagnostic tool: Public health implications from an actor-network perspective. *American Journal of Public Health,* 102 (1), 99-106

Dennis, S., 2011. Smoking causes creative responses: on state antismoking policy and resilient habits. *Critical Public Health,* 21 (1), 25-35

Derges, J., Lynch, R., Clow, A., Petticrew, M. & Draper, A., 2012. Complaints about dog faeces as a symbolic representation of incivility in London, UK: A qualitative study. *Critical Public Health,* 22, 419–425

Descola, P., 2005. *Par-delà nature et culture* Paris: Gallimard.

Descola, P., 2006. Beyond nature and culture. *Proceedings of the British Academy,* 139, 137-155

Dewey, J., 1991 [1927]. *The Public and Its Problems.* Athens, OH: Ohio University Press.

Durkheim, É., 1988 [1912]. Elementary forms of religious life. *In* Bohannan, P. & Glazer, M. eds. *High Points in Anthropology.* 2nd ed. New York: Alfred A. Knopf, 254-263.

Foucault, M., 1978 [1976]. *The History of Sexuality: An Introduction* New York: Pantheon.

Foucault, M., 1991 [1978]. Governmentality. *In* Burchell, G., Gordon, C. & Miller, P. eds. *The Foucault Effect: Studies in Governmentality with Two Lectures by and an Interview with Michel Foucault.* Chicago: University of Chicago Press, 87-104.

Frohlich, K.L., Mykhalovskiy, E., Poland, B.D., Haines-Saah, R. & Johnson, J., 2012. Creating the socially marginalised youth smoker: the role of tobacco control. *Sociology of Health & Illness,* 34 (7), 978-993

Green, J., 2012. One health, one medicine, and critical public health. *Critical Public Health,* 22, 377–381

Hacking, I., 1982. Biopower and the avalanche of printed numbers. *Humanity in Society,* 5, 279-295

Haraway, D., 2004 [1985]. A manifesto for cyborgs: Science, technology, and socialist feminism in the 1980s. *The Haraway Reader.* London: Routledge.

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

Hardy, A., 2003. Animals, disease, and man: Making connections. *Perspectives in Biology and Medicine,* 46 (2), 200-215

Hawe, P., Webster, C. & Shiell, A., 2004. A glossary of terms for navigating the field of social network analysis. *Journal of Epidemiology and Community Health,* 58 (12), 971-975

Headey, B., Na, F. & Zheng, R., 2007. Pet dogs benefit owners' health: A 'natural experiment' in China. *Social Indicators Research,* 87 (3), 481-493

Hinchliffe, S., Allen, J., Lavau, S., Bingham, N. & Carter, S., 2012. Biosecurity and the topologies of infected life: from borderlines to borderlands. *Transactions of the Institute of British Geographers*, doi: 10.1111/j.1475-5661.2012.00538.x

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

Jain, S.S.L., 2003. "Come Up to the Kool Taste": African American Upward Mobility and the Semiotics of Smoking Menthols. *Public Culture,* 15 (2), 419-438

Jones, K.E., Patel, N.G., Levy, M.A., Storeygard, A., Balk, D., Gittleman, J.L. & Daszak, P., 2008. Global trends in emerging infectious diseases. *Nature,* 451 (7181), 990-3

Jones, S.D., 2003. *Valuing Animals: Veterinarians and Their Patients in Modern America* Baltimore: Johns Hopkins University Press.

Kuhn, T., 1970 [1962]. *The Structure of Scientific Revolutions,* 2nd ed. Chicago: University of Chicago Press.

Lakoff, A., 2008. The generic biothreat, or, how we became unprepared. *Cultural Anthropology,* 23 (3), 399-428

Last, J. ed. 2001. *A Dictionary of Epidemiology,* Oxford: Oxford University Press.

Latour, B., 1983. Give me a laboratory and I will raise the world. *In* Knorr-Cetina, K.D. & Mulkay, M. eds. *Science Observed.* Beverly Hills: Sage, 141-170.

Latour, B., 1990. Drawing things together. *In* Lynch, M. & Woolgar, S. eds. *Representation in Scientific Practice.* Cambridge, MA: MIT Press, 19-68.

Latour, B., 1992. Where are the missing masses? The sociology of a few mundane artefacts. *In* Bijker, W. ed. *Shaping Technology / Building Society.* London: MIT Press, 228-45.

Law, J., 1999. After ANT: Complexity, naming and topology. *In* Law, J. & Hassard, J. eds. *Actor Network Theory and After.* Oxford: Blackwell, 1-14.

Lorimer, H., 2005. Cultural geography: the busyness of being 'more than representational'. *Progress in Human Geography,* 29 (1), 83-94

Marres, N., 2005. Issues spark a public into being: A key but often forgotten point of the Lippman-Dewey debate. *In* Latour, B. & Weibel, P. eds. *Making Things Public: Atmospheres of Democracy.* Boston: MIT Press, 208-217.

McCormack, G.R., Rock, M., Toohey, A.M. & Hignell, D., 2010. Characteristics of urban parks associated with park use and physical activity: a review of qualitative research. *Health & Place,* 16 (4), 712-726

McCormack, G.R. & Shiell, A., 2011. In search of causality: a systematic review of the relationship between the built environment and physical activity among adults. *International Journal for Behavioural Nutrition and Physical Activity,* 8 (1), 125-125

McLaren, L. & Hawe, P., 2005. Ecological perspectives in health research. *Journal of Epidemiology and Community Health,* 59 (1), 6-14

McNicholas, J., Gilbey, A., Rennie, A., Ahmedzai, S., Dono, J. & Ormerod, E., 2005. Pet ownership and human health: A brief review of evidence and issues. *BMJ,* 331 (7527), 1252-4.

Mendelsohn, J.A., 1998. From eradication to equilibrium: How epidemics became complex after World War I. *In* Lawrence, C. & Weisz, G. eds. *Greater than the Whole: Holism in Western Biomedicine 1920-1950.* Oxford: Oxford University Press, 303-331.

Merton, R., 1938. Science and the social order. *Philosophy of Science,* 5 (3), 321-337

Michael, M., 2002. Comprehension, apprehension, prehension: heterogeneity and the public understanding of science. *Science, Technology, & Human Values,* 27 (3), 357-378

Mol, A., 2002. *The Body Multiple: Ontology in Medical Practice* Raleigh, NC: Duke University Press.

Mort, M., Convery, I., Baxter, J. & Bailey, C., 2005. Psychosocial effects of the 2001 UK foot and mouth disease epidemic in a rural population: qualitative diary based study. *BMJ,* 331 (7527), 1234

Oka, K. & Shibata, A., 2009. Dog ownership and health-related physical activity among Japanese adults. *Journal of Physical Activity & Health,* 6 (4), 412-418

Oyama, S., 2000. *The Ontogeny of Information: Developmental Systems and Evolution* Durham, NC: Duke University Press.

Poland, B.D., 2000. The 'considerate' smoker in public space: The micro-politics and political economy of 'doing the right thing'. *Health and Place,* 6, 1-14

Povinelli, E.A., 2001. Radical worlds: The anthropology of incommensurability and inconceivability. *Annual Review of Anthropology,* 30, 319-334

Povinelli, E.A., 2002. *The Cunning of Recognition: Indigenous Alterities and the Making of Australian Multiculturalism* Durham, N.C.: Duke University Press.

Rickles, D., Hawe, P. & Shiell, A., 2007. A simple guide to chaos and complexity. *Journal of Epidemiology & Community Health,* 61 (11), 933-937

Rock, M., Buntain, B., Hatfield, J. & Hallgrímsson, B., 2009. Animal-human connections, 'one health,' and the syndemic approach to prevention. *Social Science & Medicine,* 68 (6), 991-995

Sallis, J.F., Floyd, M.F., Rodríguez, D.A. & Saelens, B.E., 2012. Role of Built Environments in Physical Activity, Obesity, and Cardiovascular Disease. *Circulation,* 125 (5), 729-737

Scott, C., 1989. Knowledge construction among the Cree hunters : metaphors and literal understanding. *Journal de la Société des Américanistes,* 75 (1), 193-208

Shiell, A., Donaldson, C., Mitton, C. & Currie, G., 2002. Health economic evaluation: A glossary. *Journal of Epidemiology and Community Health,* 56 (2), 85-88

Sismondo, S., 2003. *An Introduction to Science and Technology Studies* Malden, MA: Blackwell

Smith, B.J., Tang, K.C. & Nutbeam, D., 2006. WHO Health Promotion Glossary: new terms. *Health Promotion International,* 21 (4), 340-345

Thrift, N., 1996. *Spatial Formations* Sage: London.

Toohey, A.M. & Rock, M.J., 2011. Unleashing their potential: a critical realist scoping review of the influence of dogs on physical activity for dog-owners and non-owners. *International Journal of Behavioral Nutrition and Physical Activity,* 8 (1), 46-46

Warner, M., 2002. Publics and counterpublics. *Public Culture,* 14, 49-90

Weir, L. & Mykhalovskiy, E., 2010. *Global Public Health Vigilance: Creating a World on Alert*: Routledge.

Wolfe, C., 2010. *What is Posthumanism?* Minneapolis: University of Minnesota Press.

Young, D., Borland, R. & Coghill, K., 2010. An actor-network theory analysis of policy innovation for smoke-free places: understanding change in complex systems. *American Journal of Public Health,* 100 (7), 1208-1217

Zinsstag, J., Schelling, E., Waltner-Toews, D. & Tanner, M., 2011. From "one medicine" to "one health" and systemic approaches to health and well-being. *Preventive Veterinary Medicine,* 101 (3-4), 148-156